



# **Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire**

GIP Loire Estuaire

## **EXPLOITATION DU MODELE LOCAL DU SITE DE LA LAMBARDE– MODELISATIONS HYDROSEDIMENTAIRES DE LA STABILITE DU DEPOT SUR 13 ANS (2021-2034)**

Rapport de Phase 2 – MODELISATIONS DE LA STABILITE DU SITE DE LA LAMBARDE - version V1

## Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire

GIP Loire Estuaire

EXPLOITATION DU MODELE LOCAL DE LA LAMBARDE – MODELISATIONS DE LA STABILITE DU DEPOT SUR 13 ANS (2021-2034)

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## SYNTHESE ET CONCLUSIONS

Le Groupement d'Intérêt Public Loire Estuaire (GIP LE) dispose d'un outil de modélisation hydrosédimentaire et de qualité des eaux (HSQE) de l'estuaire de la Loire décrit dans le rapport « Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire : Construction, calage et validation du modèle global 3d hydrosédimentaire et d'oxygène dissous, Rapport de Phase 1 – version V2.1 » [1].

Dans le cadre de la construction de ce modèle global, un modèle local du site de clapage de la Lambarde a également été réalisé et calibré afin de modéliser la stabilité du dépôt sur ce site. Ce modèle est décrit dans le rapport « Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire : Construction et calage du modèle 3D hydrosédimentaire local de stabilité du site de clapage de la Lambarde, Rapport de Phase 1 – version V1 » [2].

Ce modèle opérationnel du site de clapage de la Lambarde peut maintenant être exploité pour étudier la stabilité du dépôt sur le long terme. Dans le cadre de la tranche ferme de la phase 2 du marché, l'exploitation est conduite sur 13 années de 2021 à 2034. La stratégie de clapage retenue pour cette exploitation est en accord avec les souhaits du GPMNSN. Elle est rappelée dans la partie méthodologie du présent document.

Durant les 13 ans d'exploitation du modèle, environ 48 millions de m<sup>3</sup> ont été clapés au total sur le secteur. Cinq sous-zones sont concernées par ce clapage à savoir : la sous-zone 19, la sous-zone 22, la sous-zone 23, la sous-zone 27 et la sous-zone 28 sur la fin de l'exploitation (sous-zone non-saturée). Les changements de zones ont été effectués selon la procédure décrite précédemment.

Le volume global restant en place sur la durée de l'exploitation est de 12.9 millions de m<sup>3</sup>, ce qui représente une stabilité générale de 27%. La stabilité pour chaque sous-zone varie entre 24% et 29%. Notons que la durée d'utilisation de chaque sous-zone est variable car elle est directement impactée par l'étalement du dépôt sur les sous-zones adjacentes précédemment utilisées. Les différentes stabilités et durées d'utilisation sont synthétisées dans le Tableau 1-1 ci-dessous.

Tableau 1-1 : Stabilité par sous-zone de clapage

Zone de clapage	Début du clapage	Fin du clapage	Durée du clapage (année)	Stabilité du site sur la période	Volume en place (m <sup>3</sup> )	Volume clapé (m <sup>3</sup> )
Zone 19	01/10/2021	12/08/2025	3.9	29 %	3 929 975	14 152 735
Zone 22	12/08/2025	23/10/2026	1.4	28 %	1 530 490	5 391 322
Zone 23	23/10/2026	08/03/2031	4.3	24 %	3 628 000	15 063 337
Zone 27	06/04/2031	06/11/2033	2.6	29 %	3 115 041	10 743 827
Zone 28	06/11/2033	01/10/2034	0.9	27 %	694 118	2 615 838
Total	01/10/2021	01/10/2034	13	27 %	12 897 624	47 967 059

En fin de simulation, les volumes encore disponibles sur le site sont de 13 millions de m<sup>3</sup> sous la cote -18 m CM. En faisant une hypothèse de stabilité d'environ 27 % au-delà de 2034 et en respectant la cote moyenne-objectif de -18 m CM, il pourrait être encore possible de claper environ 48,6 millions de m<sup>3</sup> de sédiments, ce qui représente potentiellement un minimum de 13 années d'exploitation supplémentaires.



# 1. METHODOLOGIE ET MISE EN PLACE

Cette partie méthodologique reprend les objectifs et les conditions d'exploitation du modèle hydrosédimentaire local du site de la Lambarde en réponse aux mobilisations comprises dans la tranche ferme - phase 2 du marché.

## 1.1. OBJECTIFS

Cette simulation prospective est réalisée dans le but de pouvoir estimer la stabilité du site de clapage de la Lambarde sur le long-terme. A ce titre, 13 ans d'immersions sur le site seront simulés, d'Octobre 2021 à Octobre 2034.

Cette modélisation permettra d'analyser les évolutions bathymétriques des différentes zones au fil du temps afin de pouvoir, s'il est jugé nécessaire, affiner la stratégie générale des clapages.

## 1.2. STRATEGIE DE CLAPAGE

Les études précédentes sur le secteur ont mis en évidence une réduction de la stabilité sur les sous-zones qui semble corrélée à l'atteinte d'une cote moyenne sur la sous-zone autour de -18 m CM. La stratégie de clapage mise en œuvre s'appuie donc sur cette observation, avec un changement de casier dès lors que la cote moyenne dépasse la valeur de -18m CM.

En pratique, ce dépassement de cote moyenne ne permet pas de piloter les opérations de clapage, puisqu'il nécessiterait des levés bathymétriques fréquents et analysés en temps réel. Le dépassement de cote moyenne a donc été rapporté à un dépassement de cote locale (sous le bateau, au niveau du point d'immersion). Cette cote limite locale est fixée à -21 m CM et a été déterminée à partir des observations sur le levé bathymétrique de Mai 2017. A cette date, la cote moyenne de la sous-zone 18 dépasse pour la première fois la valeur de -18m CM et on observe que ponctuellement, la cote de -21 m CM est dépassée sur la totalité de la sous-zone (Figure 1-1).

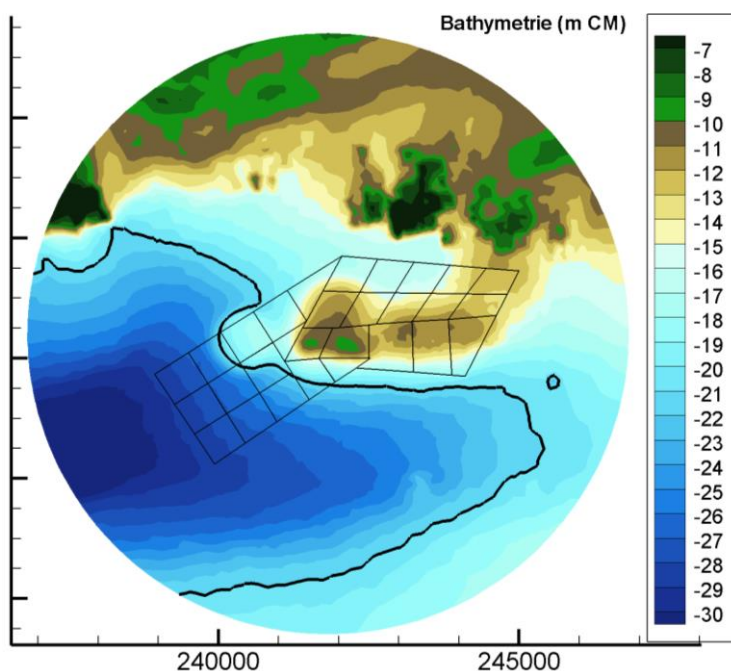


Figure 1-1 : Bathymétrie de Mai 2017 et isobathe -21 m CM (ligne noire)

## 1.3. FORÇAGES ET CONDITIONS INITIALES POUR L'EXPLOITATION

### 1.3.1. Conditions initiales

Le calcul est initialisé à partir d'un calcul précédent réalisé dans le cadre du calage du présent modèle et s'arrêtant au 1<sup>er</sup> Octobre 2021. Les évolutions du fond modélisées ainsi que sa composition durant toute la période de calage (2011 - 2021) sont ainsi prises en compte, ce qui permet de ne pas repartir d'un fond dur.

### 1.3.2. Forçages hydro-météorologiques

Comme précisé précédemment, le modèle est exploité sur 13 années, d'Octobre 2021 à Octobre 2034. Les forçages hydro-météorologiques de la période s'étalant d'Octobre 2011 à Octobre 2018 sont répétés en boucle afin de couvrir l'ensemble de la période d'exploitation.

Rappelons que ces forçages correspondent directement aux résultats du modèle global hydrodynamique en termes de niveaux et vitesses.

Les paramètres principaux permettant de propager la houle (Hauteur moyenne  $Hm0$ , Période de pic  $Tp$ , Direction de pic  $Dp$  et étalement directionnel  $Spd$ ) sont quant à eux issus de la base de données HOMERE.

### 1.3.3. Forçages des clapages

Les masses de sédiments (vase et sable) injectées dans le modèle issues des clapages correspondent à celles de la période Octobre 2011 - Octobre 2018 répétées en boucle de manière équivalente et en phase avec les forçages hydrométéorologiques. Les quantités immergées sont simplement corrigées par un facteur permettant de respecter un volume moyen annuel sur l'ensemble de la période (2021-2034) de 3,7 millions de m<sup>3</sup>/an (facteur correcteur : 3%). Cette méthode permet de respecter l'objectif en termes de volume tout en conservant la variabilité temporelle des immersions. La stratégie de clapage décrite dans [2] est implémentée dans le modèle et se réalise automatiquement. L'enchaînement des casiers est identique à celui réalisé lors des précédentes études à savoir : après la fin d'exploitation de la sous-zone 19, les immersions se feront sur les zones 22, 23, 27, 28, 20, 24, 29 dans cet ordre.

Pour ces raisons, les résultats obtenus par la simulation prospective ne seront pas comparables au futur réalisé dans le détail. Ils fournissent néanmoins un taux pluri-annuel réaliste au vu du jeu de validation effectué.

D'autre part, la stratégie de clapage proposée précédemment a été programmée de manière à se réaliser automatiquement en fonction de la cote du point choisi pour claper.

## 2. RESULTATS DE L'EXPLOITATION

Cette partie présente l'exploitation des résultats de la simulation prospective. Une analyse des volumes clapés et restant en place permet de conclure sur l'évolution de la stabilité du site au cours du temps. Les évolutions bathymétriques des sous-zones sont également analysées et mises en évidence au travers de cartes bathymétriques réalisées à chaque changement de point de clapage.

### 2.1. EVOLUTION DE LA STABILITE DU SITE

Durant les 13 ans d'exploitation du modèle, environ 48 millions de m<sup>3</sup> ont été clapés au total sur le secteur. Cinq sous-zones sont concernées par ce clapage à savoir : la sous-zone 19, la sous-zone 22, la sous-zone 23, la sous-zone 27 et la sous-zone 28 sur la fin de l'exploitation (sous-zone non-saturée). Les changements de zones ont été effectués selon la procédure décrite précédemment.

Le volume global restant en place sur la durée de l'exploitation est de 12.9 millions de m<sup>3</sup>, ce qui représente une stabilité générale de 27%. La stabilité pour chaque sous-zone varie entre 24% et 29%. Notons que la durée d'utilisation de chaque sous-zone est variable car elle est directement impactée par l'étalement du dépôt sur les sous-zones adjacentes précédemment utilisées. Les différentes stabilités et durées d'utilisation sont synthétisées dans le Tableau 2-1 ci-dessous.

Tableau 2-1 : Stabilité par sous-zone de clapage

Zone de clapage	Début du clapage	Fin du clapage	Durée du clapage (année)	Stabilité du site sur la période	Volume en place (m3)	Volume clapé (m3)
Zone 19	01/10/2021	12/08/2025	3.9	29 %	3 929 975	14 152 735
Zone 22	12/08/2025	23/10/2026	1.4	28 %	1 530 490	5 391 322
Zone 23	23/10/2026	08/03/2031	4.3	24 %	3 628 000	15 063 337
Zone 27	06/04/2031	06/11/2033	2.6	29 %	3 115 041	10 743 827
Zone 28	06/11/2033	01/10/2034	0.9	27 %	694 118	2 615 838
Total	01/10/2021	01/10/2034	13	27 %	12 897 624	47 967 059

La sous-zone 19 continue à être utilisée dans la simulation jusqu'en août 2025. La durée de vie des zones suivantes varie entre 1.4 (sous-zones 22) et 4.3 (sous-zone 23) années. Cette différence peut s'expliquer par le fait que les sous-zones 19 et 23 sont initialement plus profondes que les sous-zones 22 et 27 (cf. Figure 2-1).

En fin de simulation, les volumes encore disponibles sur le site sont de 13 millions de m<sup>3</sup> sous la cote -18 m CM. En faisant une hypothèse de stabilité d'environ 27 % au-delà de 2034 et en respectant la cote moyenne-objectif de -18 m CM, il pourrait être encore possible de claper environ 48,6 millions de m<sup>3</sup> de sédiments, ce qui représente potentiellement un minimum de 13 années d'exploitation supplémentaires.

Les résultats sont également analysés à une échelle temporelle plus importante, sur les périodes cumulées du calage et de l'exploitation, à savoir de Septembre 2011, jusqu'à Octobre 2034. Le graphique ci-dessous (Figure 2-2) permet de représenter l'évolution de la stabilité du site tout au long de cette période.

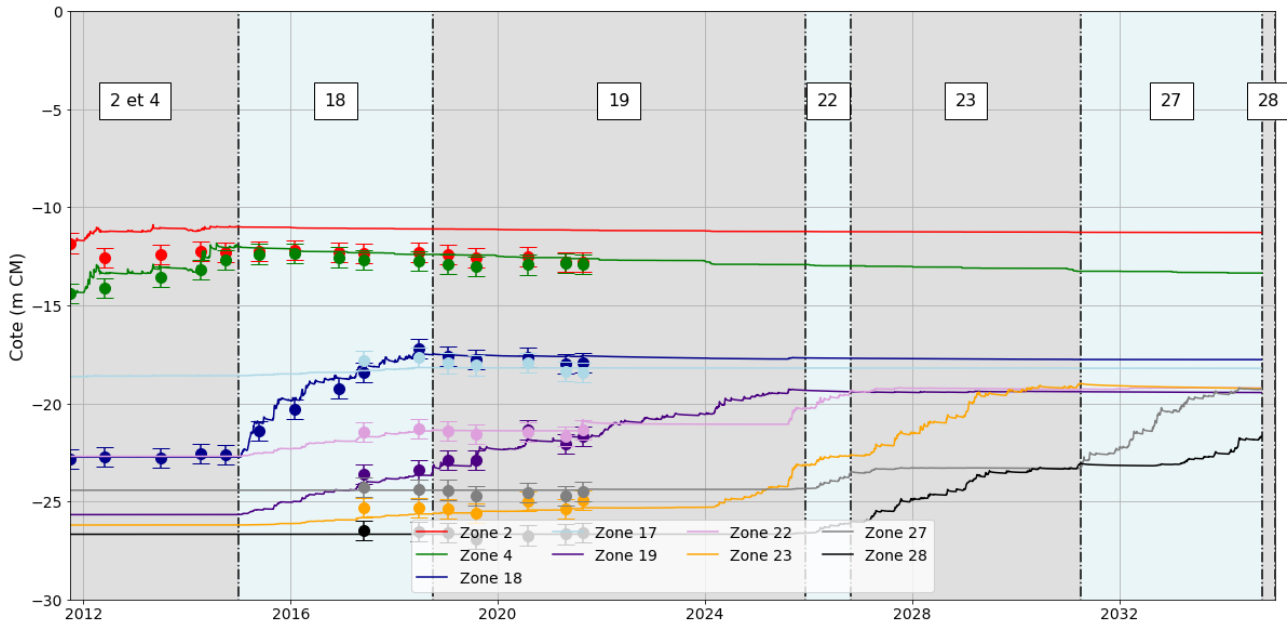


Figure 2-1 : Evolutions des cotes moyennes des différentes sous-zones entre Septembre 2011 et Octobre 2034

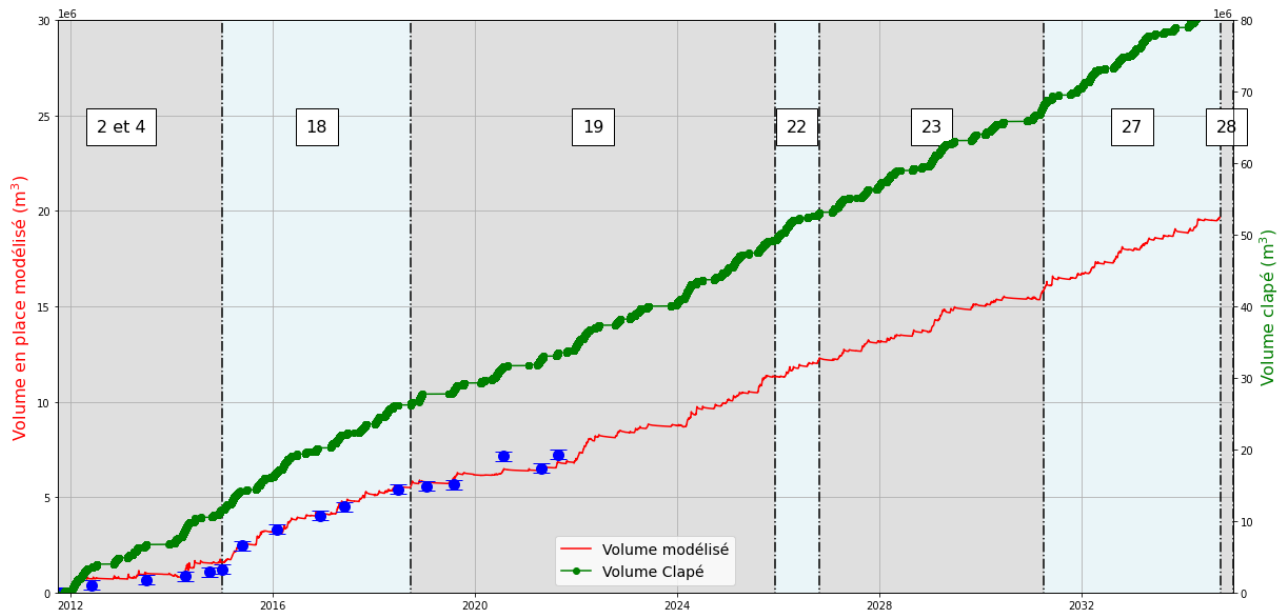


Figure 2-2 : Volume en place et volume clapé entre Septembre 2011 et Octobre 2034

## 2.2. EVOLUTIONS BATHYMÉTRIQUES

Les figures ci-après (Figure 2-3 à Figure 2-7) présentent la bathymétrie finale obtenue à chaque changement de casier. Elles permettent notamment de visualiser l'étendue du dépôt sur les sous-zones adjacentes.

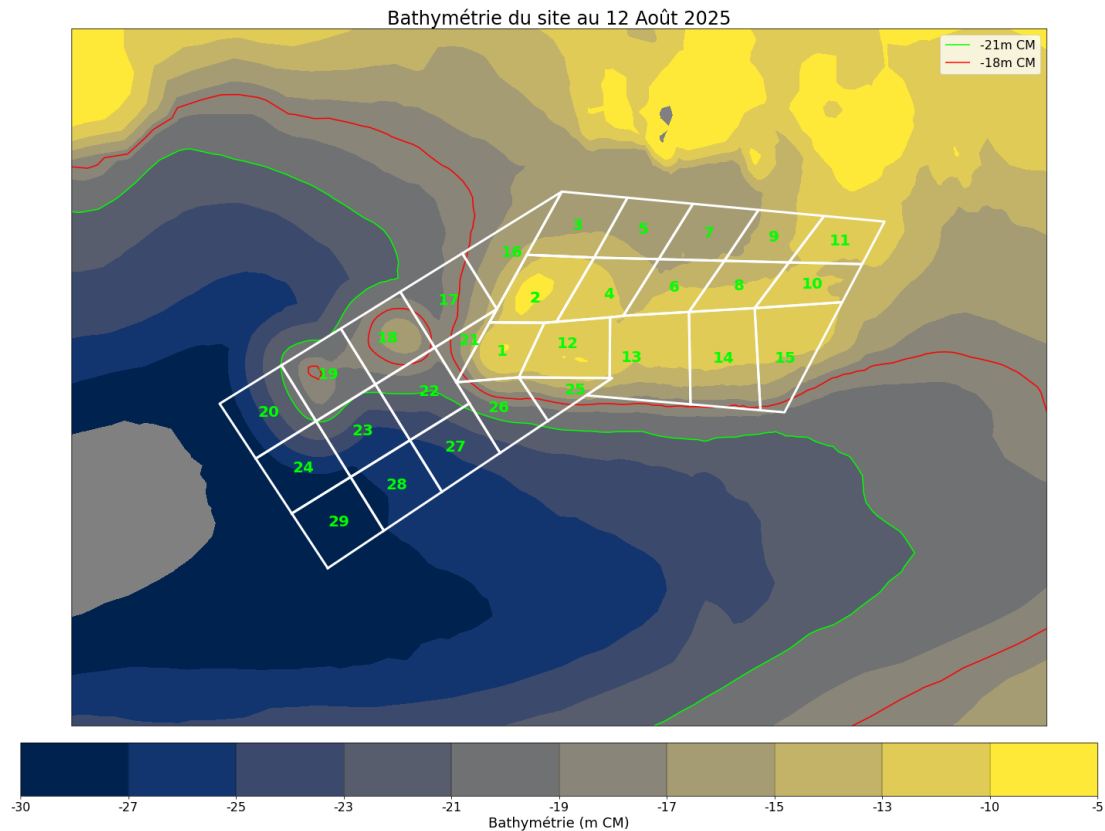


Figure 2-3 : Bathymétrie du site après le clapage sur la sous-zone 19

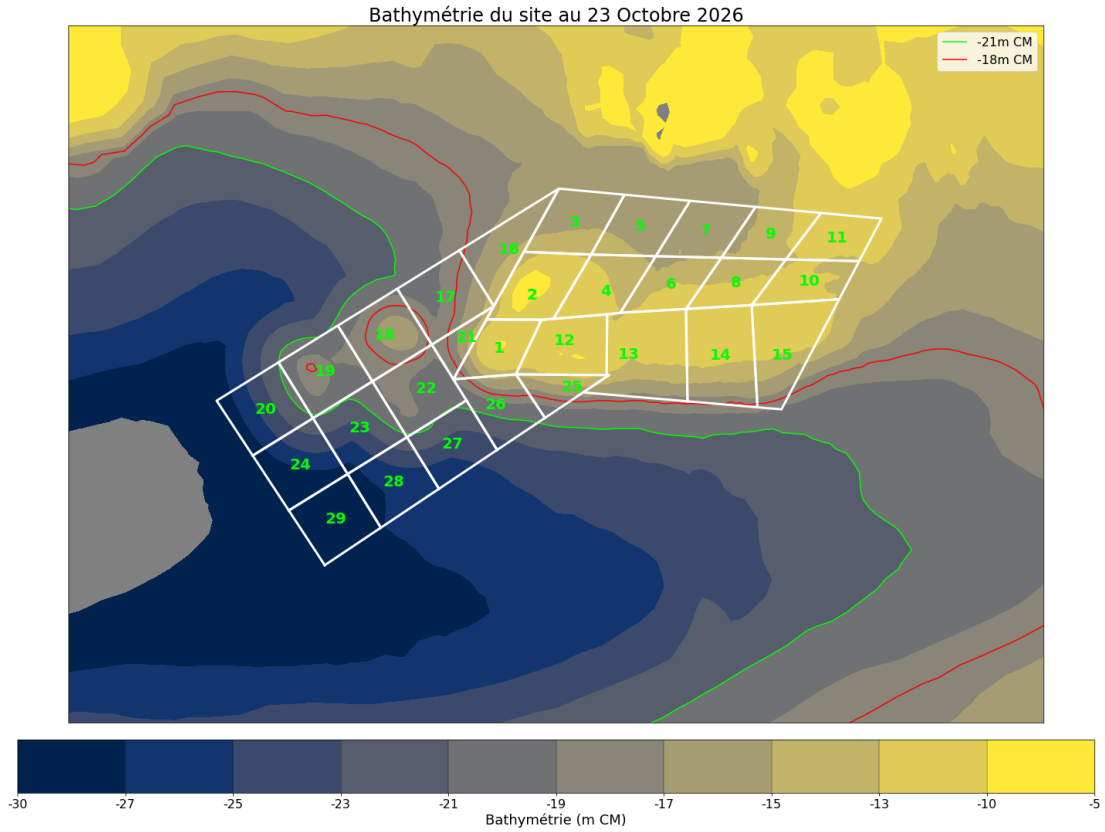


Figure 2-4 : Bathymétrie du site après le clapage sur la sous-zone 22

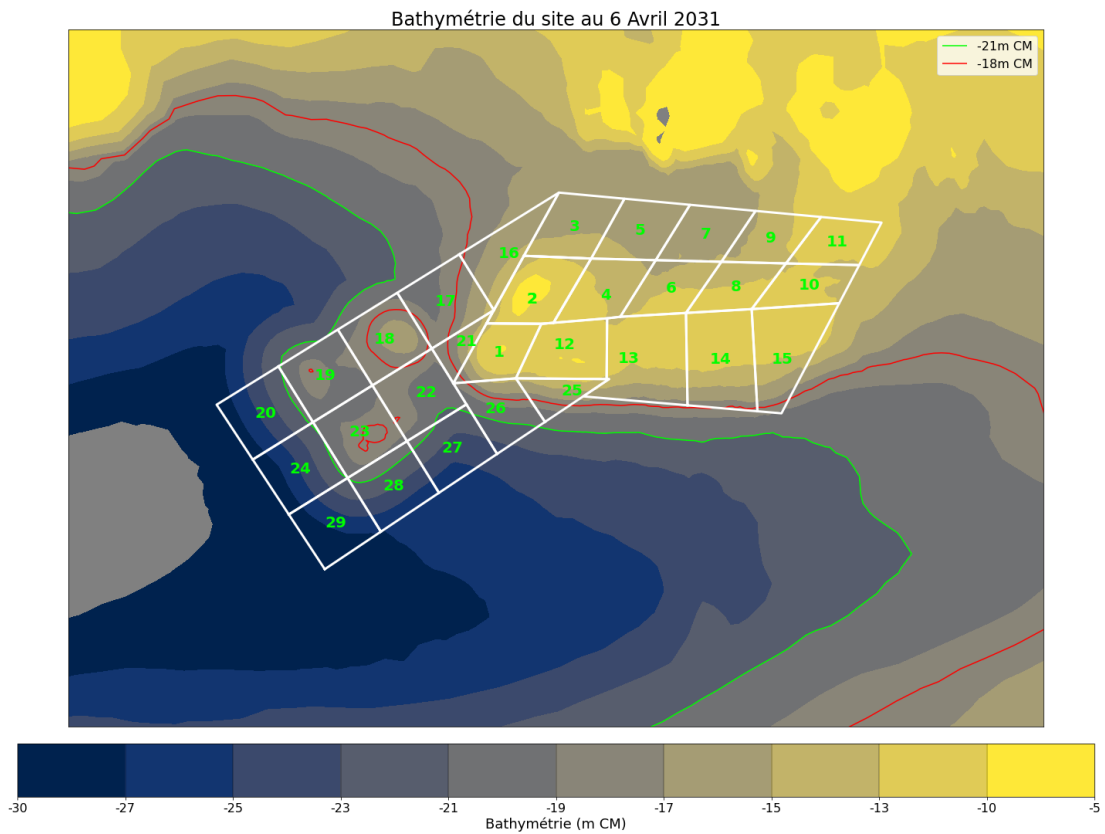


Figure 2-5 : Bathymétrie du site après le clapage sur la sous-zone 23

Bathymétrie du site au 6 Novembre 2033

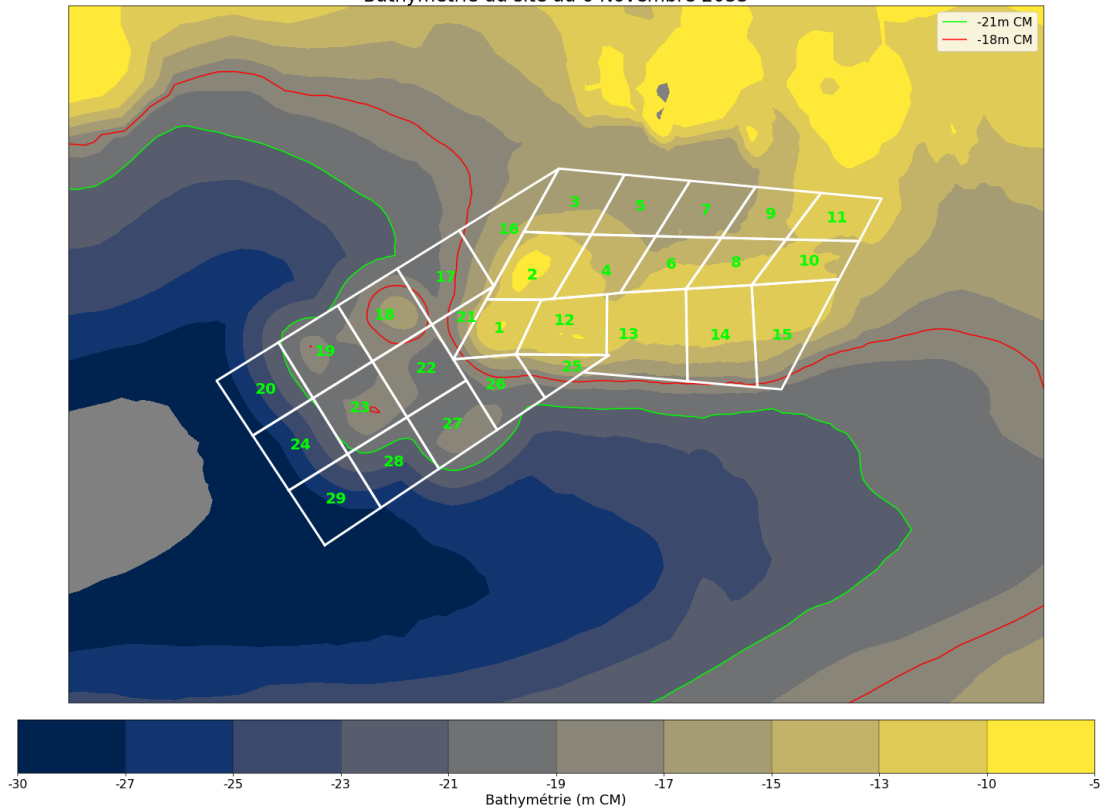


Figure 2-6 : Bathymétrie du site après le clapage sur la sous-zone 27

Bathymétrie du site au 1er Octobre 2034

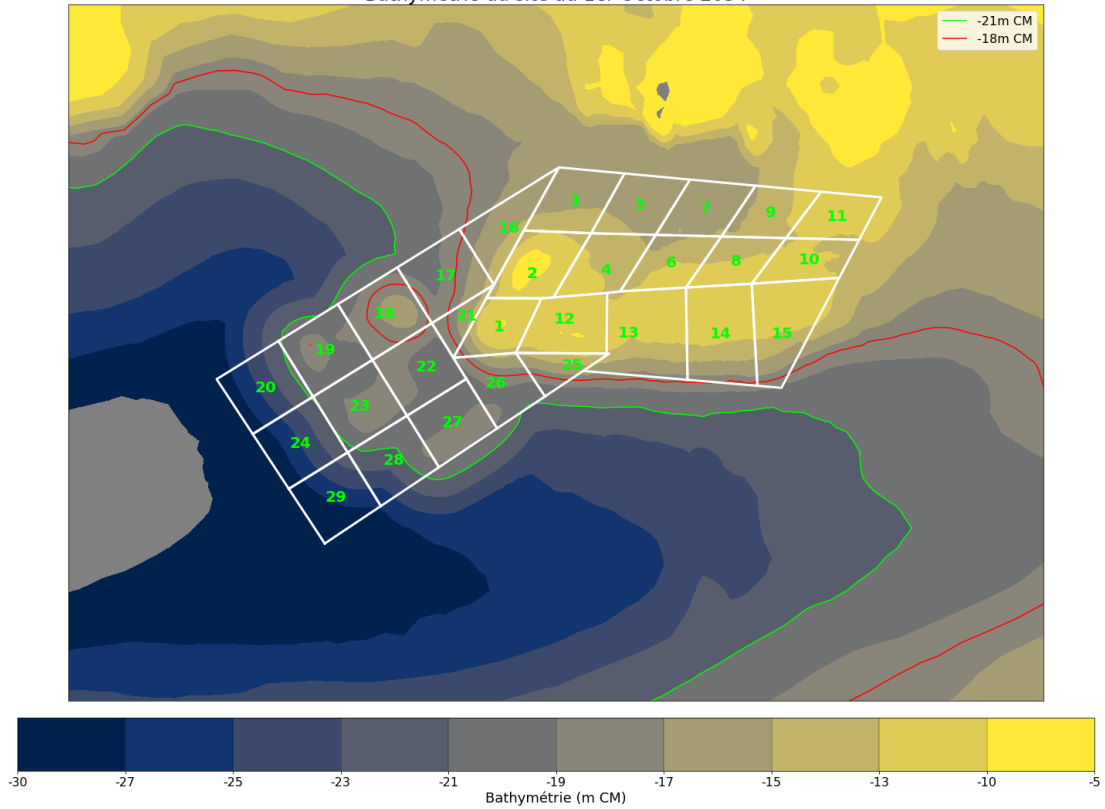


Figure 2-7 : Bathymétrie du site après la phase complète d'exploitation

Des cartes bathymétriques sont produites à différents instants de la simulation, avec une vue en parallèle de l'évolution de la cote moyenne de la sous-zone concernée par le clapage. Un exemple de ce rendu est visible sur la Figure 2-8. L'ensemble des cartographies sont disponibles en Annexe A du présent document.

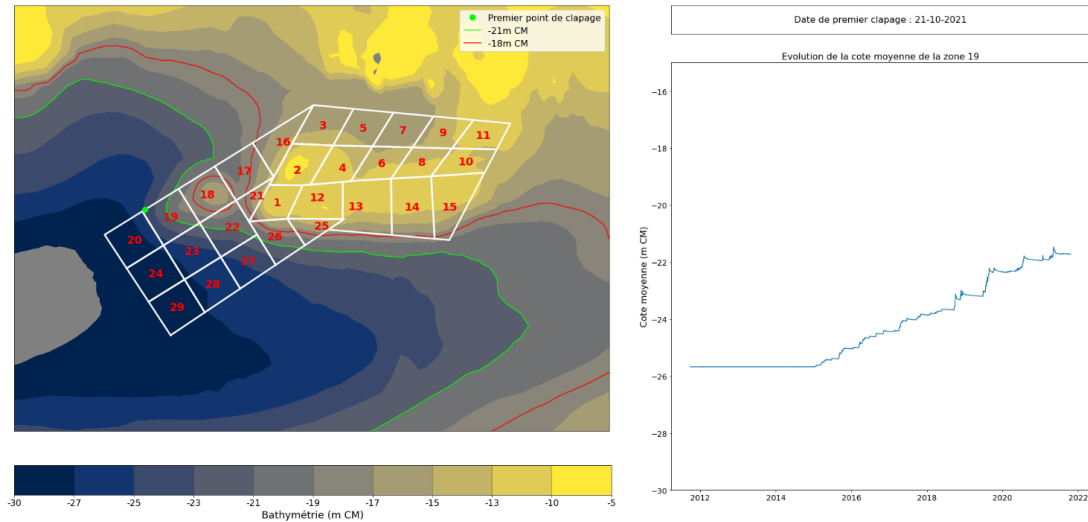


Figure 2-8 : Exemple de rendu cartographique pour la vue 2D de la bathymétrie et l'évolution temporelle de la cote moyenne

Une carte d'évolution bathymétrique générale (Figure 2-9) sur la période d'exploitation est également présentée et met en évidence les dépôts sur les sous-zones concernées par les clapages et la lente érosion des sous-zones précédemment utilisées.

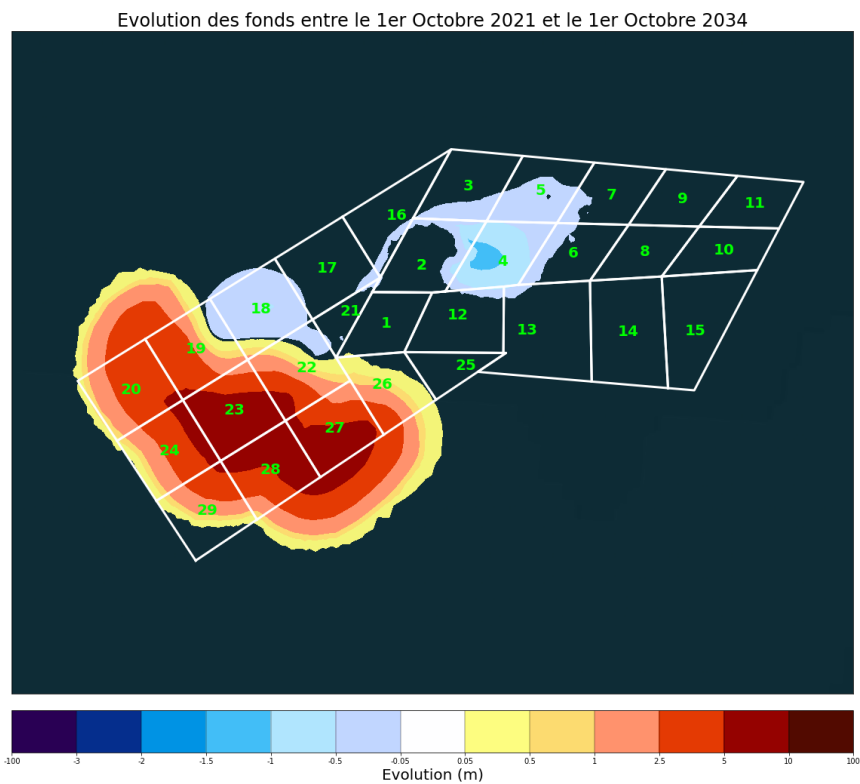


Figure 2-9 : Différentiel bathymétrique entre le début et la fin de la phase d'exploitation



## REFERENCES

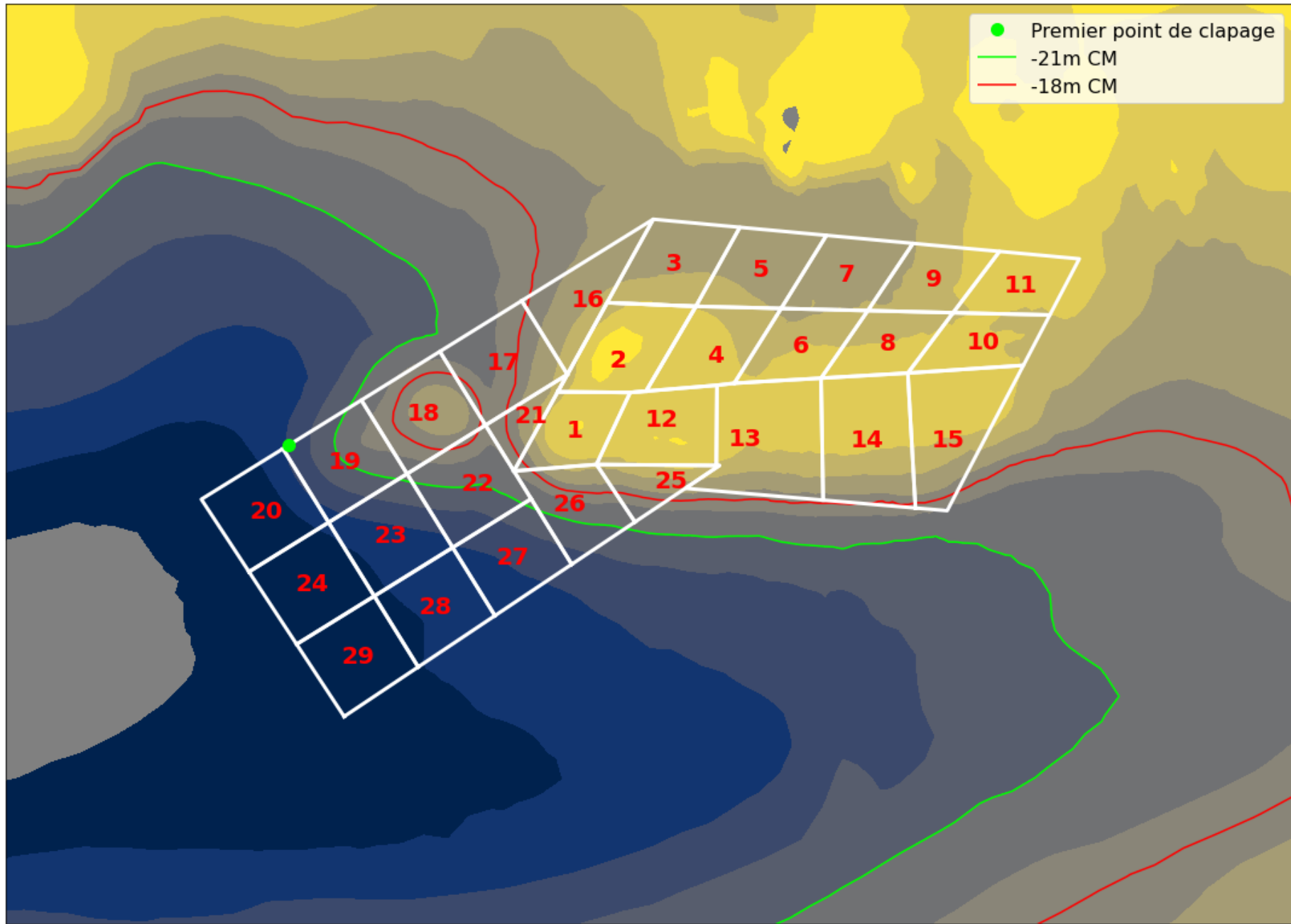
- [1] Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire : Construction, calage et validation du modèle global 3d hydrosédimentaire et d'oxygène dissous, Rapport de Phase 1 – version V2.1, rapport ARTELIA-8716307-Tranche ferme phase 1
- [2] Modèle 3D hydrosédimentaire et de qualité des eaux de la Loire : Construction et calage du modèle 3D hydrosédimentaire local de stabilité du site de clapage de la Lambarde, Rapport de Phase 1 – version V2, rapport ARTELIA-8716307-Tranche ferme phase 1 - 03-2023

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# Site de la Lambarde : Modélisations hydrosédimentaires de la stabilité du dépôt sur 13 ans

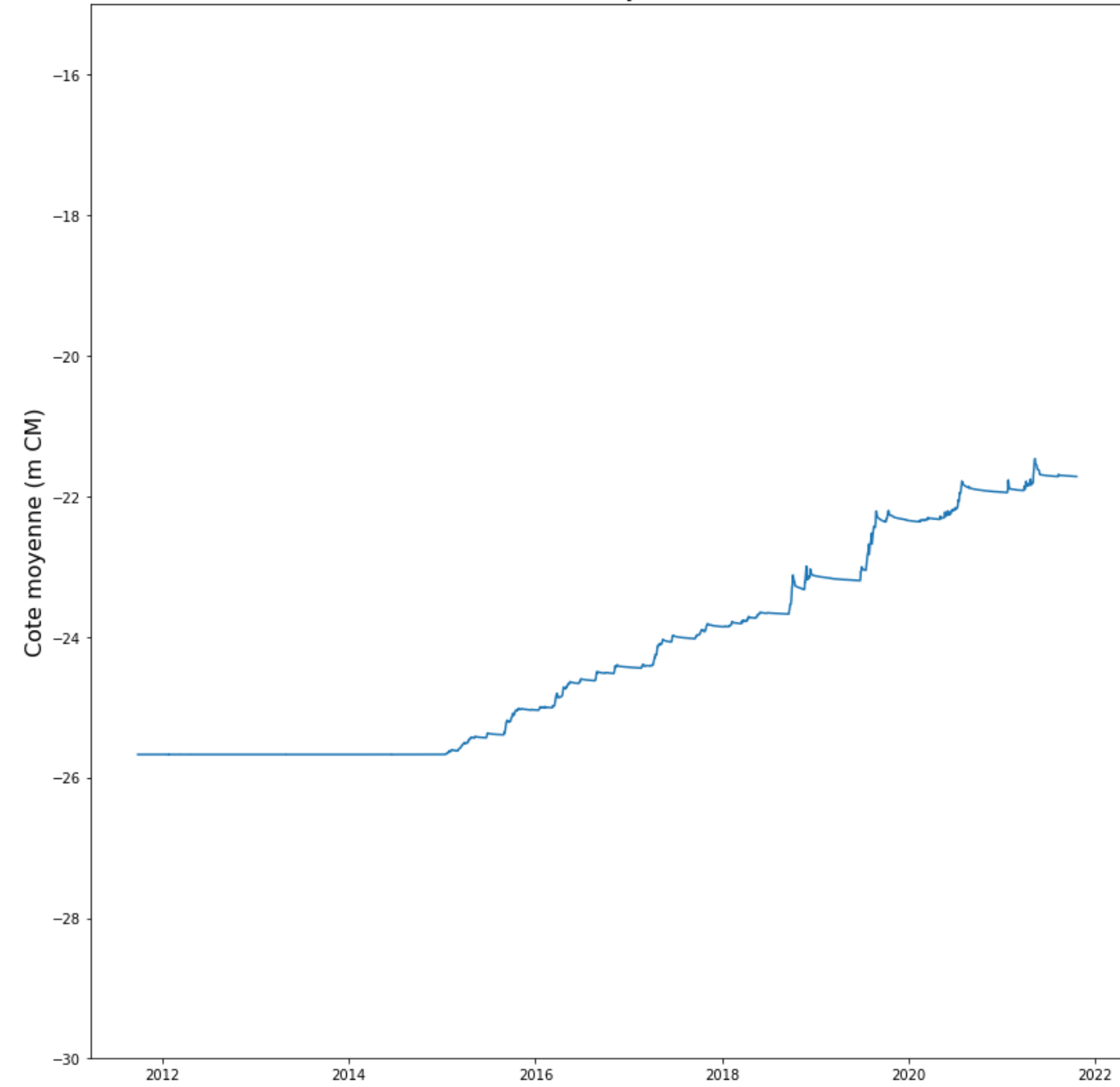
*Annexe A - Cartographies bathymétriques*

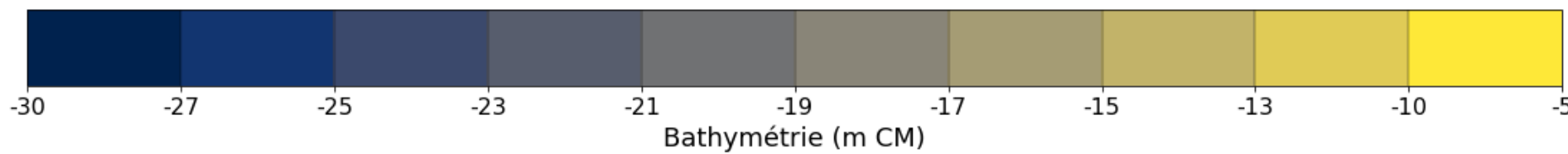
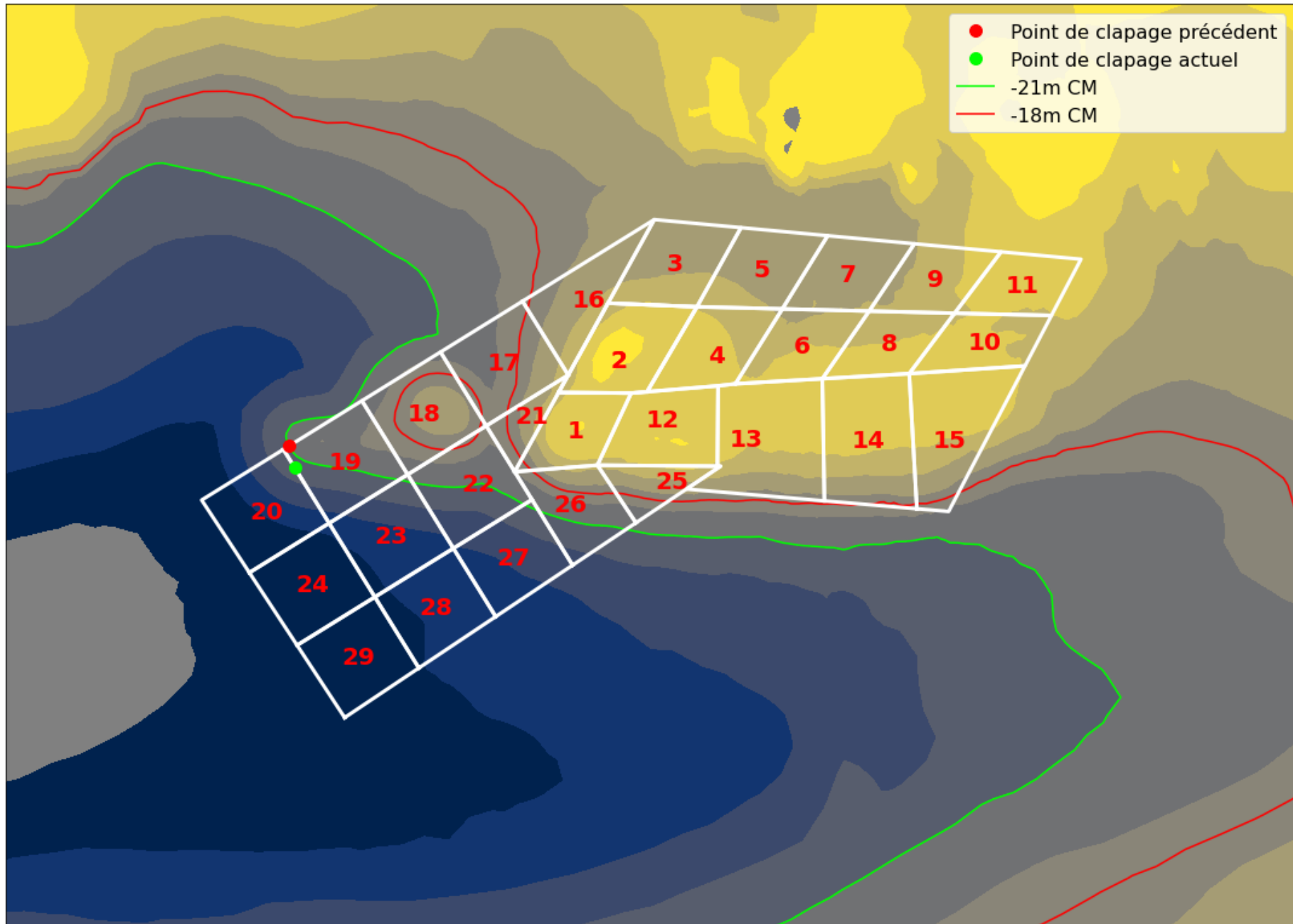




Date de premier clapage : 21-10-2021

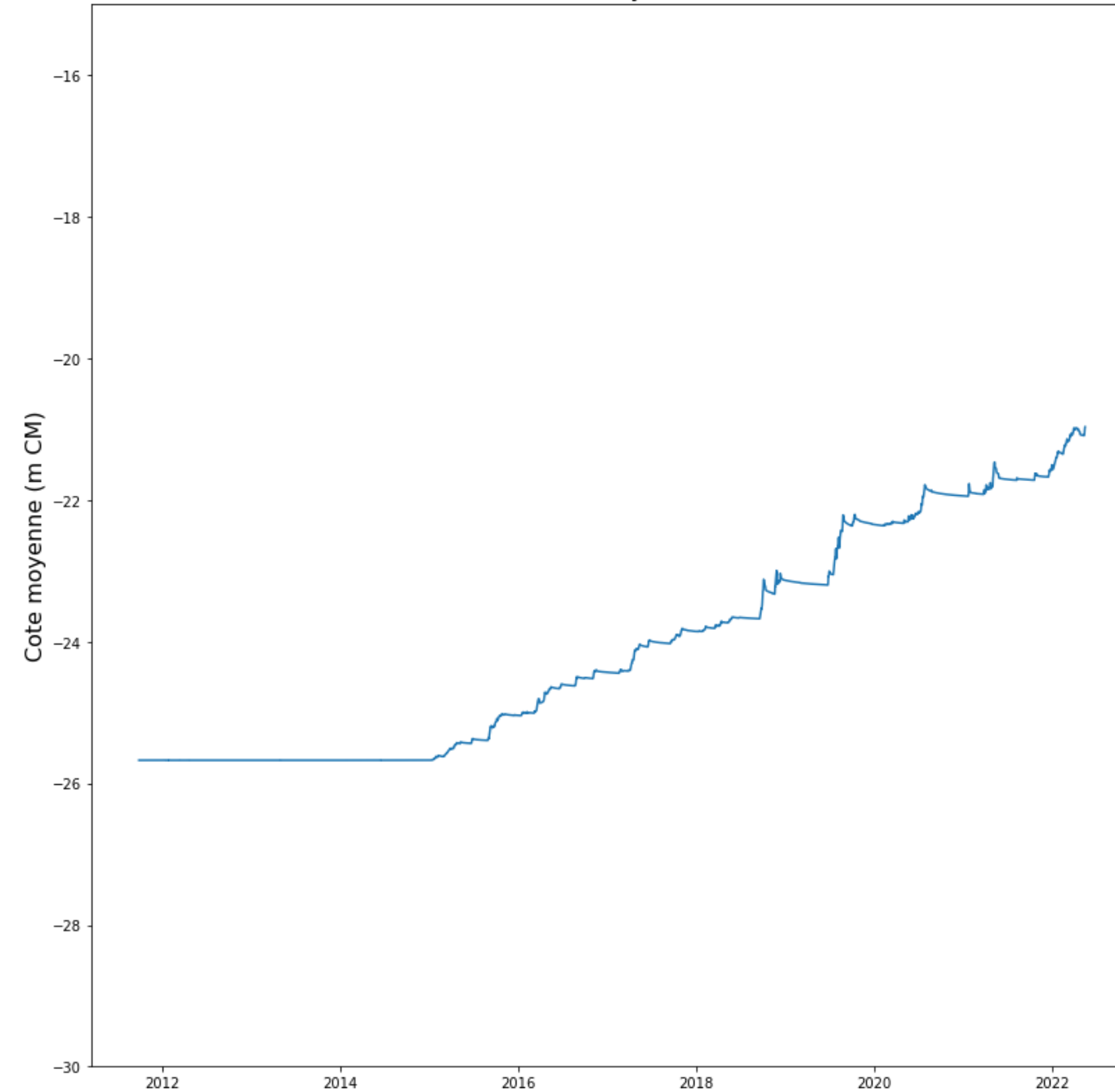
Evolution de la cote moyenne de la zone 19

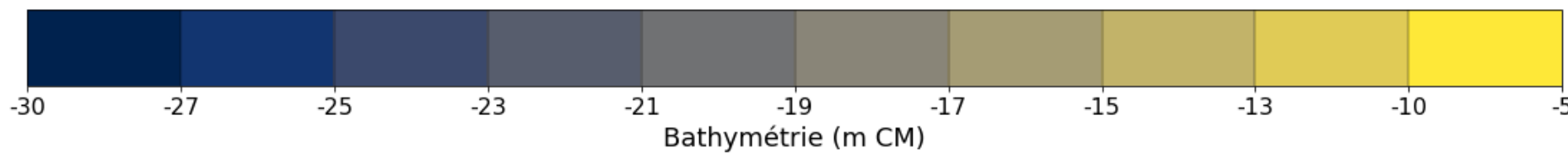
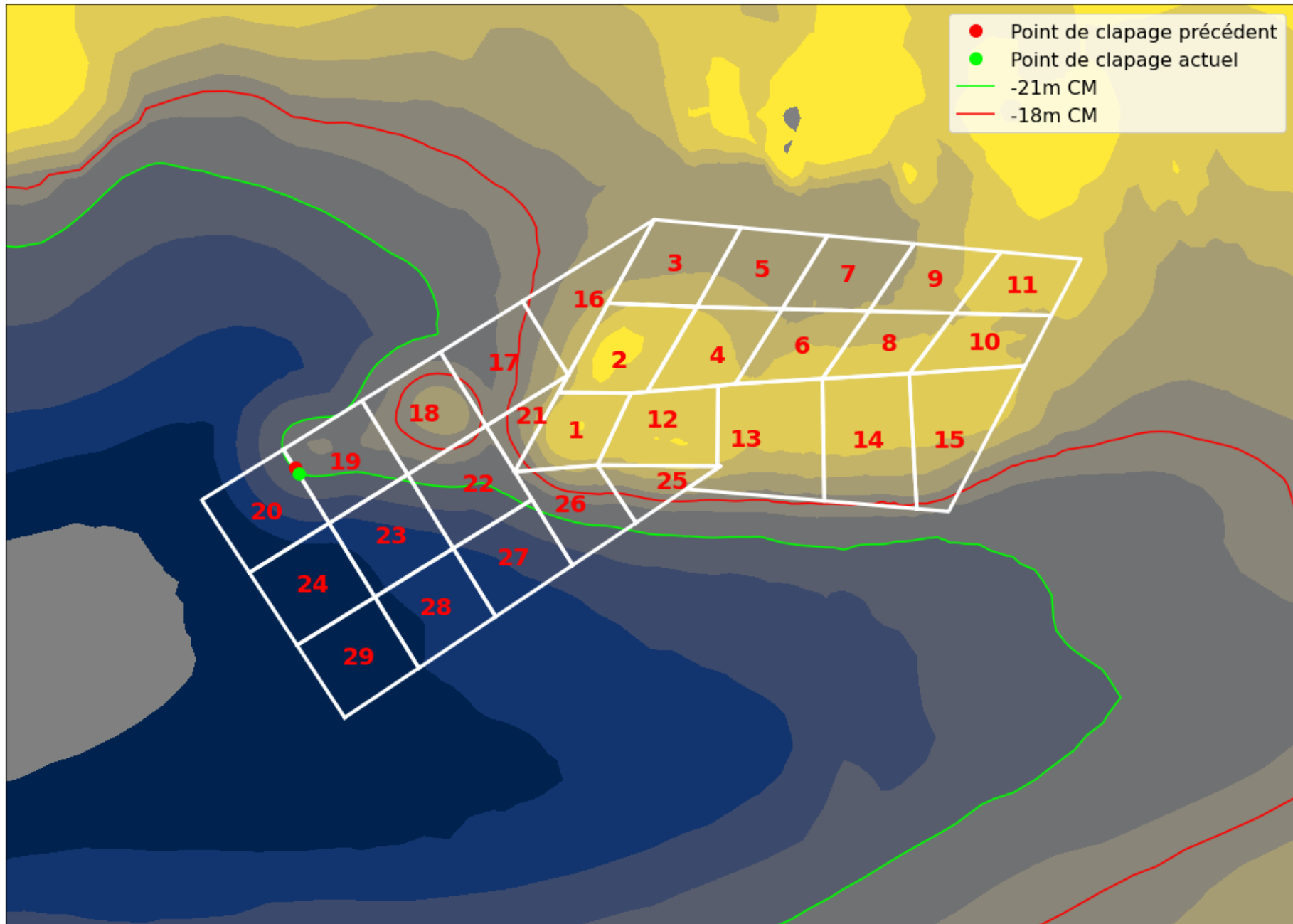




Date de changement de point : 17-05-2022

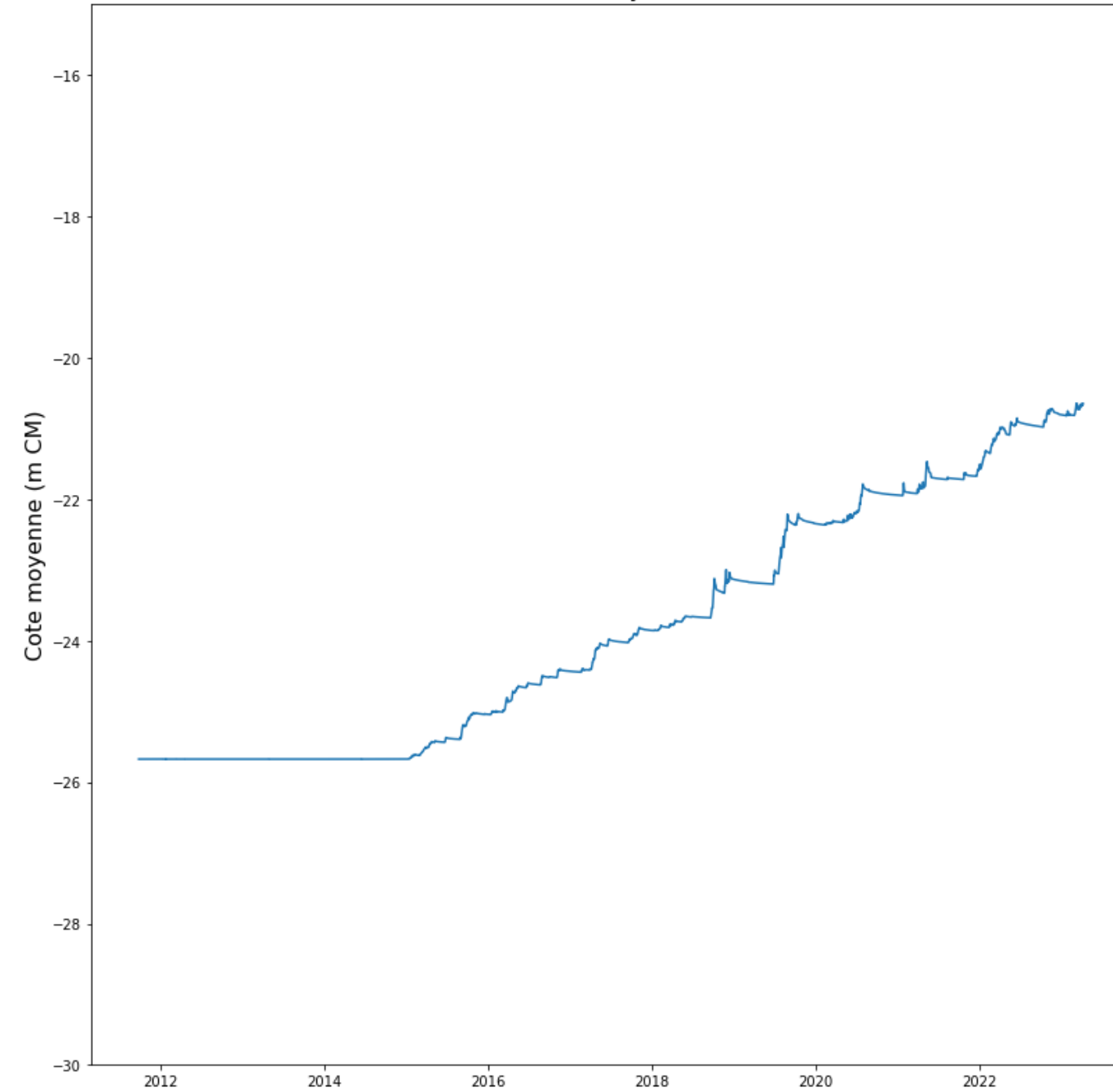
Evolution de la cote moyenne de la zone 19

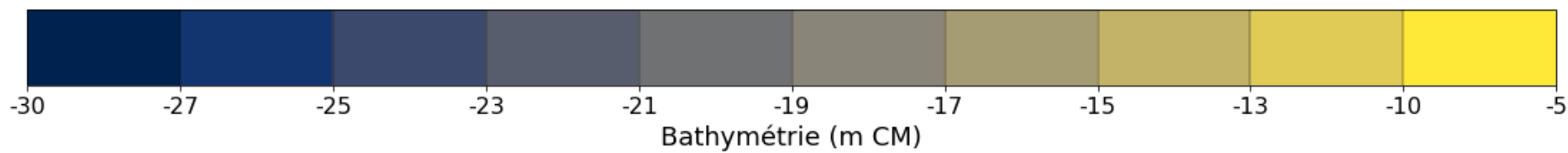
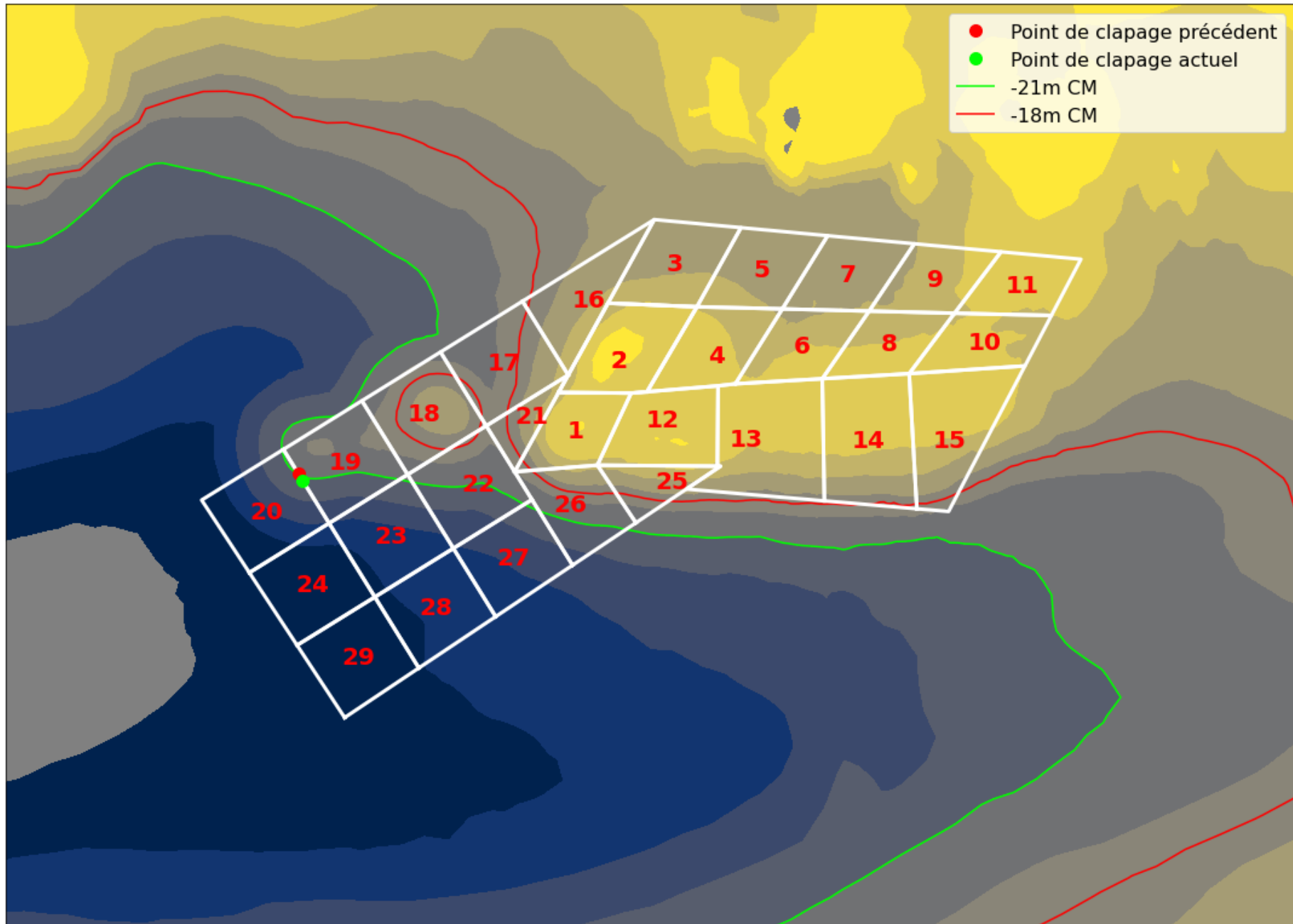




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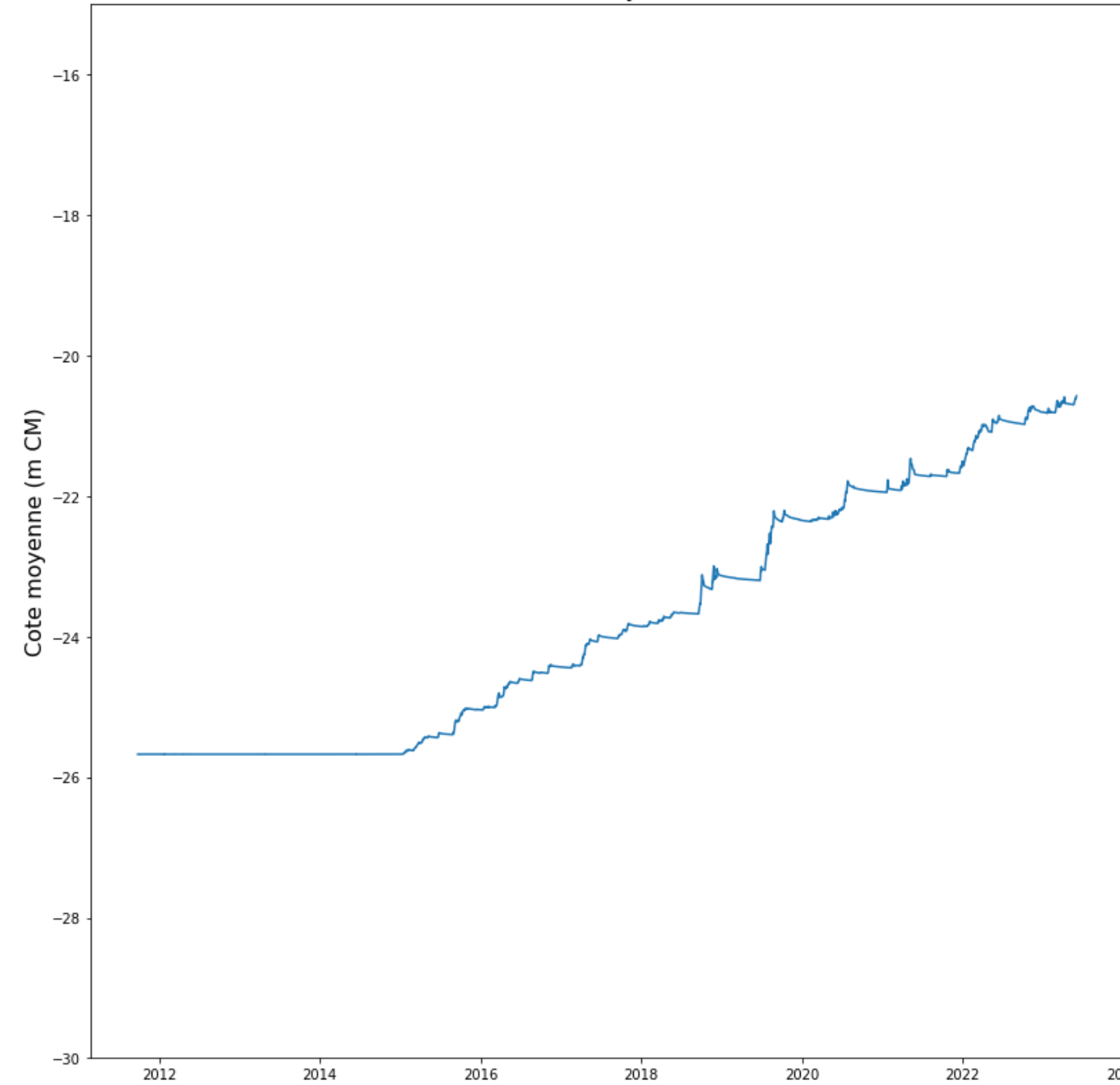
Evolution de la cote moyenne de la zone 19

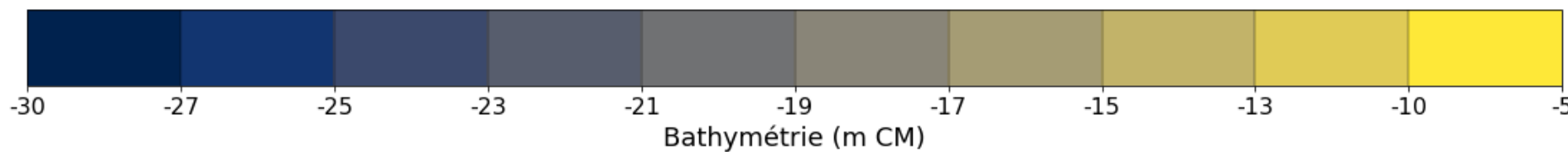
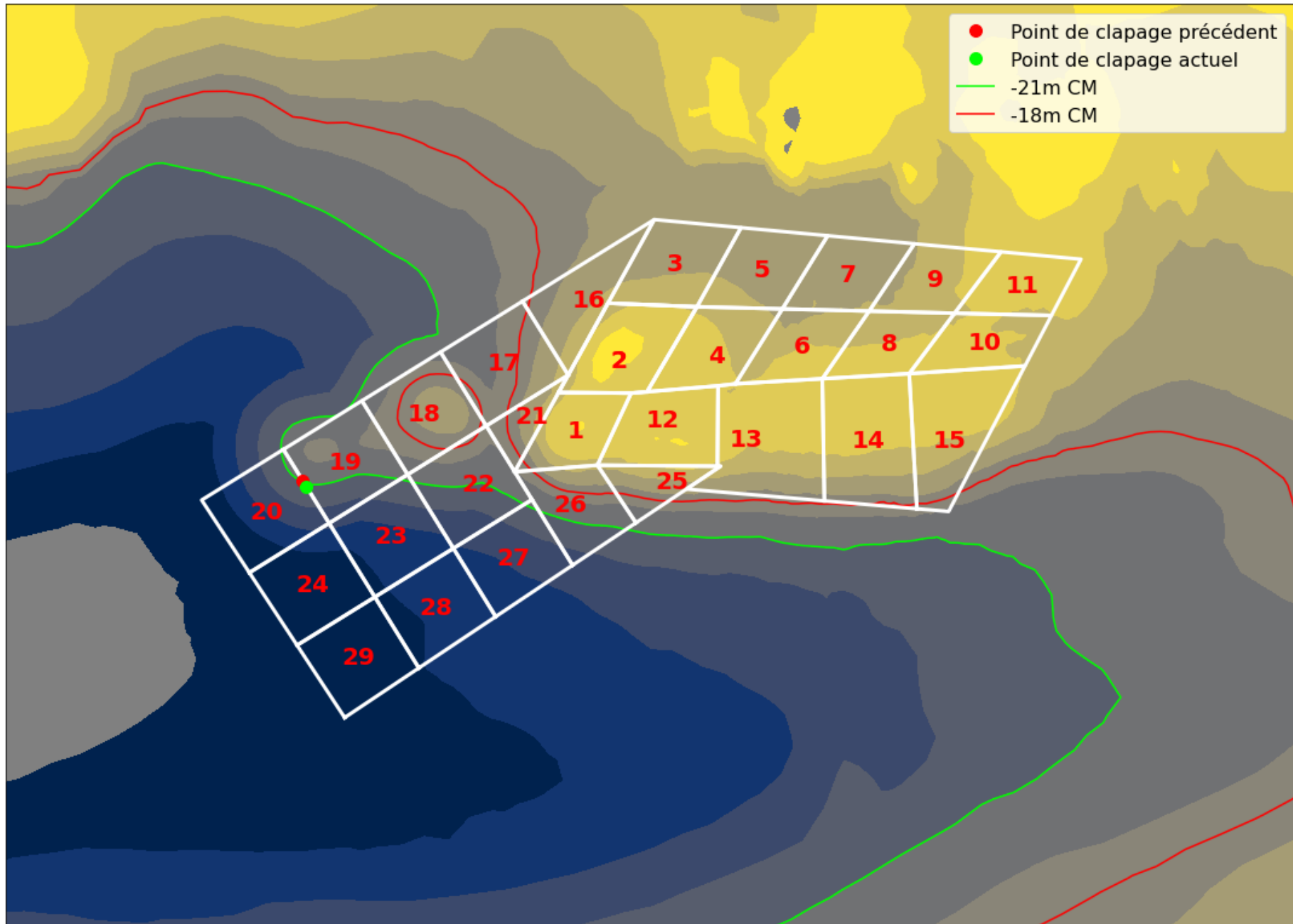




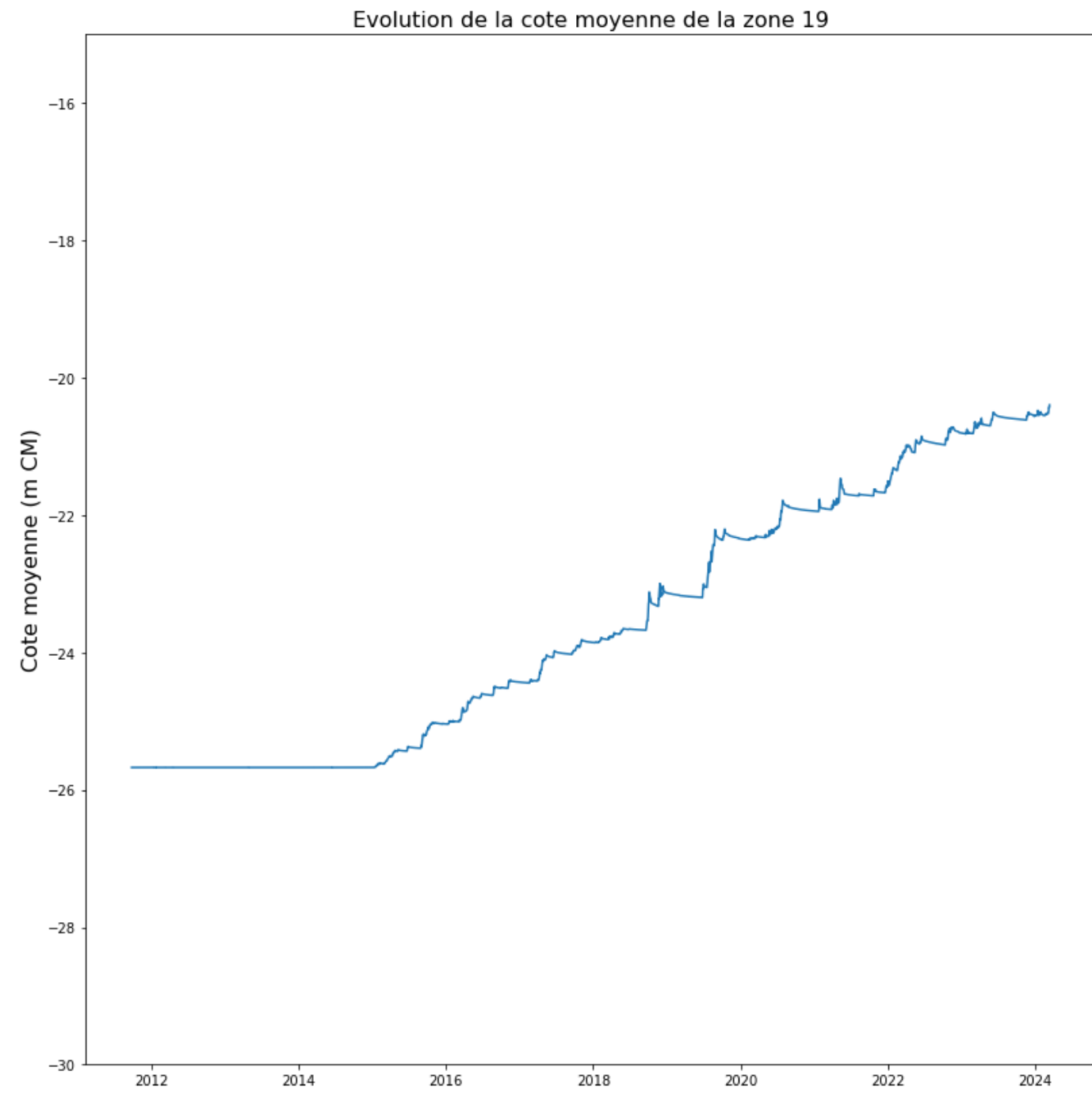
Date de changement de point : 04-06-2023

Evolution de la cote moyenne de la zone 19

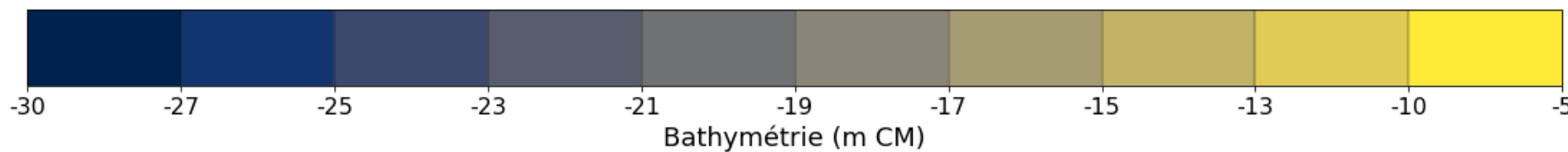
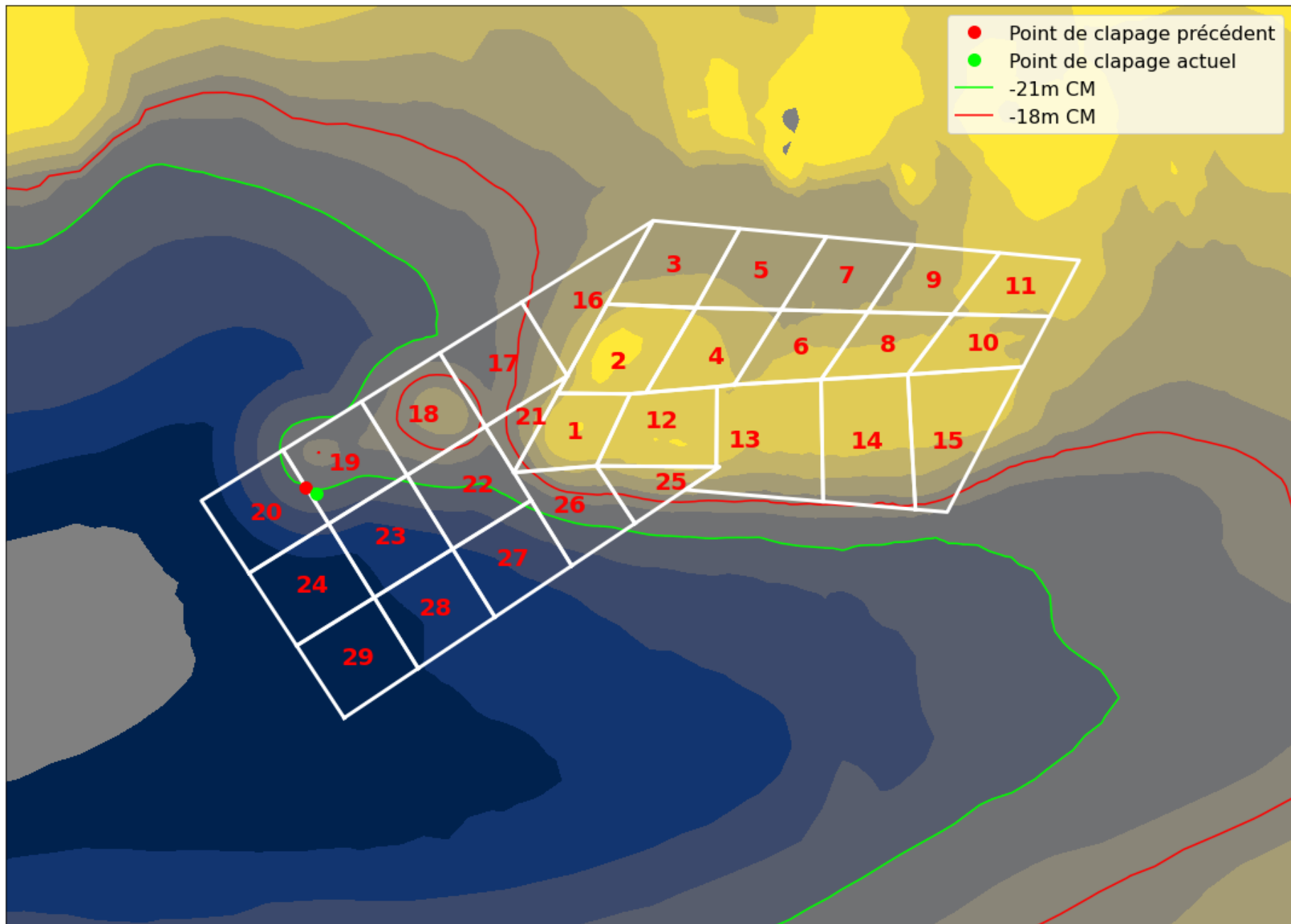




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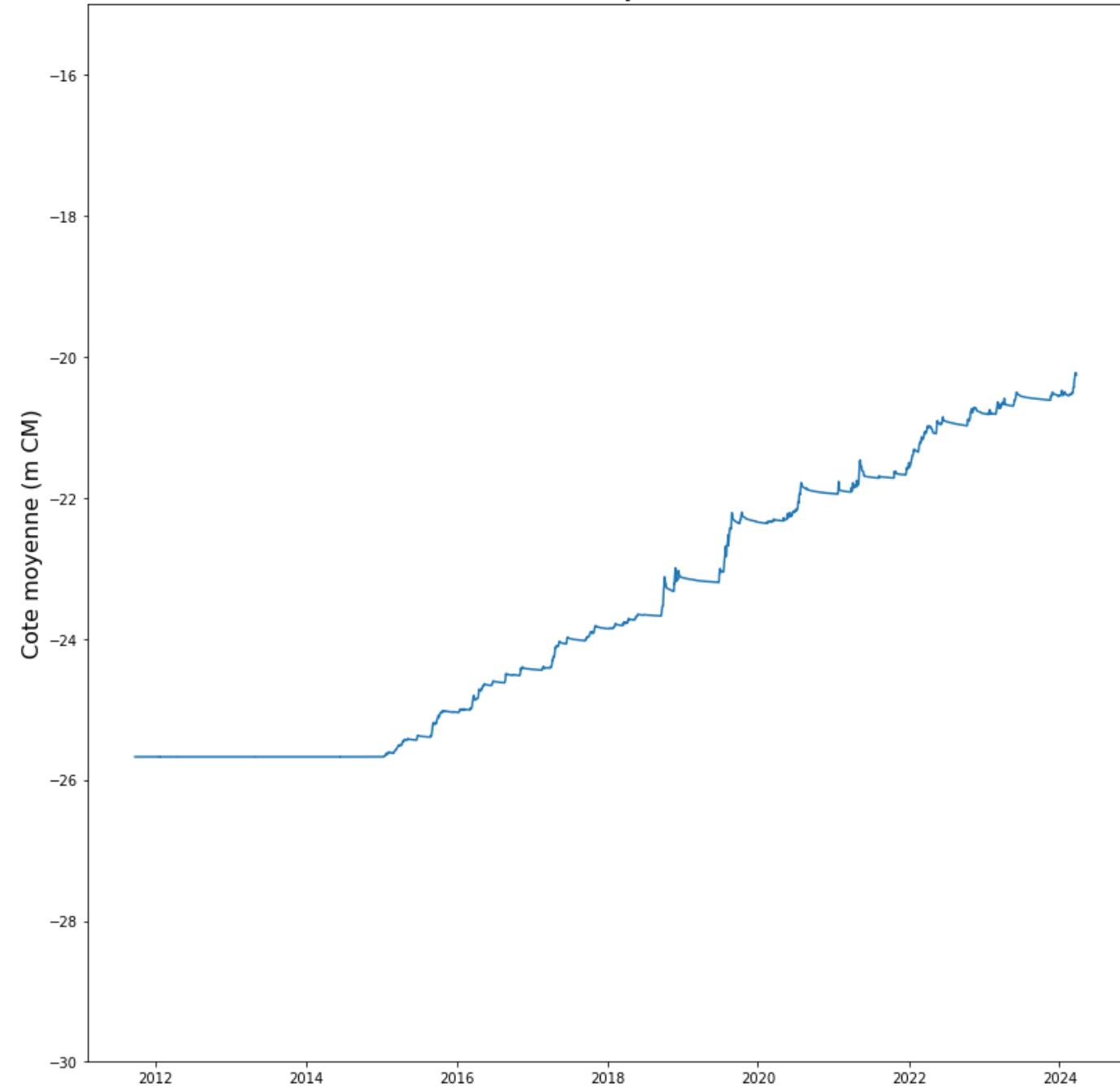




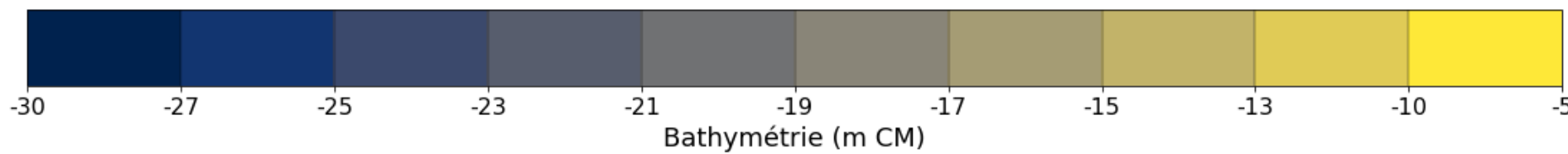
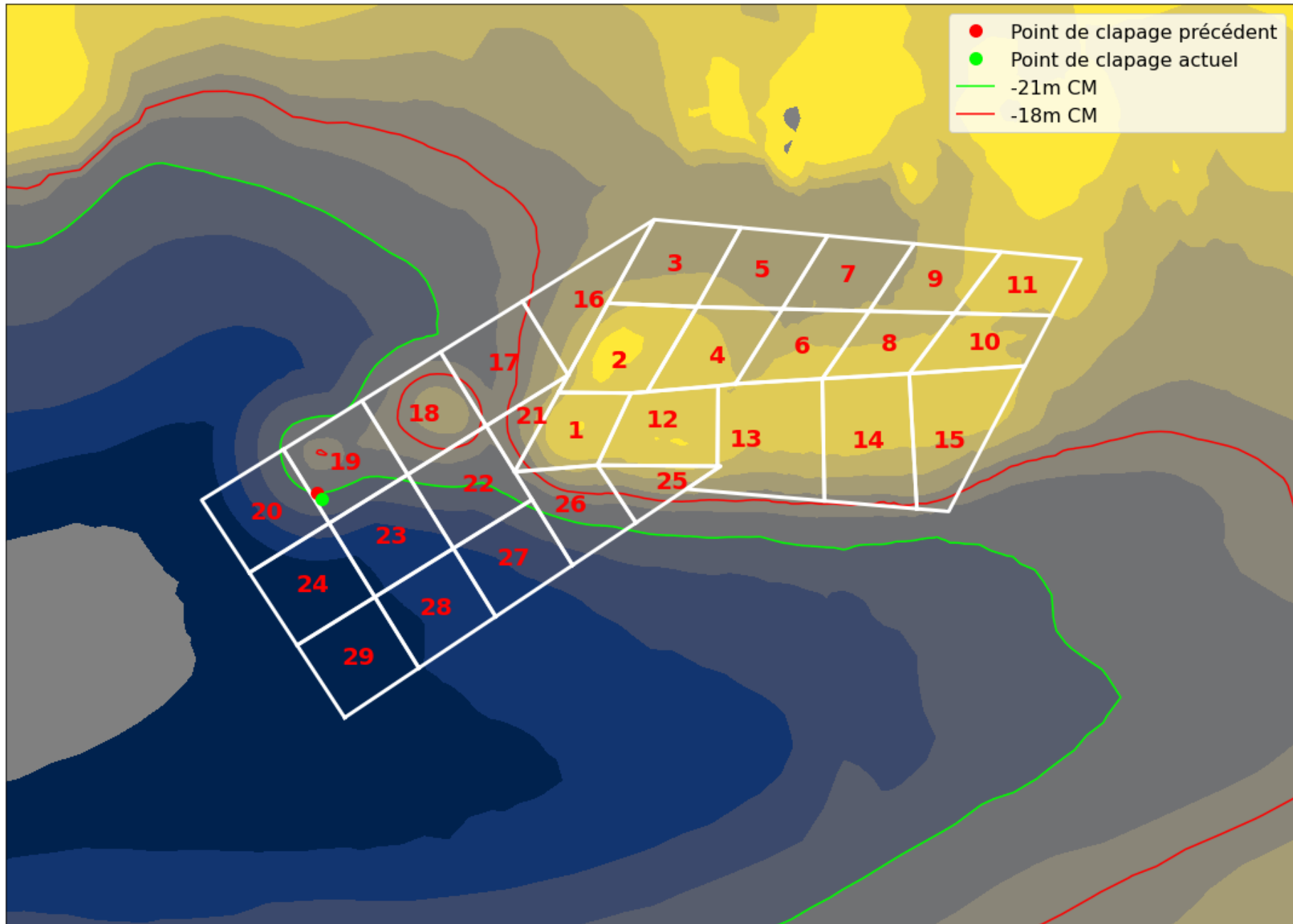


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Evolution de la cote moyenne de la zone 19

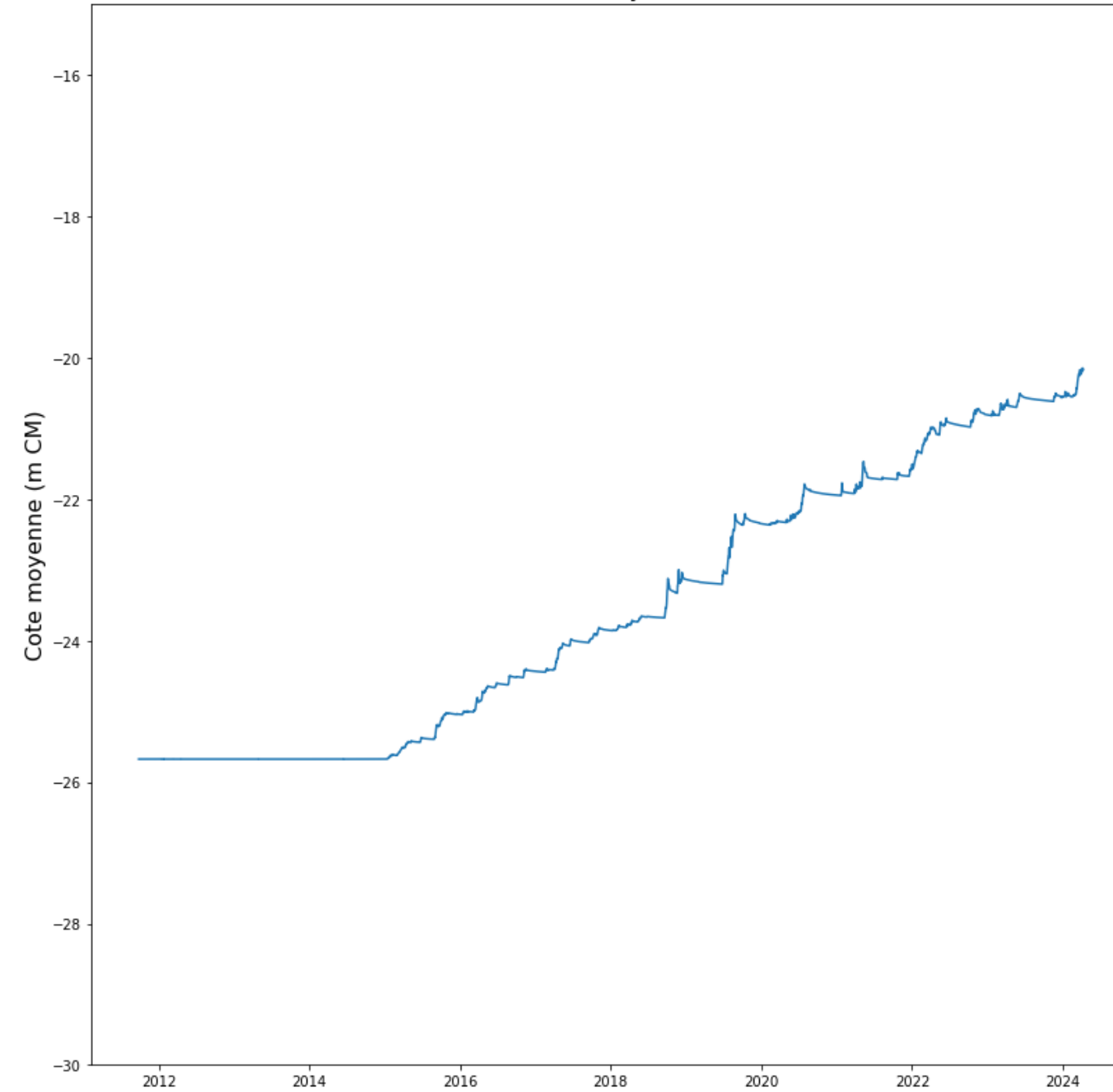


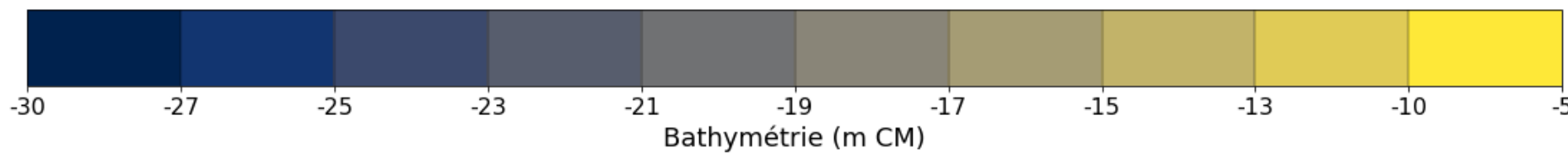
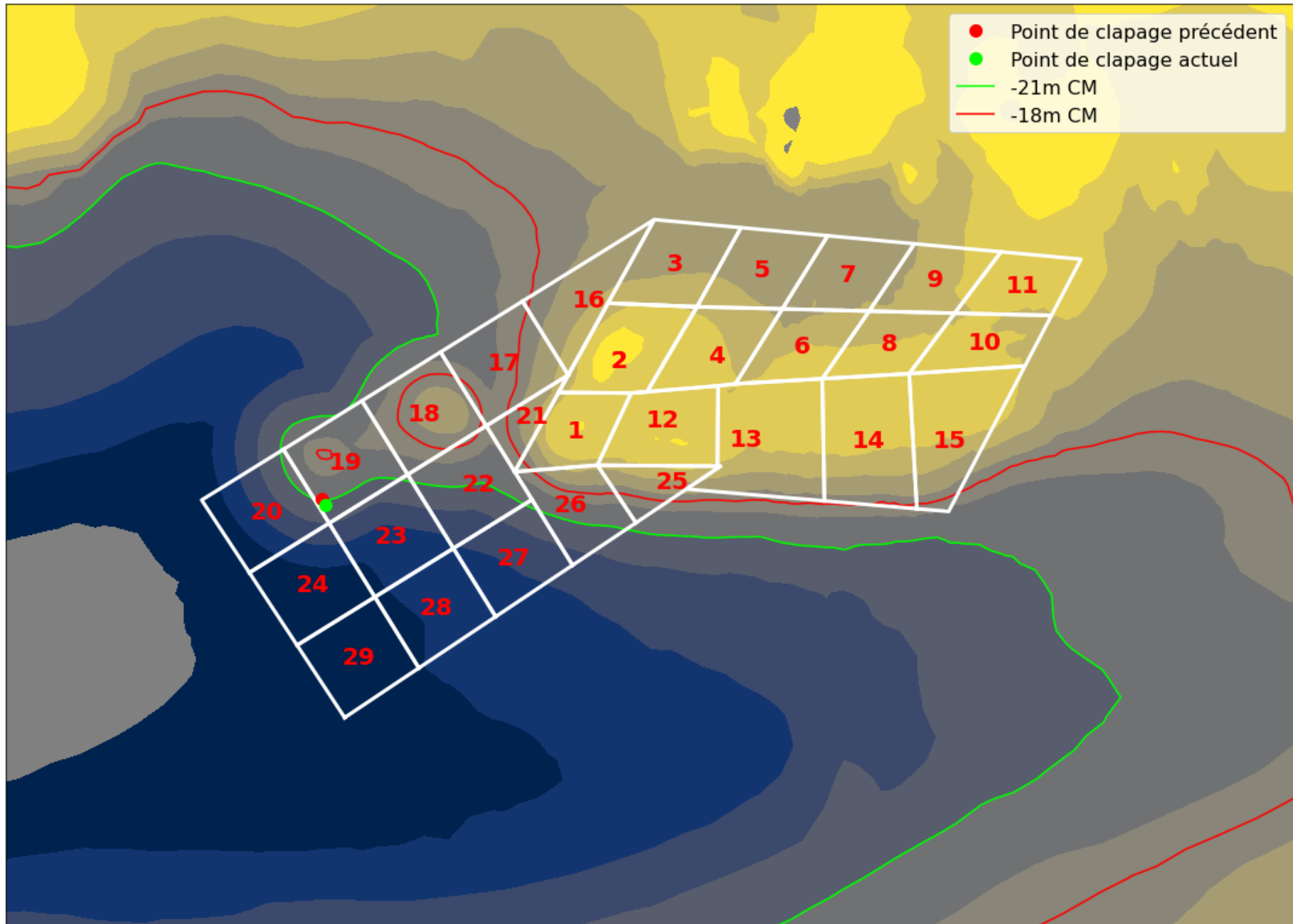




Date de changement de point : 10-04-2024

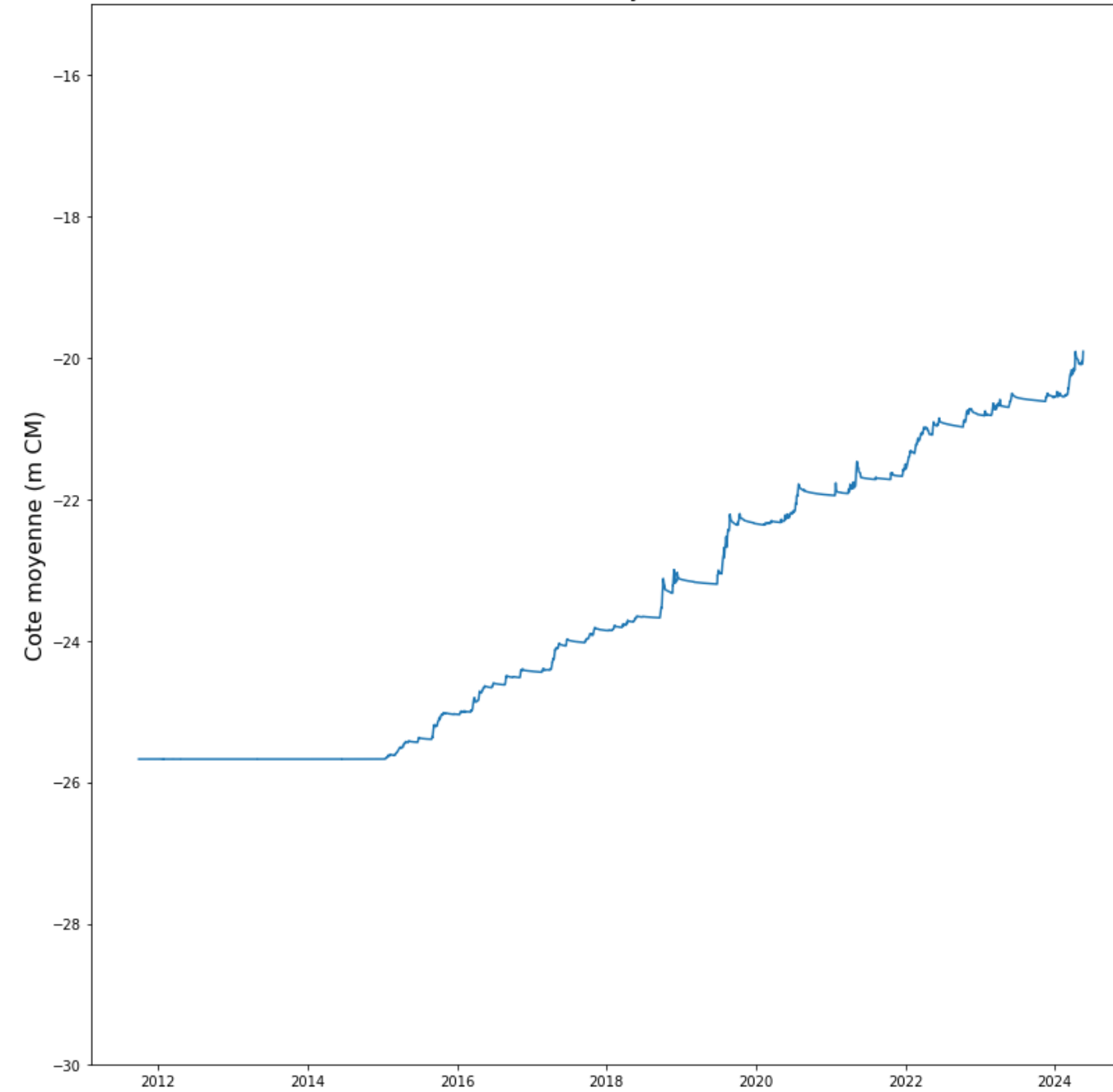
Evolution de la cote moyenne de la zone 19

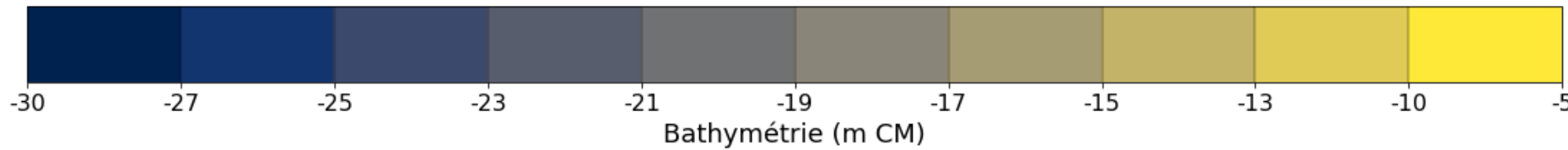
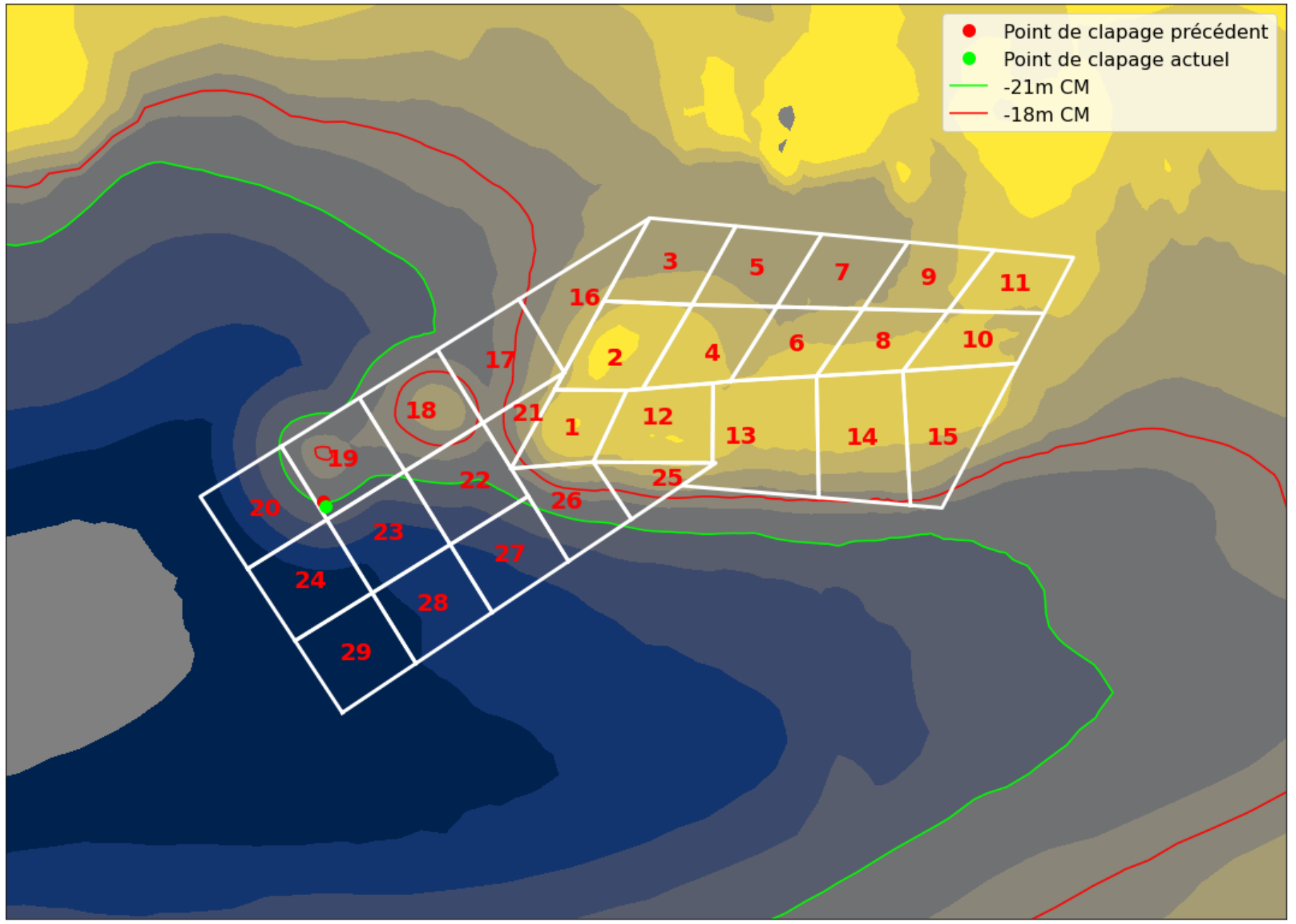




Date de changement de point : 21-05-2024

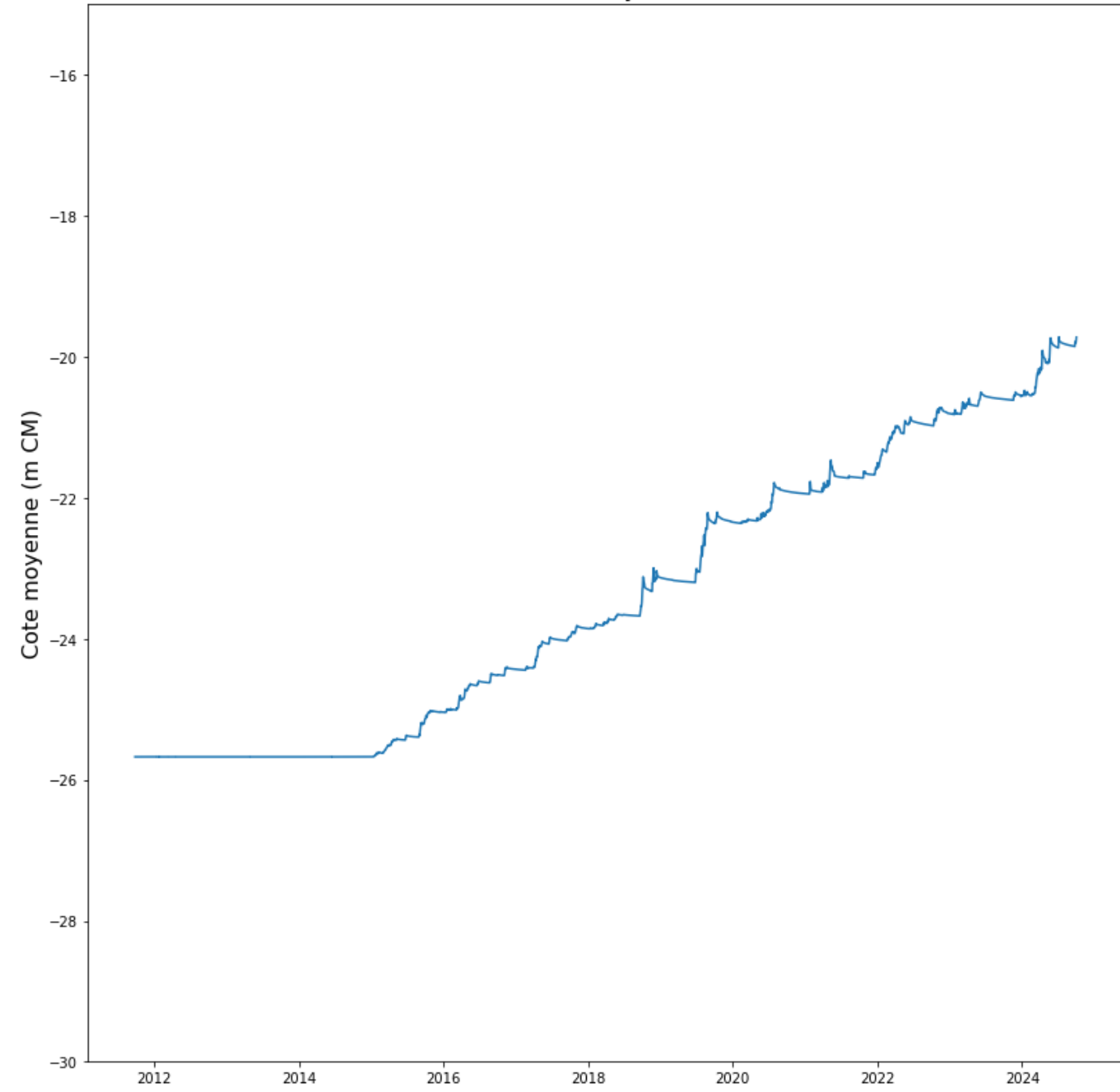
Evolution de la cote moyenne de la zone 19

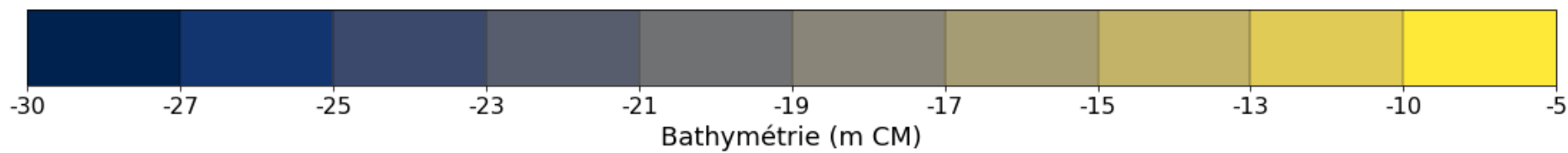
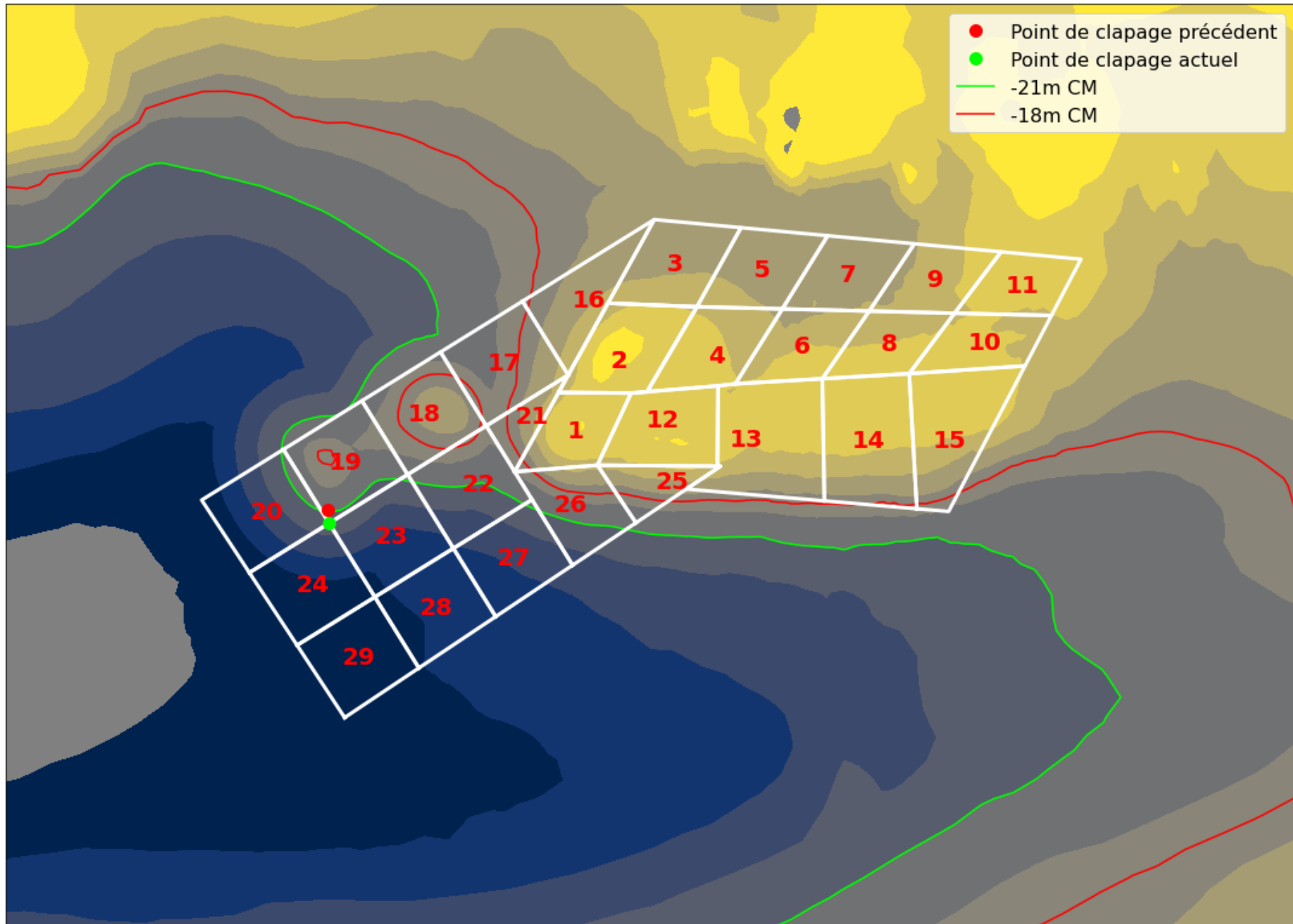




Date de changement de point : 02-10-2024

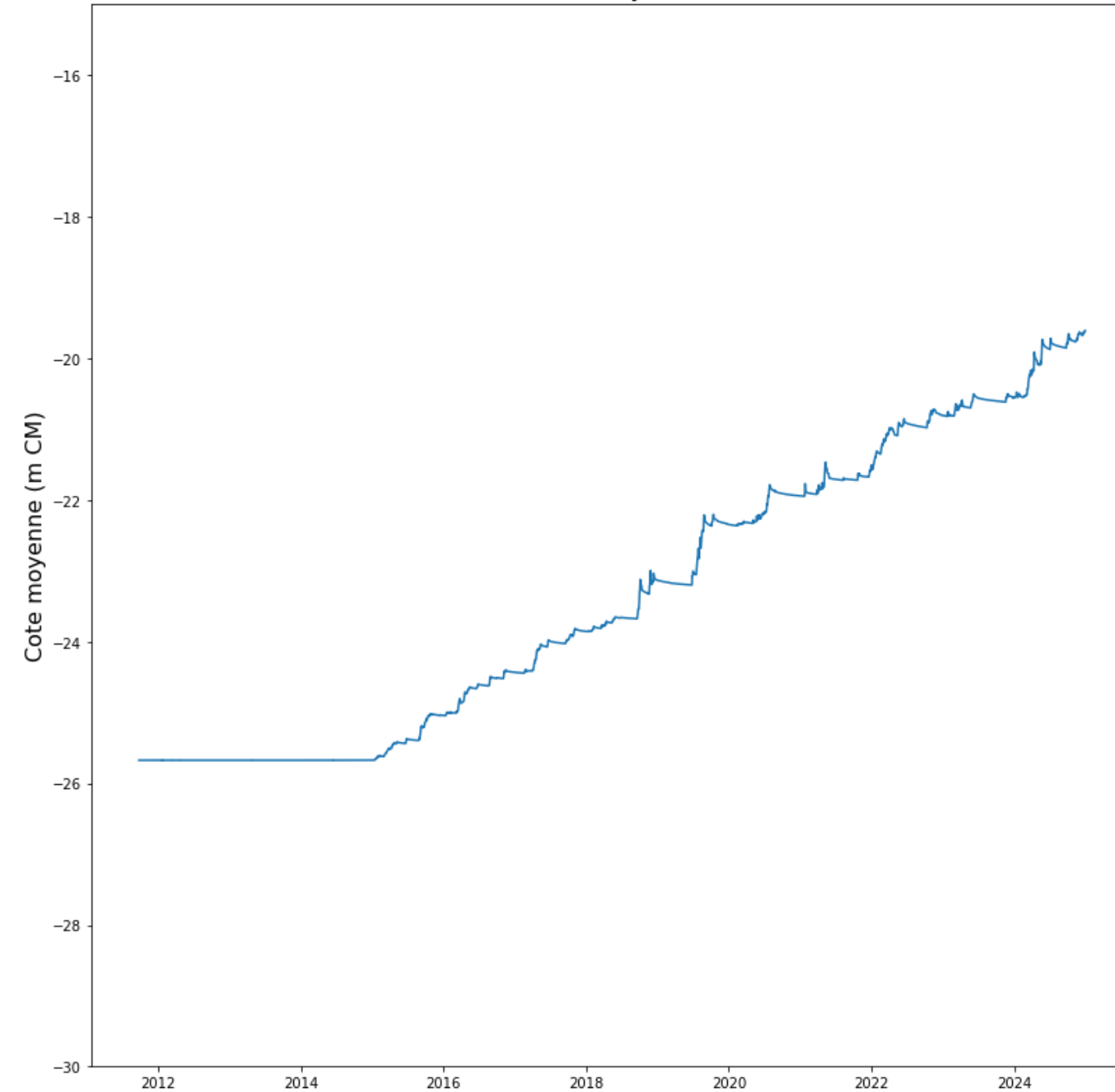
Evolution de la cote moyenne de la zone 19

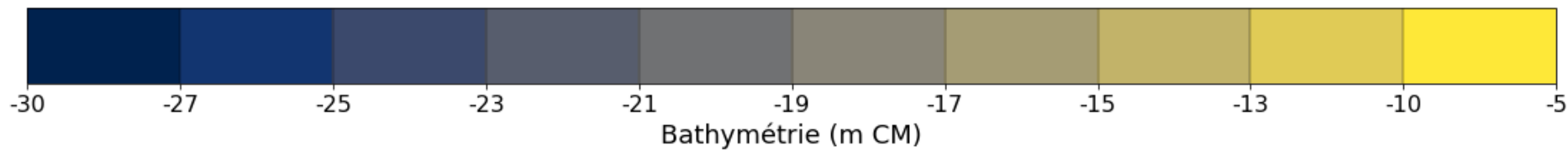
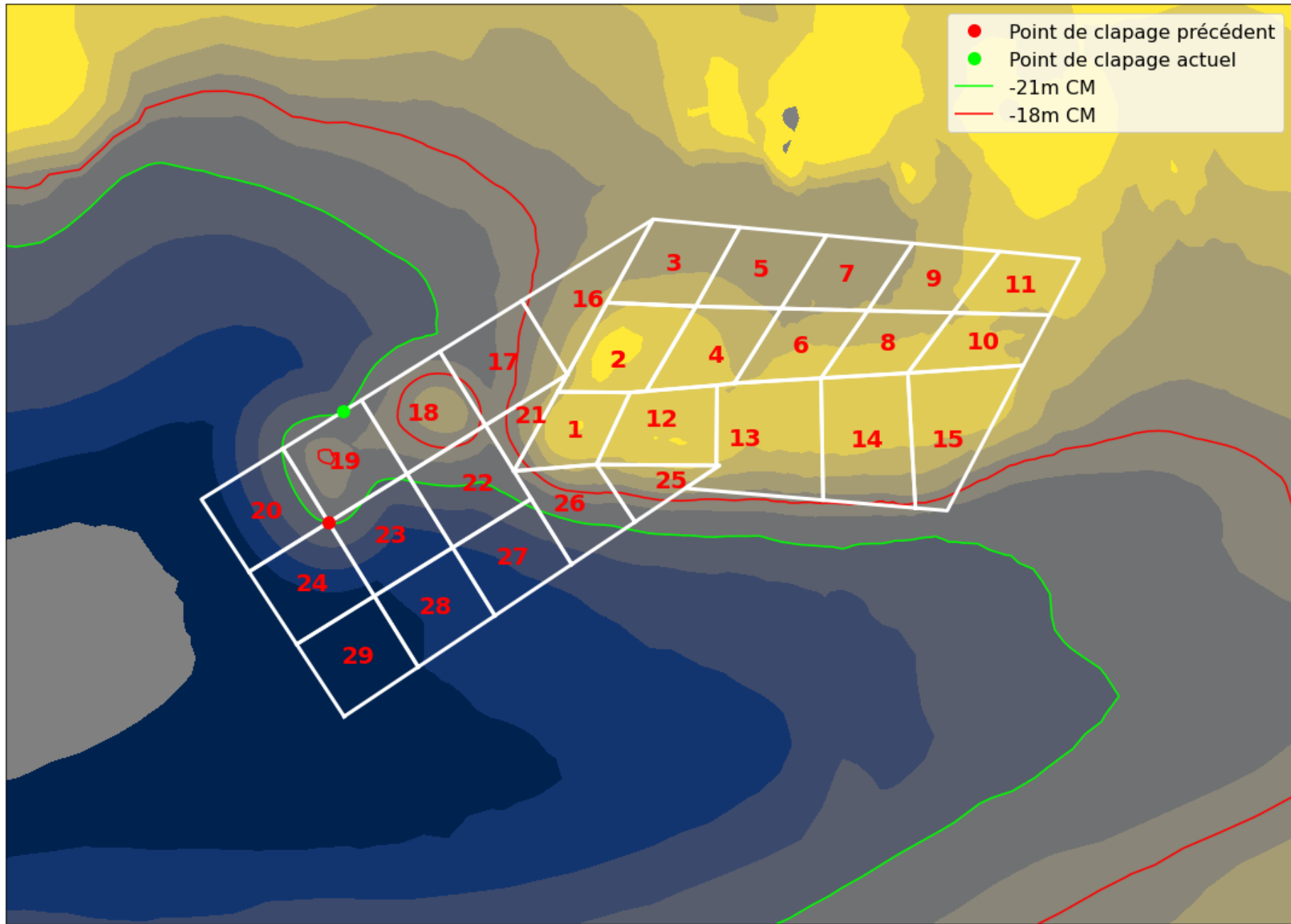




Date de changement de point : 29-12-2024

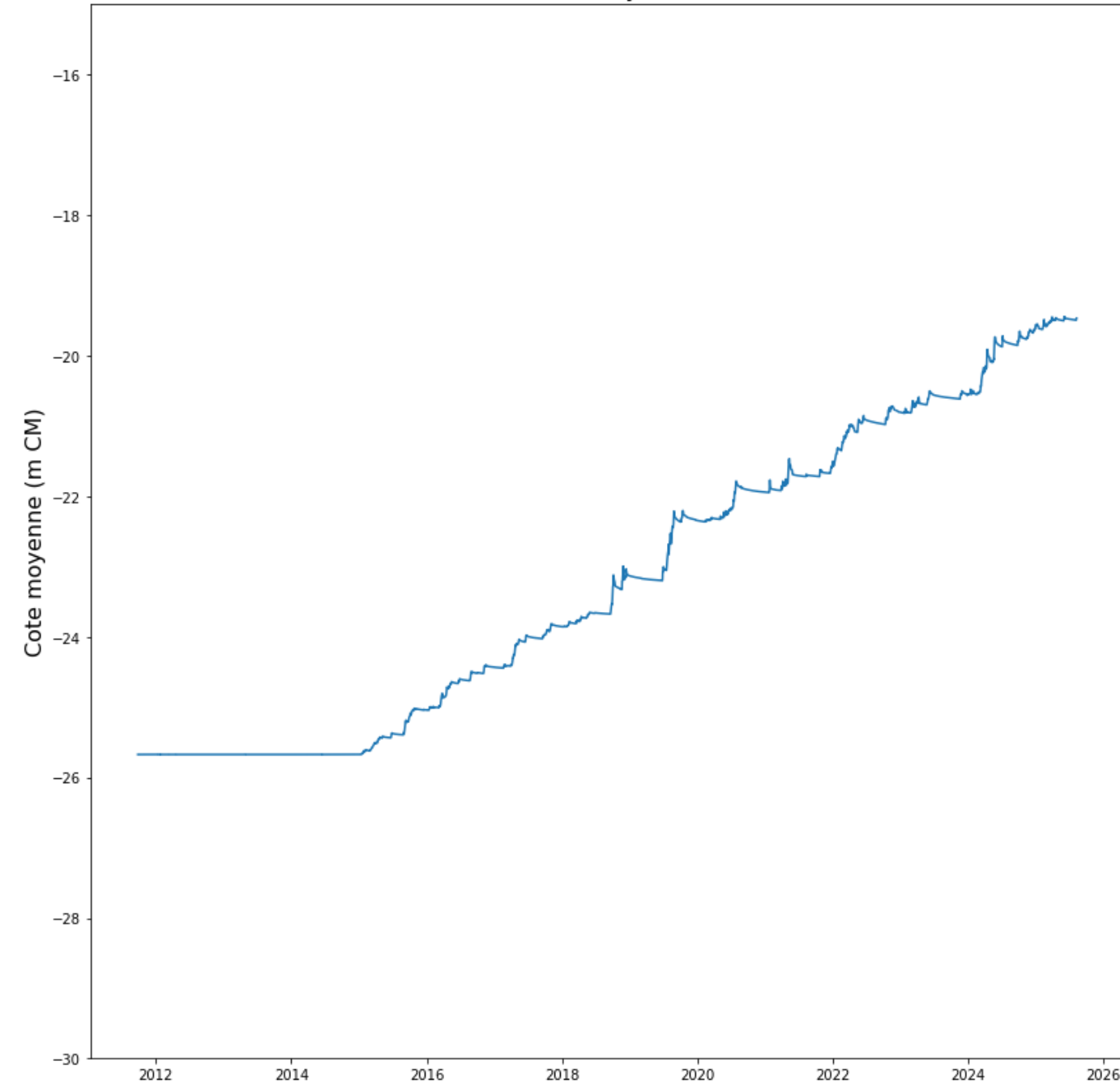
Evolution de la cote moyenne de la zone 19

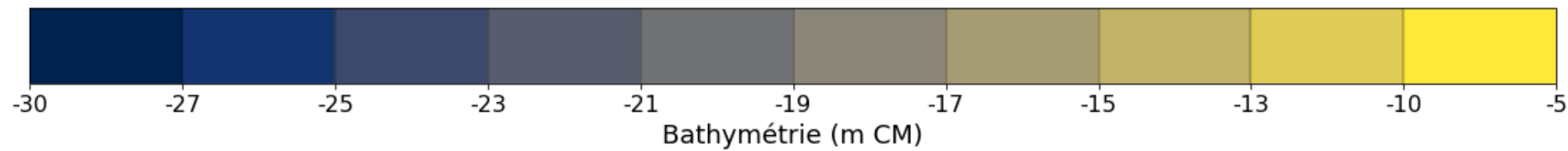
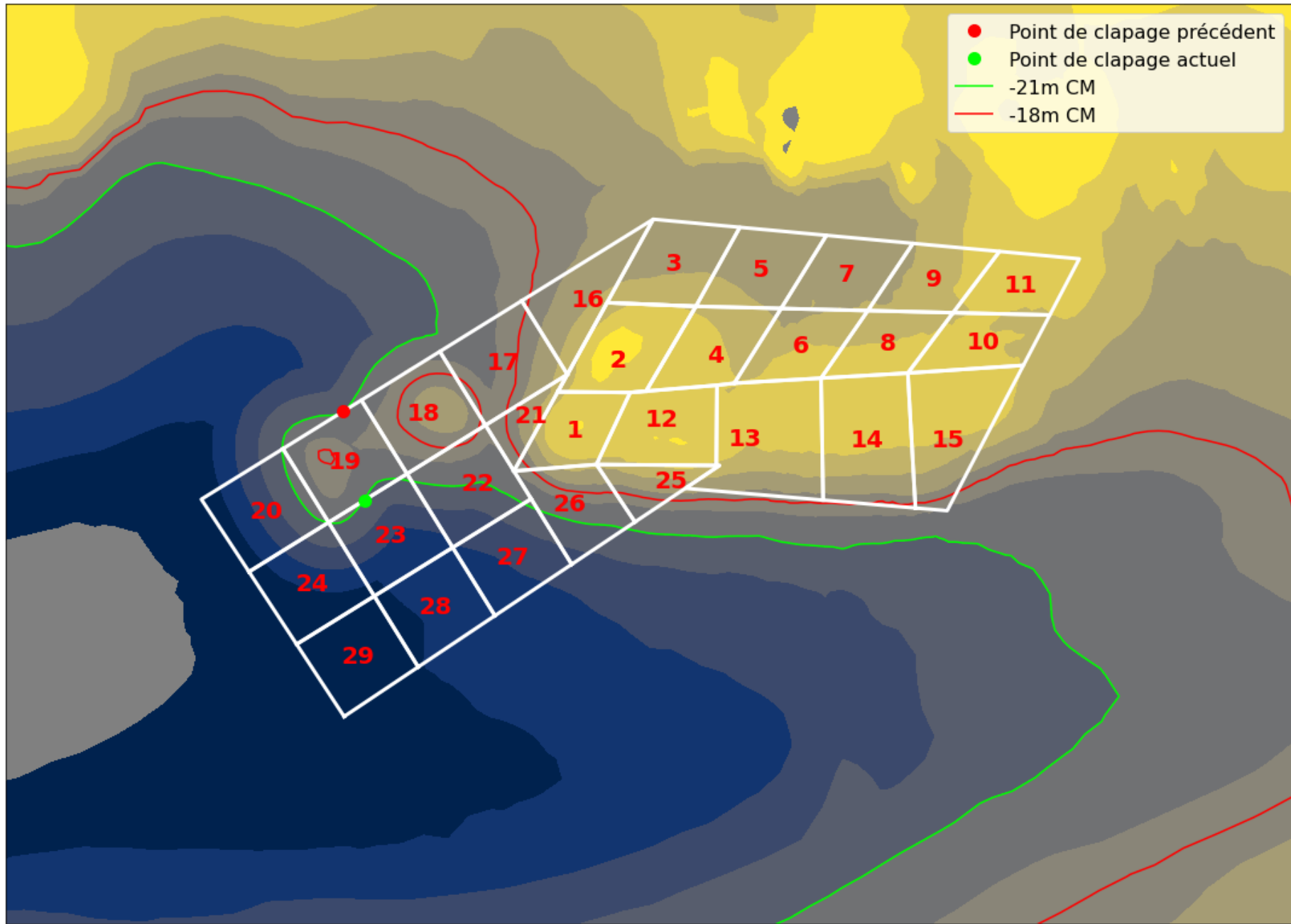




Date de changement de point : 07-08-2025

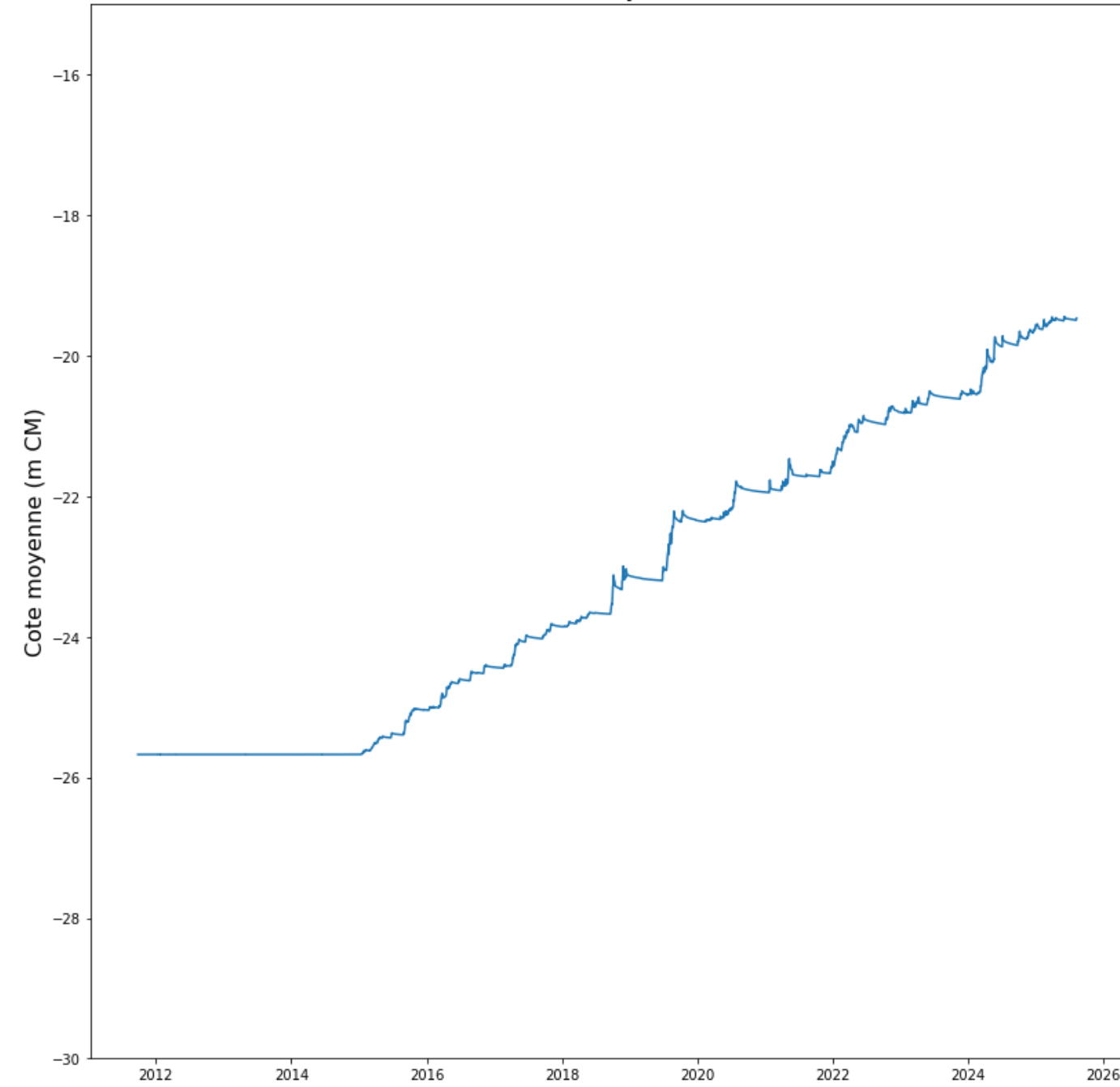
Evolution de la cote moyenne de la zone 19



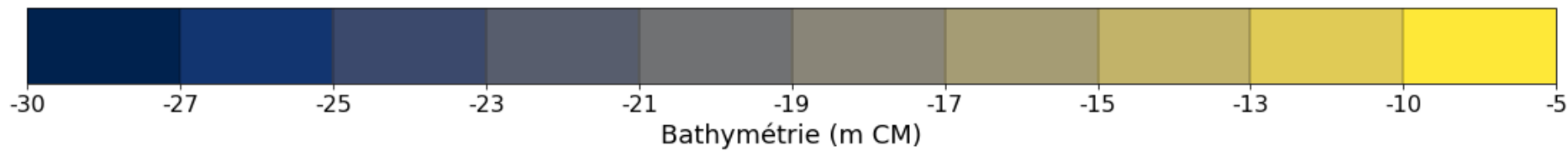
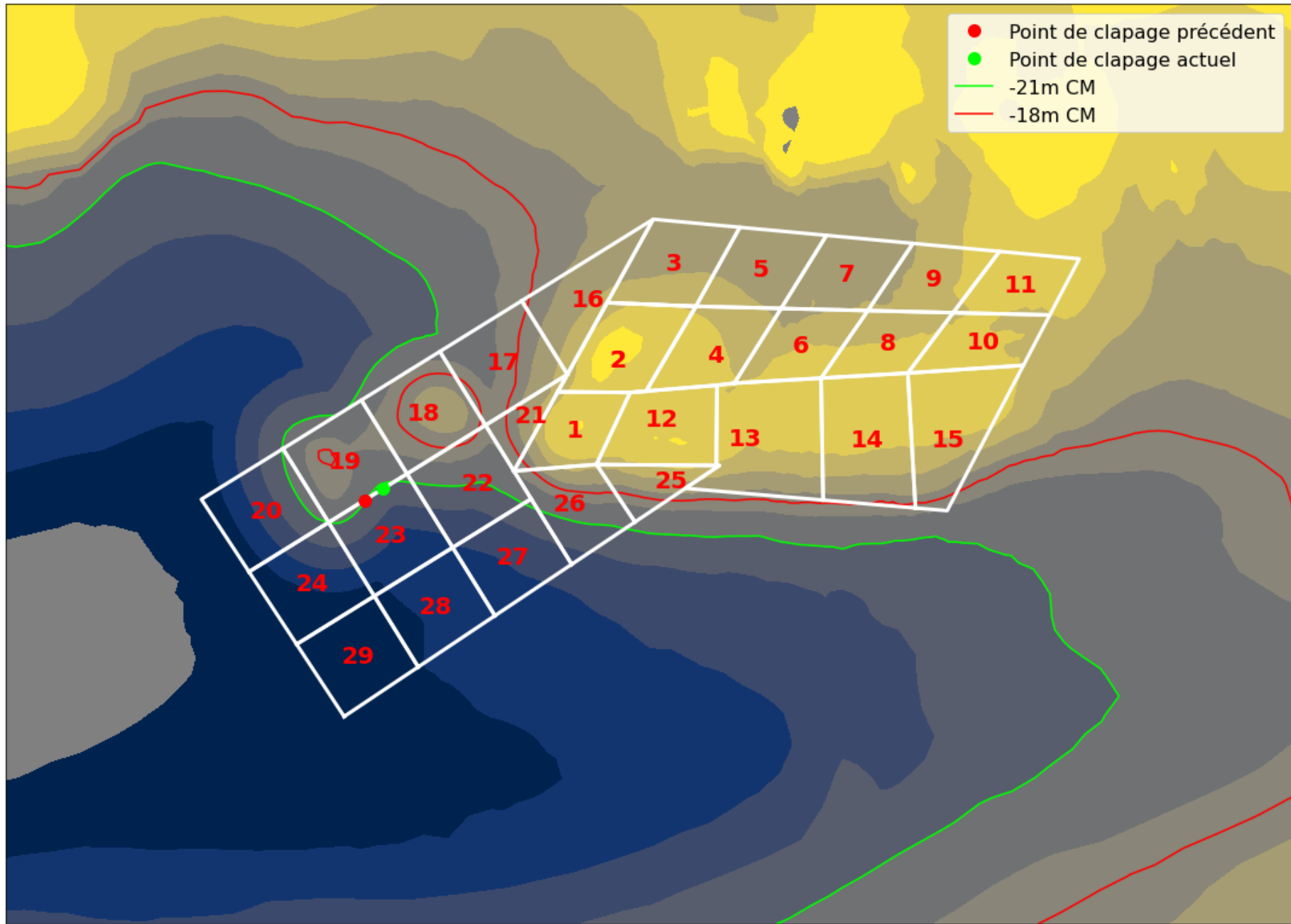


Date de changement de point : 07-08-2025

Evolution de la cote moyenne de la zone 19

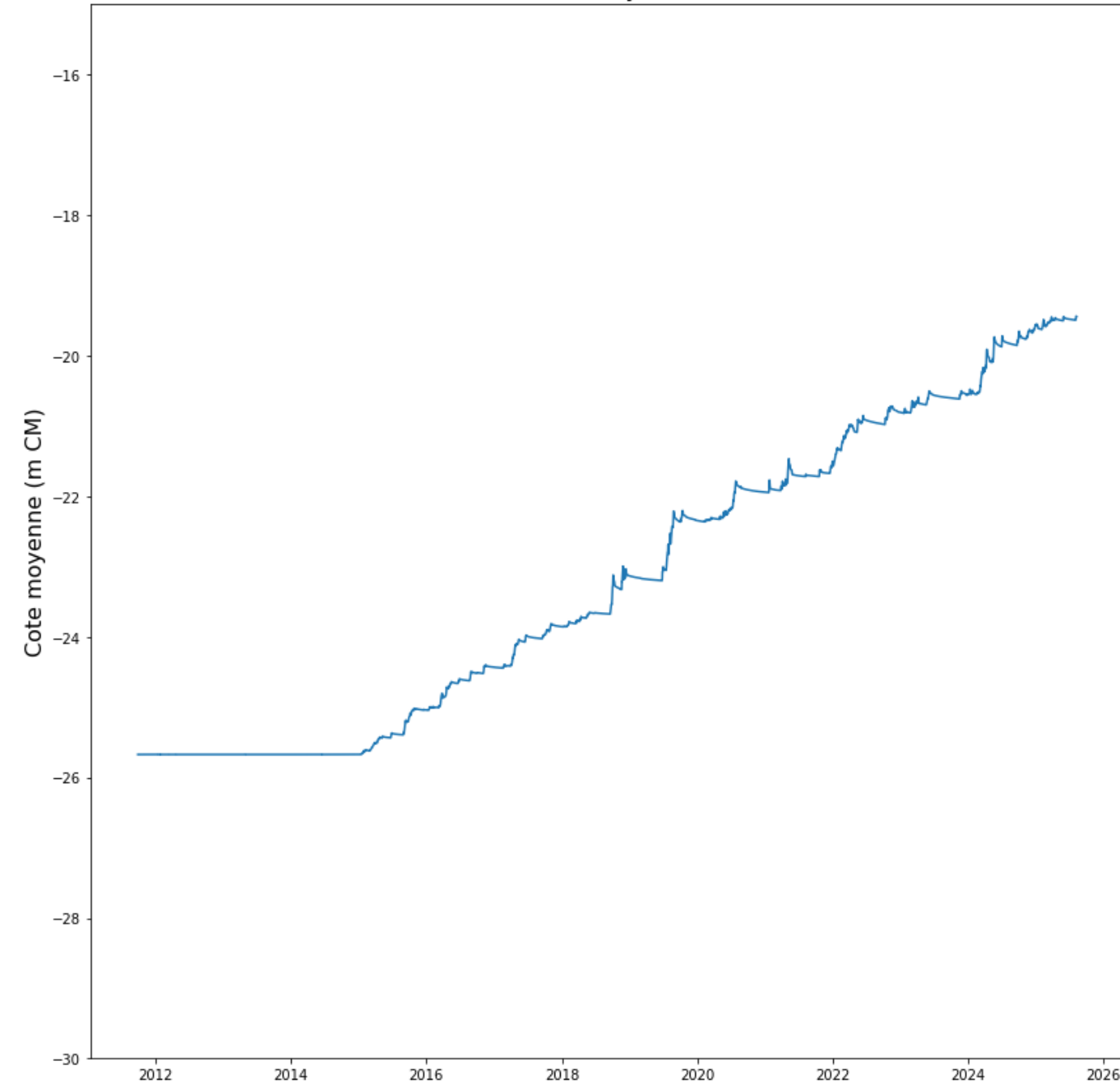


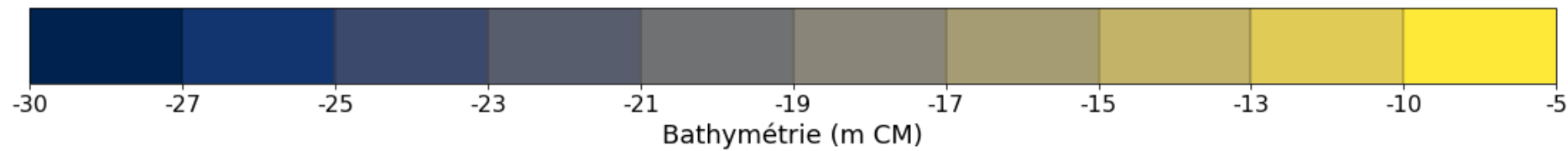
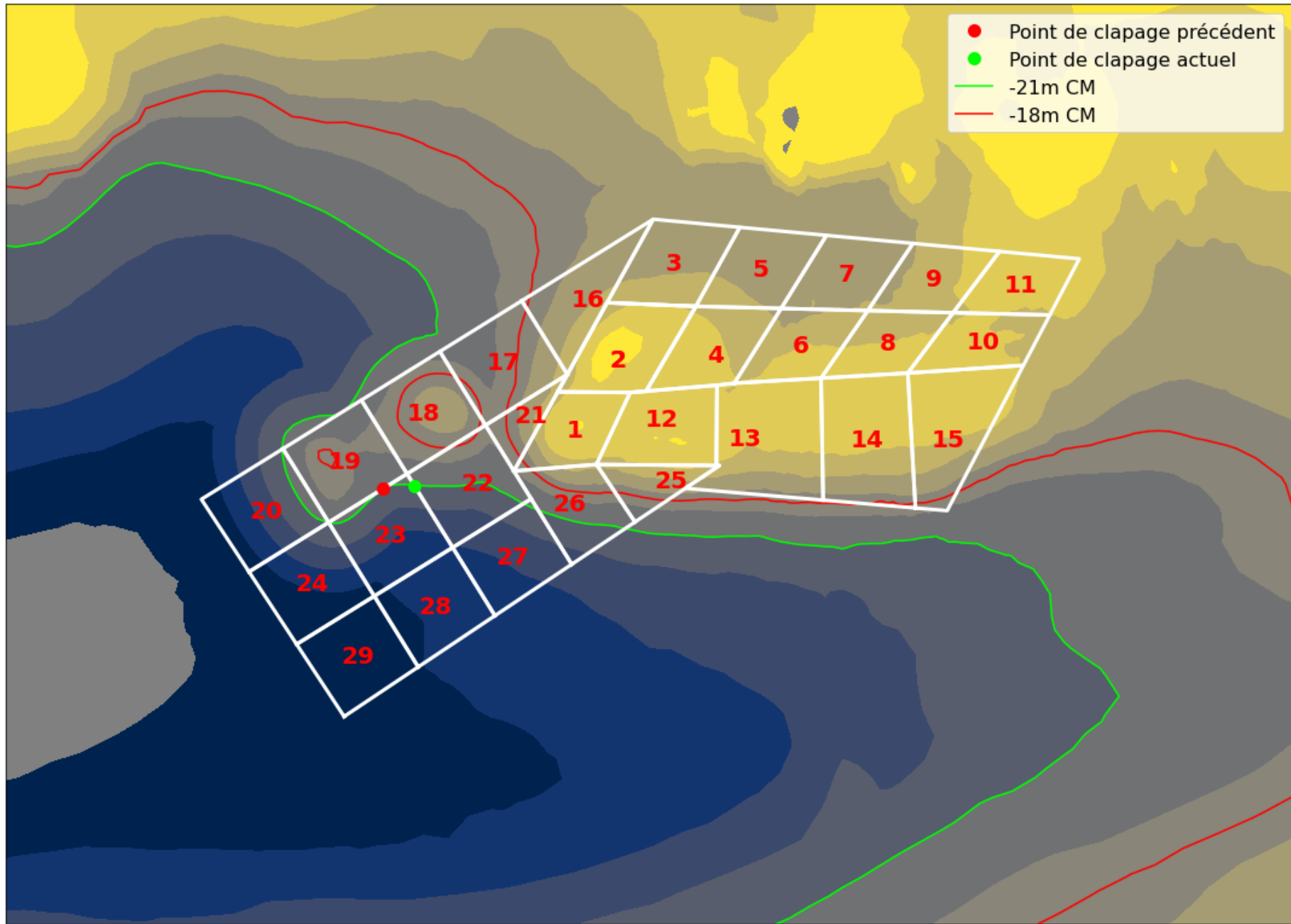




Date de changement de point : 10-08-2025

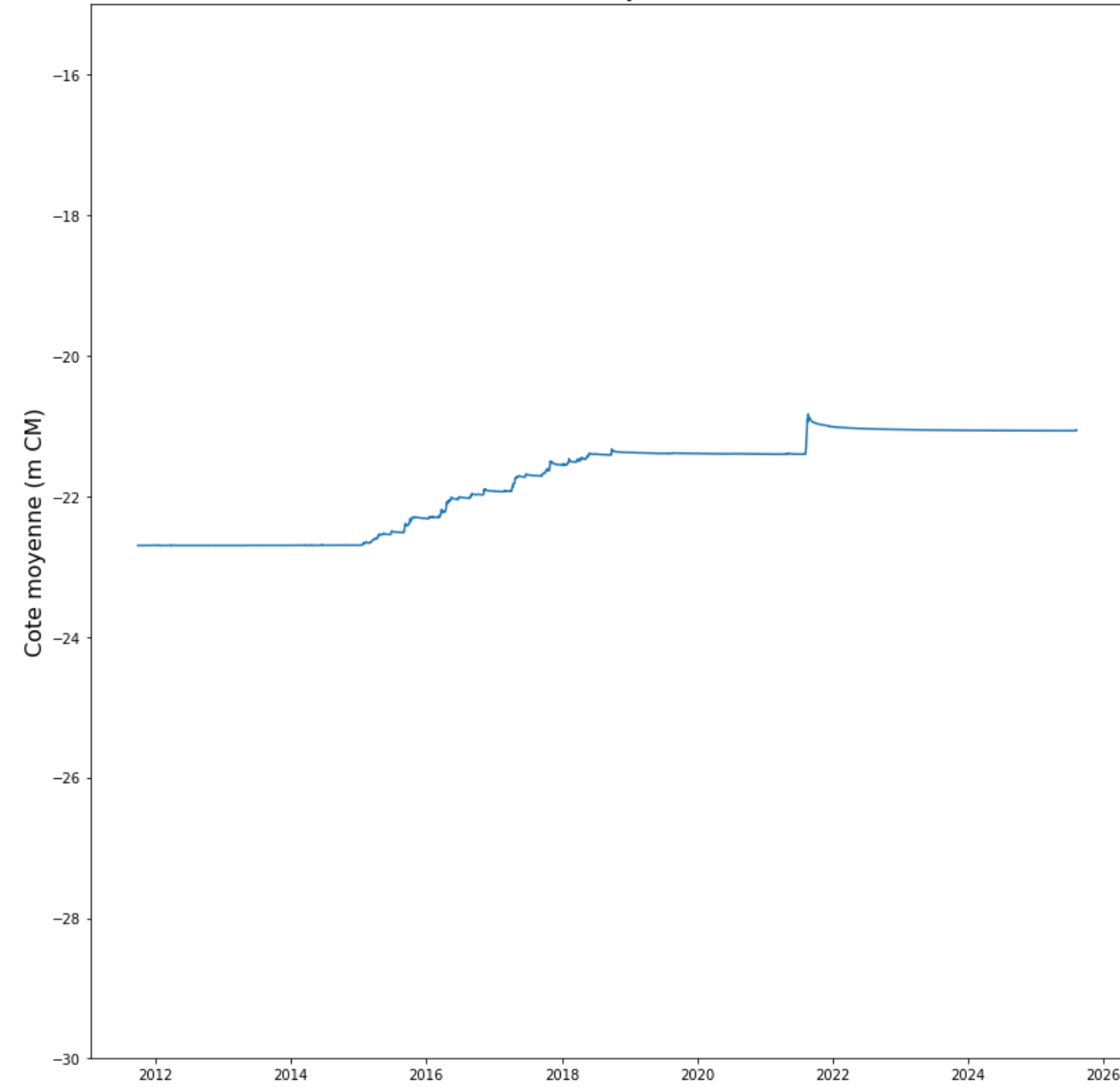
Evolution de la cote moyenne de la zone 19



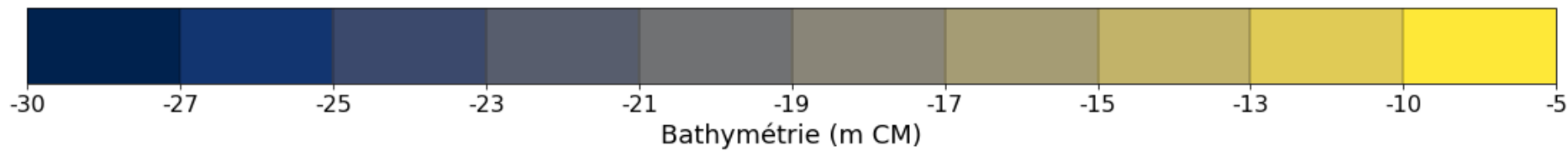
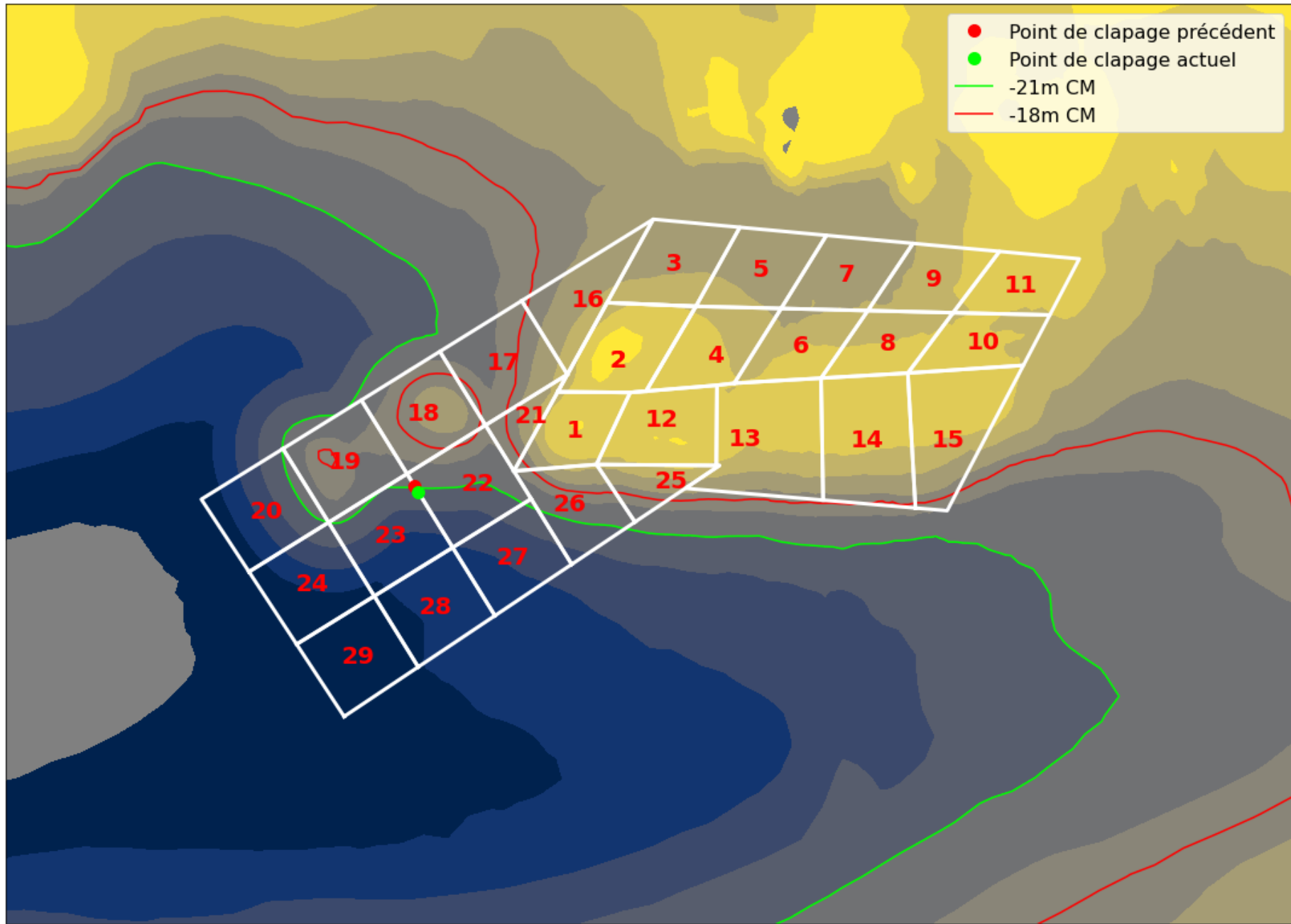


Date de changement de point : 12-08-2025

Evolution de la cote moyenne de la zone 22

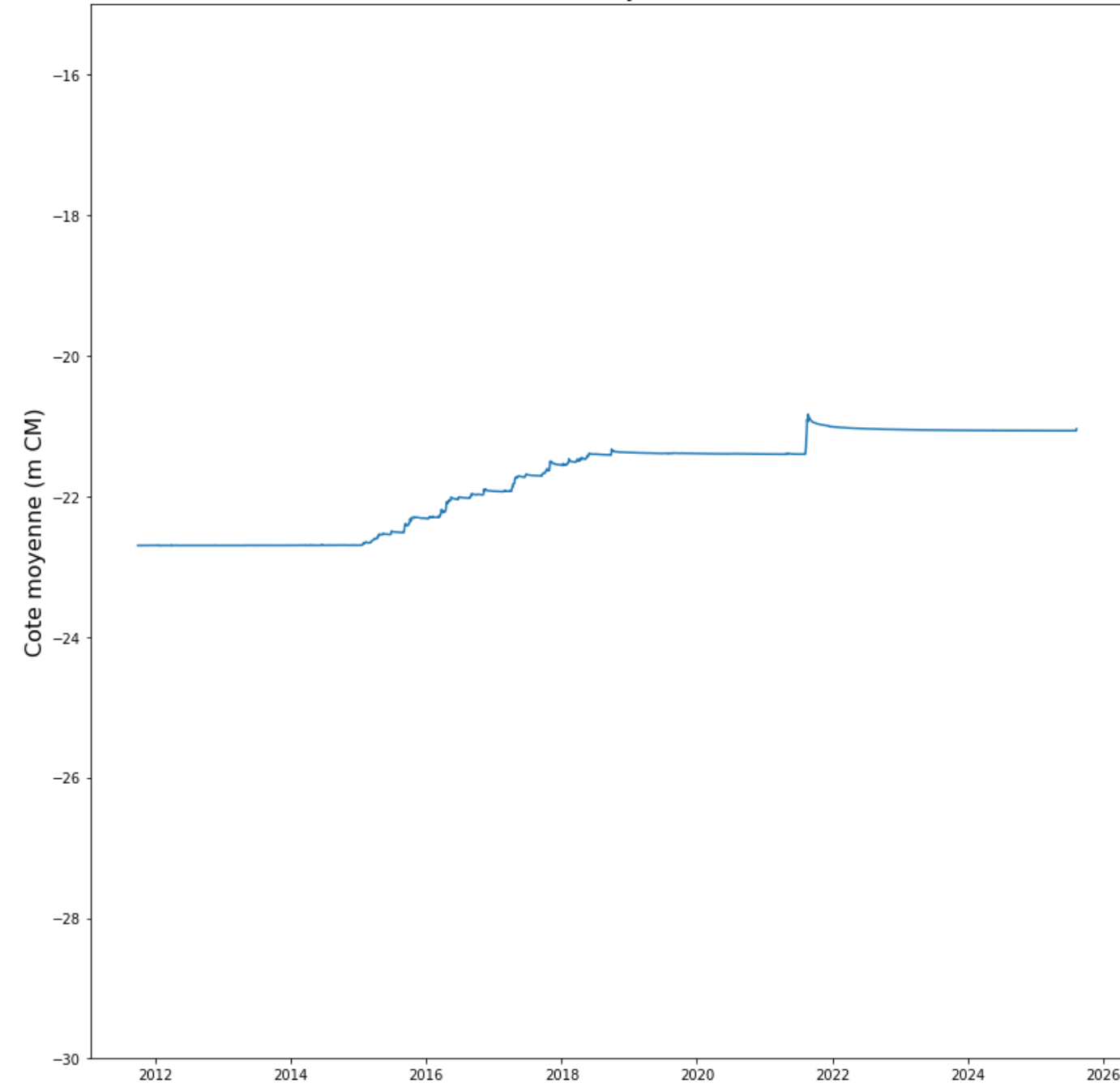


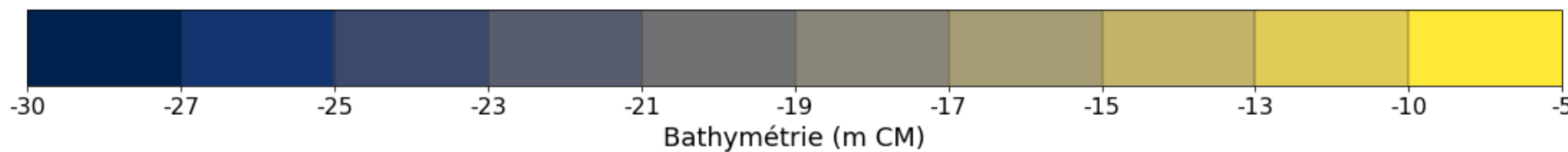
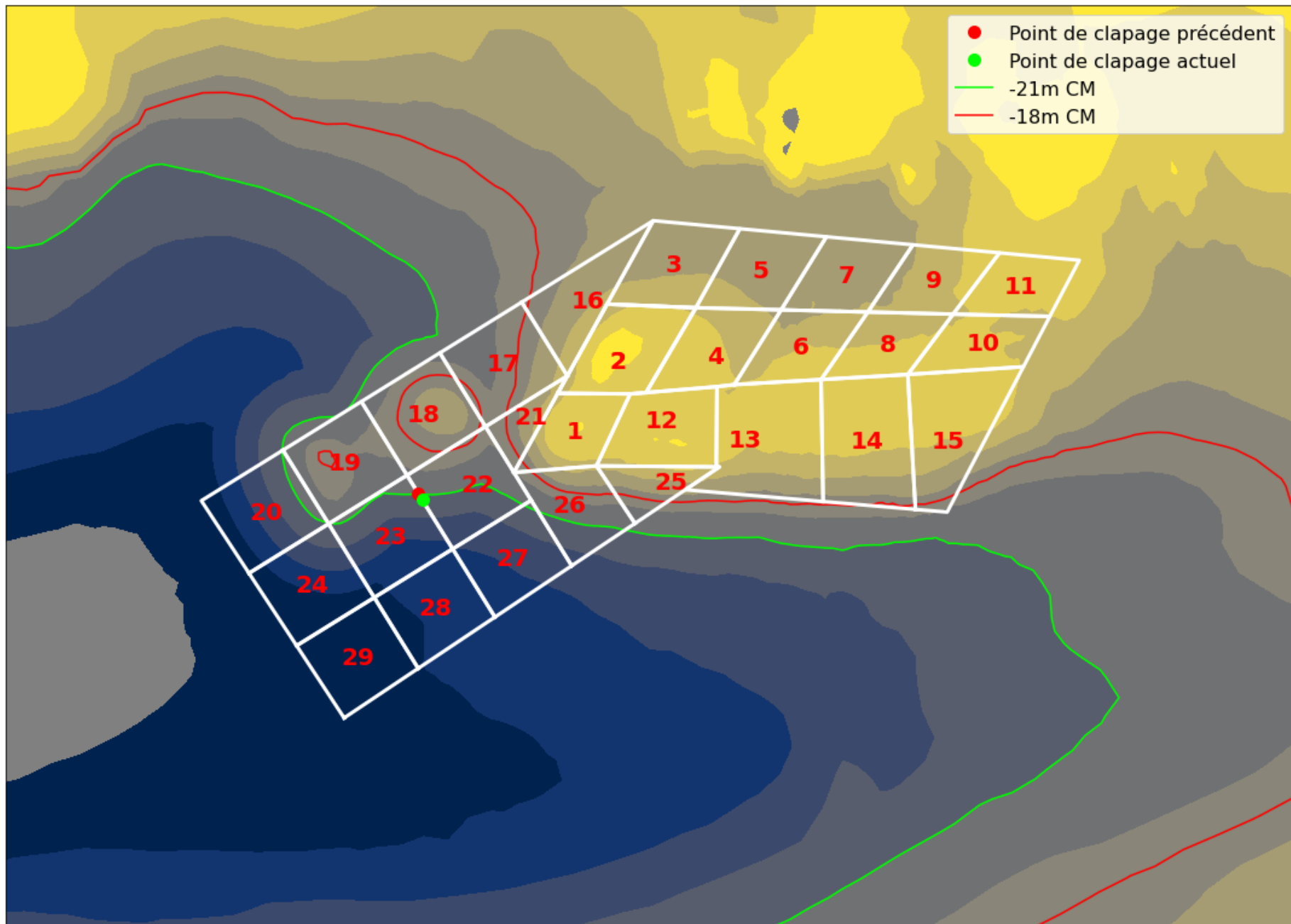




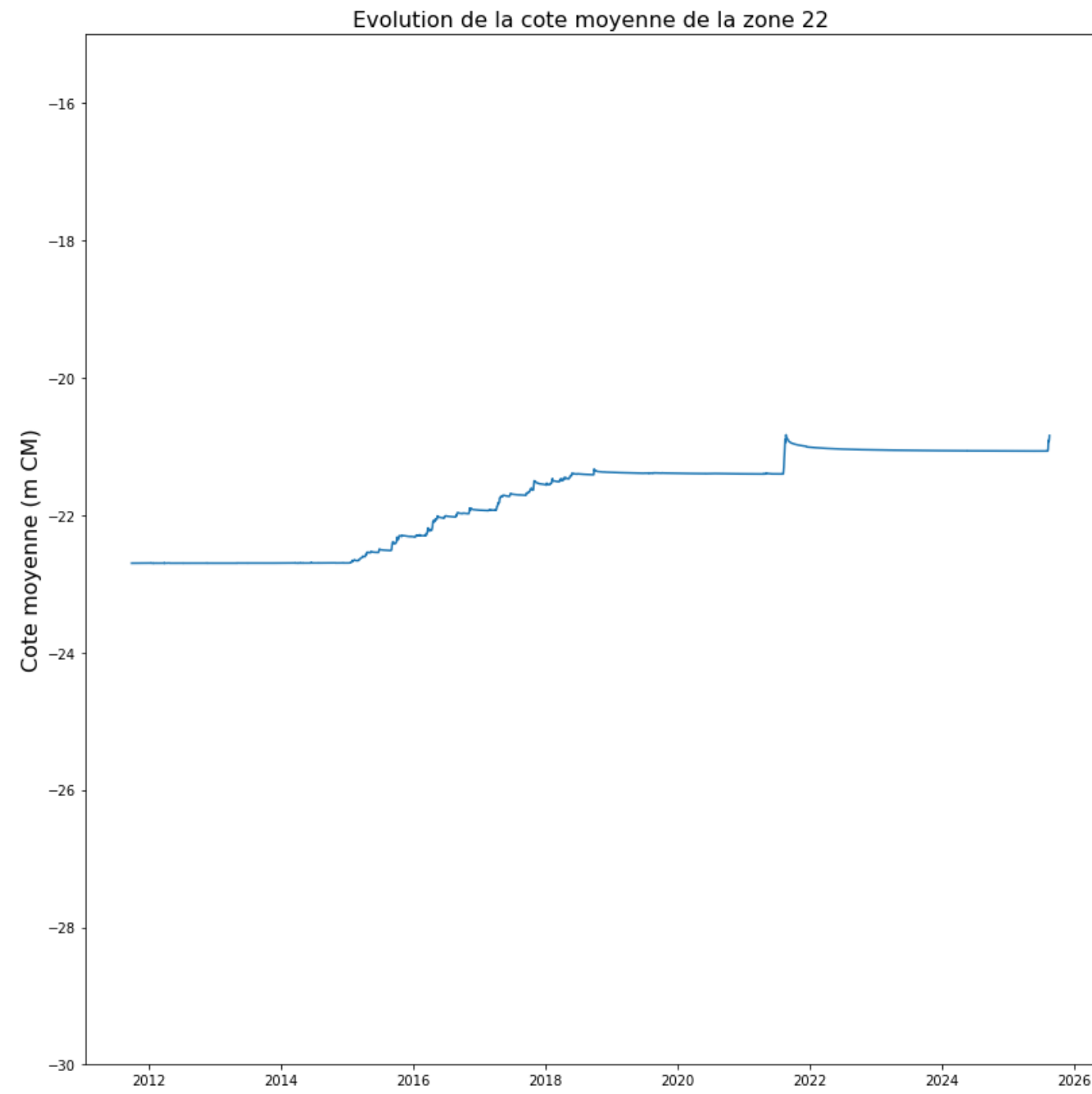
Date de changement de point : 12-08-2025

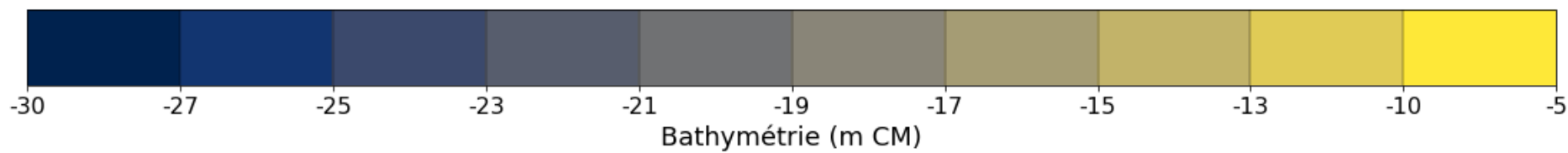
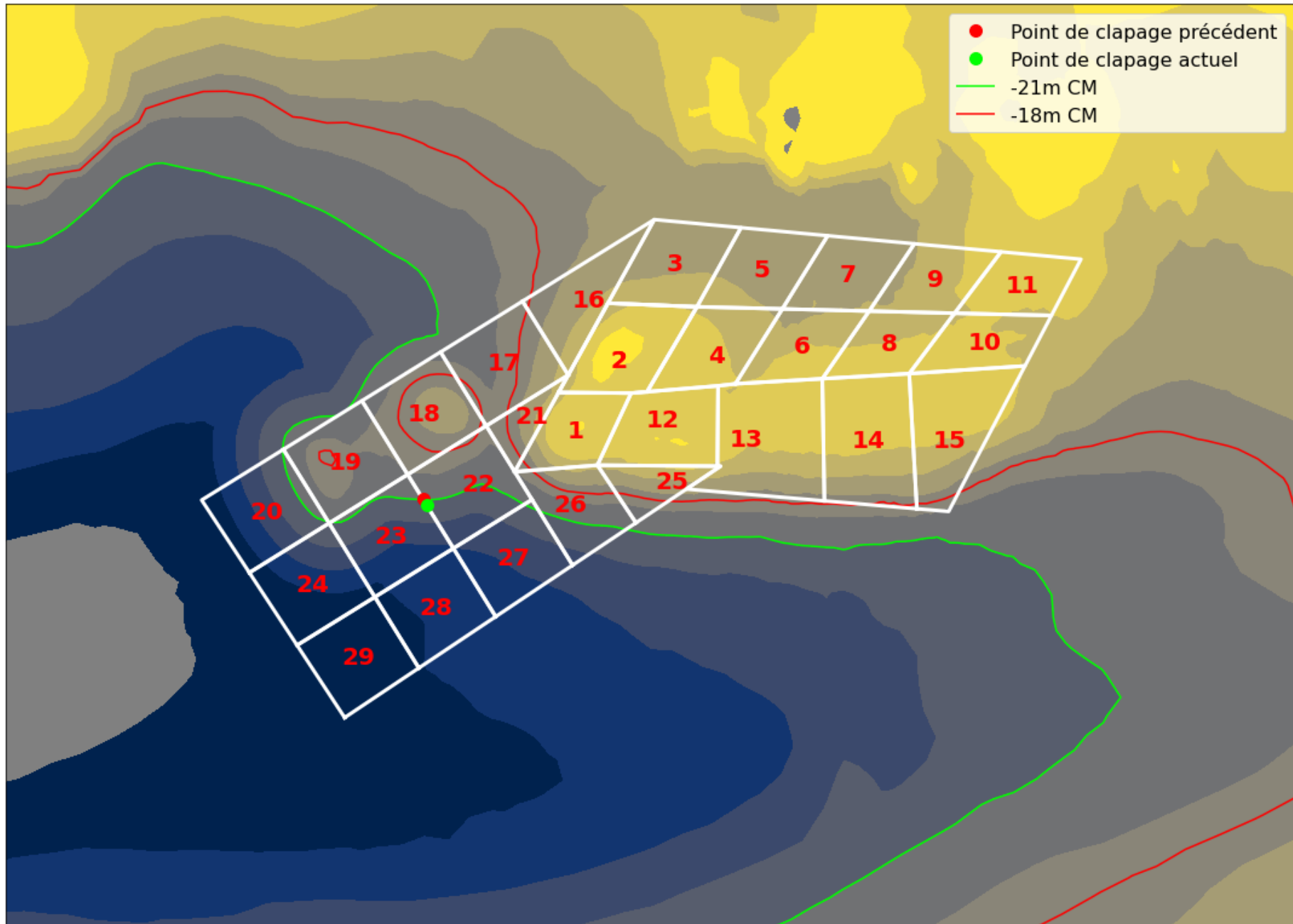
Evolution de la cote moyenne de la zone 22





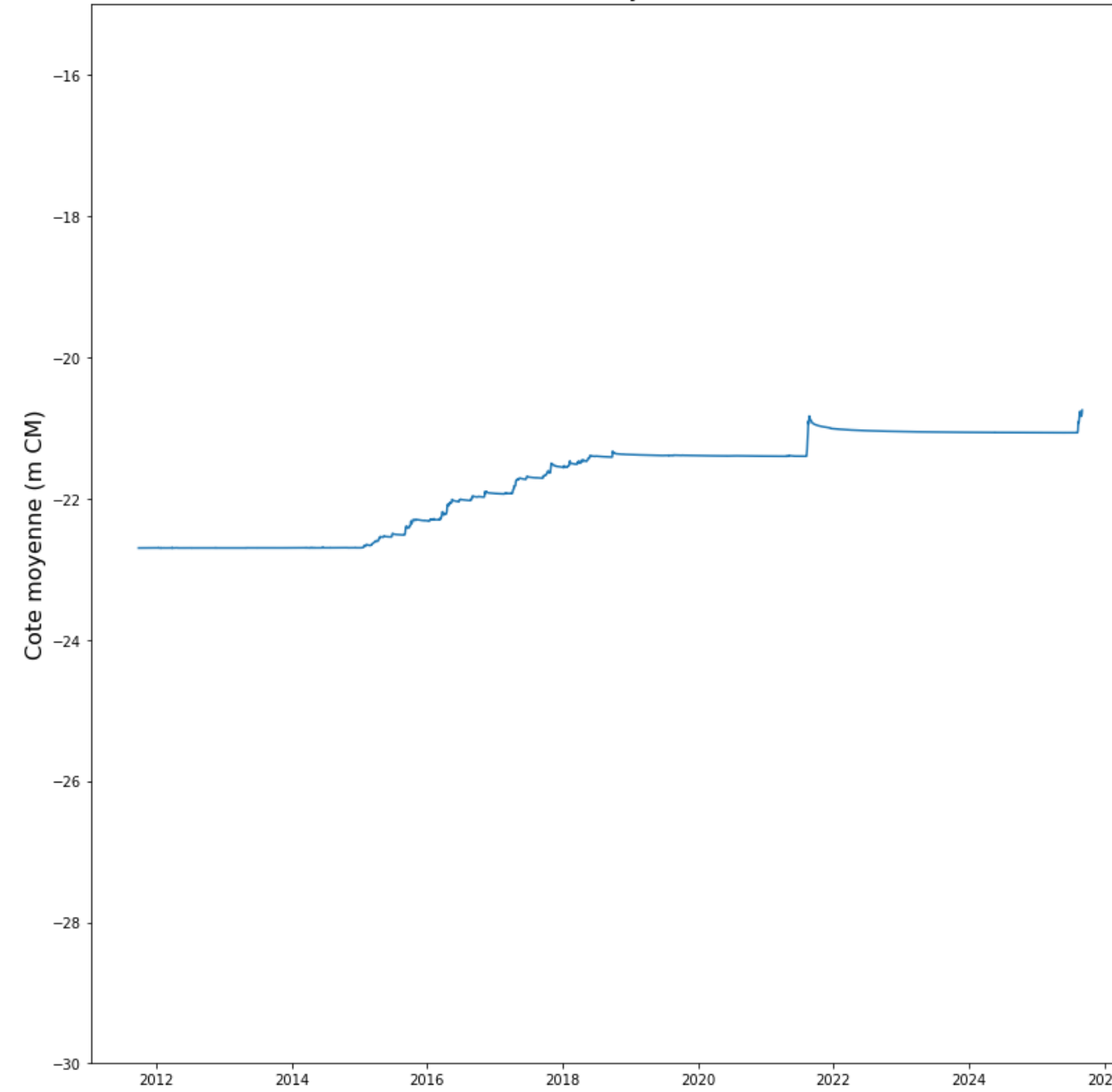
Date de changement de point : 20-08-2025

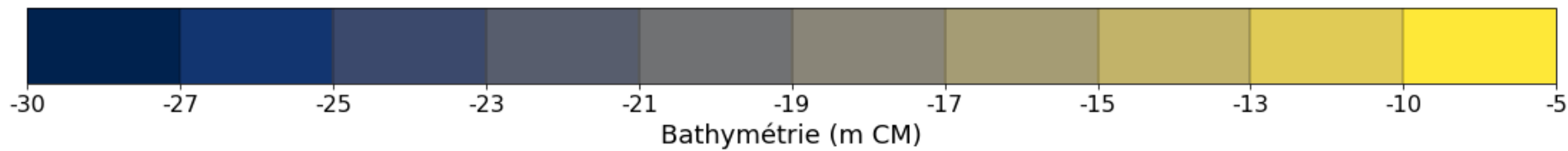
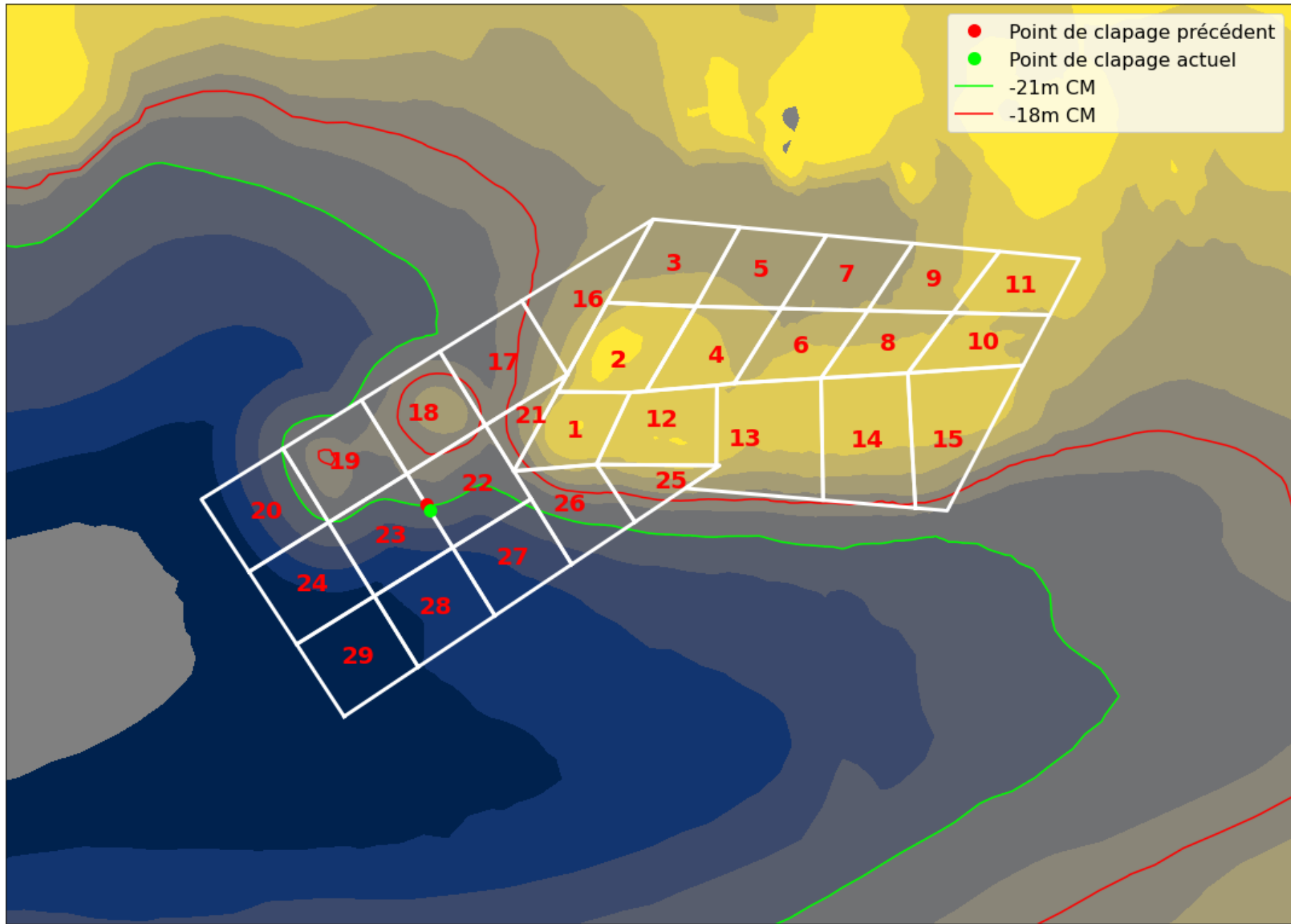




Date de changement de point : 05-09-2025

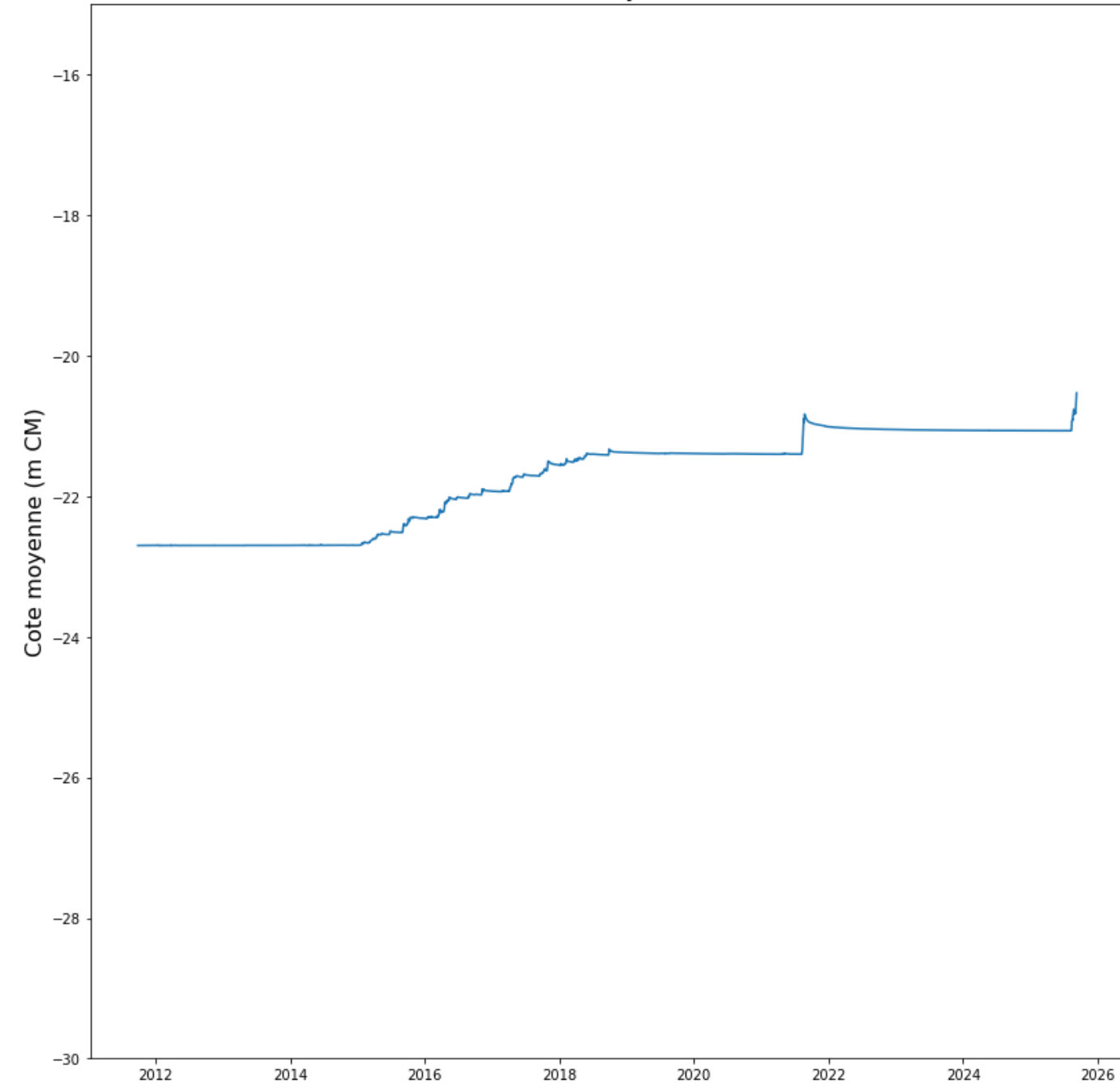
Evolution de la cote moyenne de la zone 22

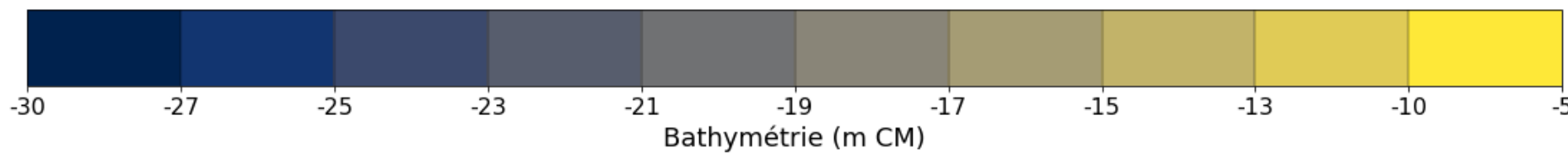
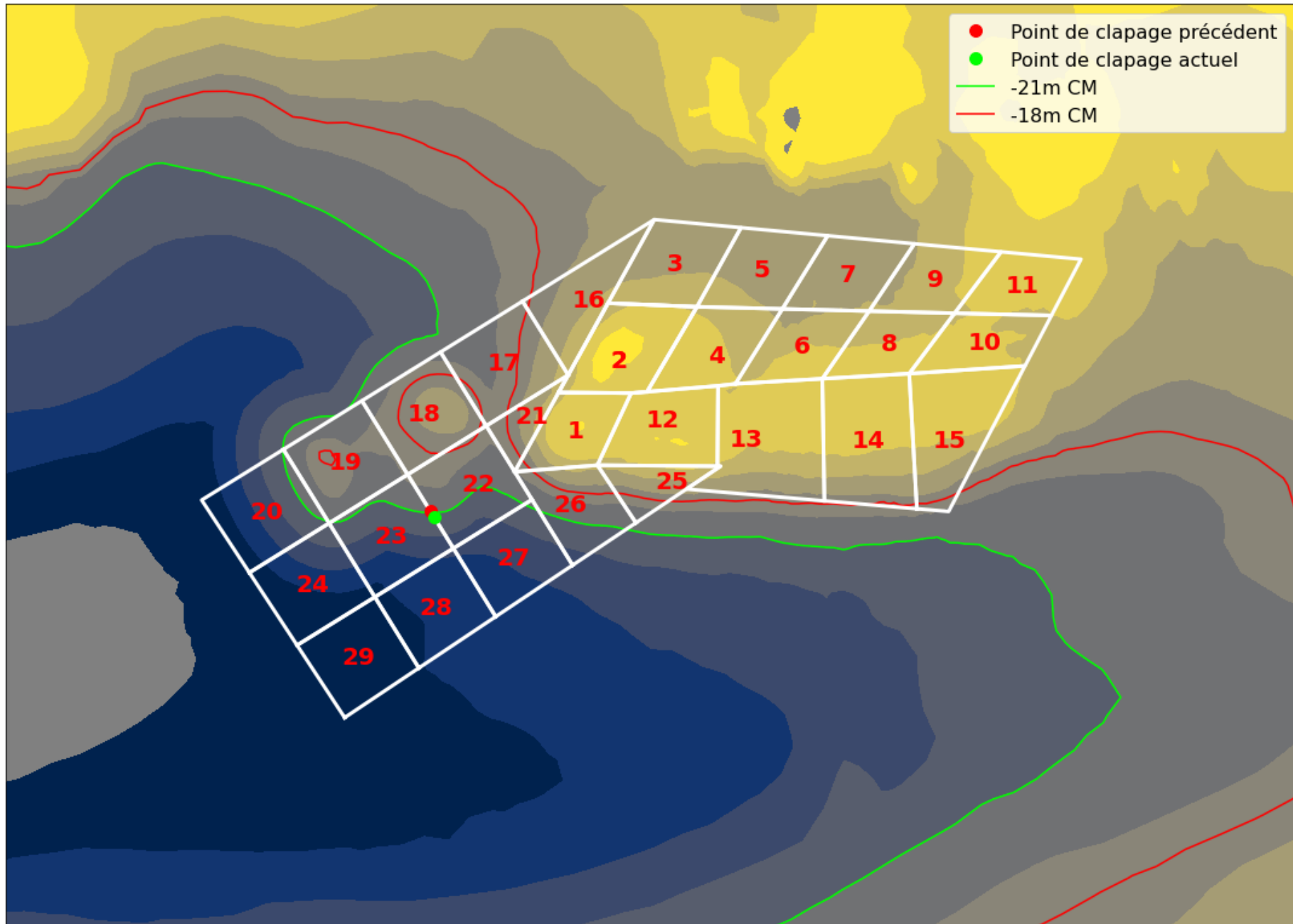




Date de changement de point : 09-09-2025

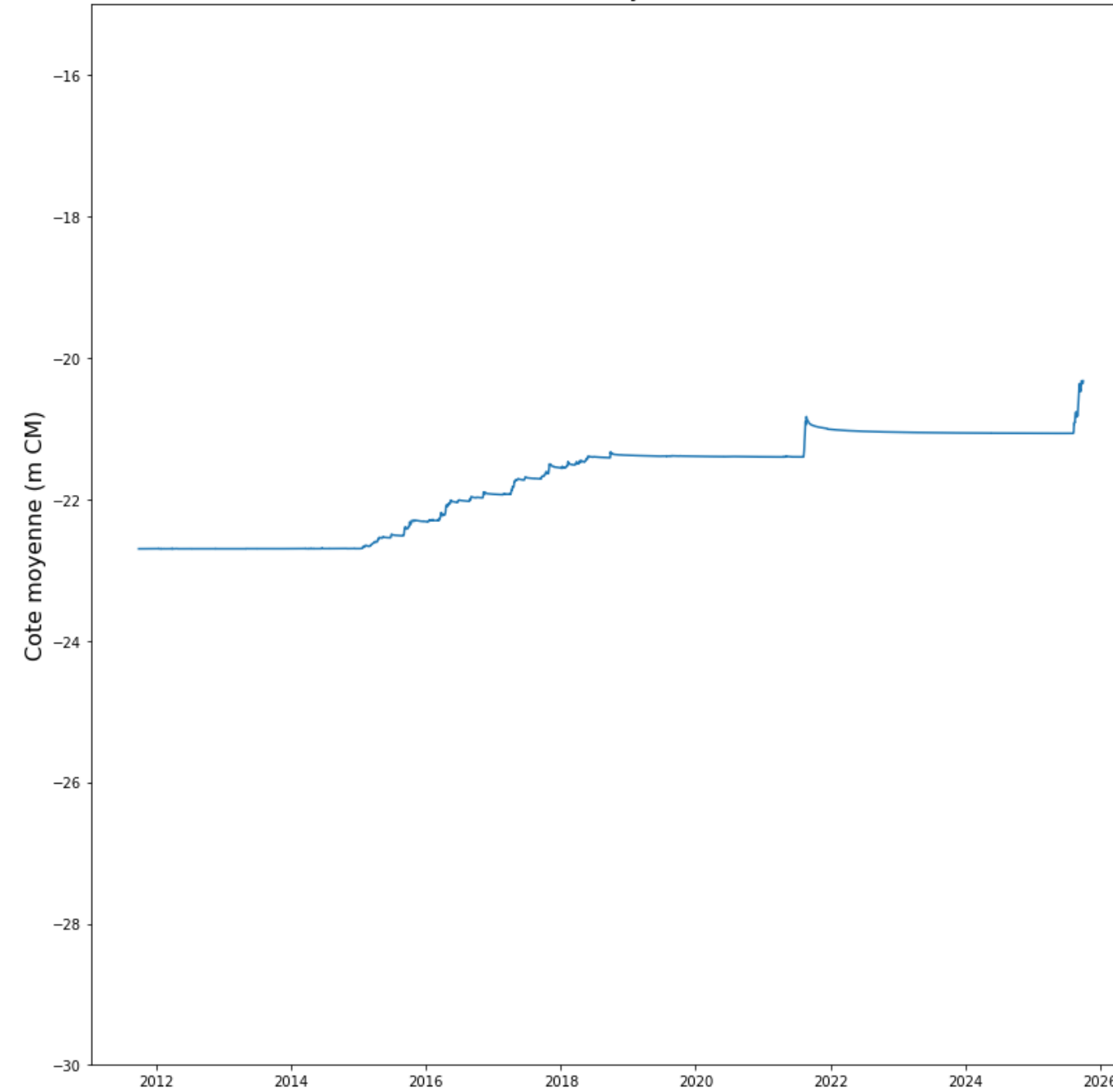
Evolution de la cote moyenne de la zone 22

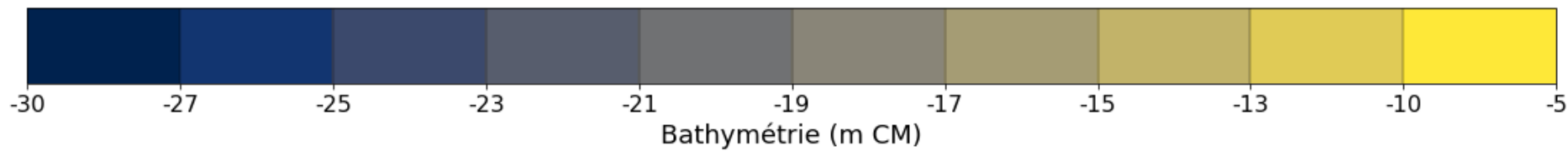
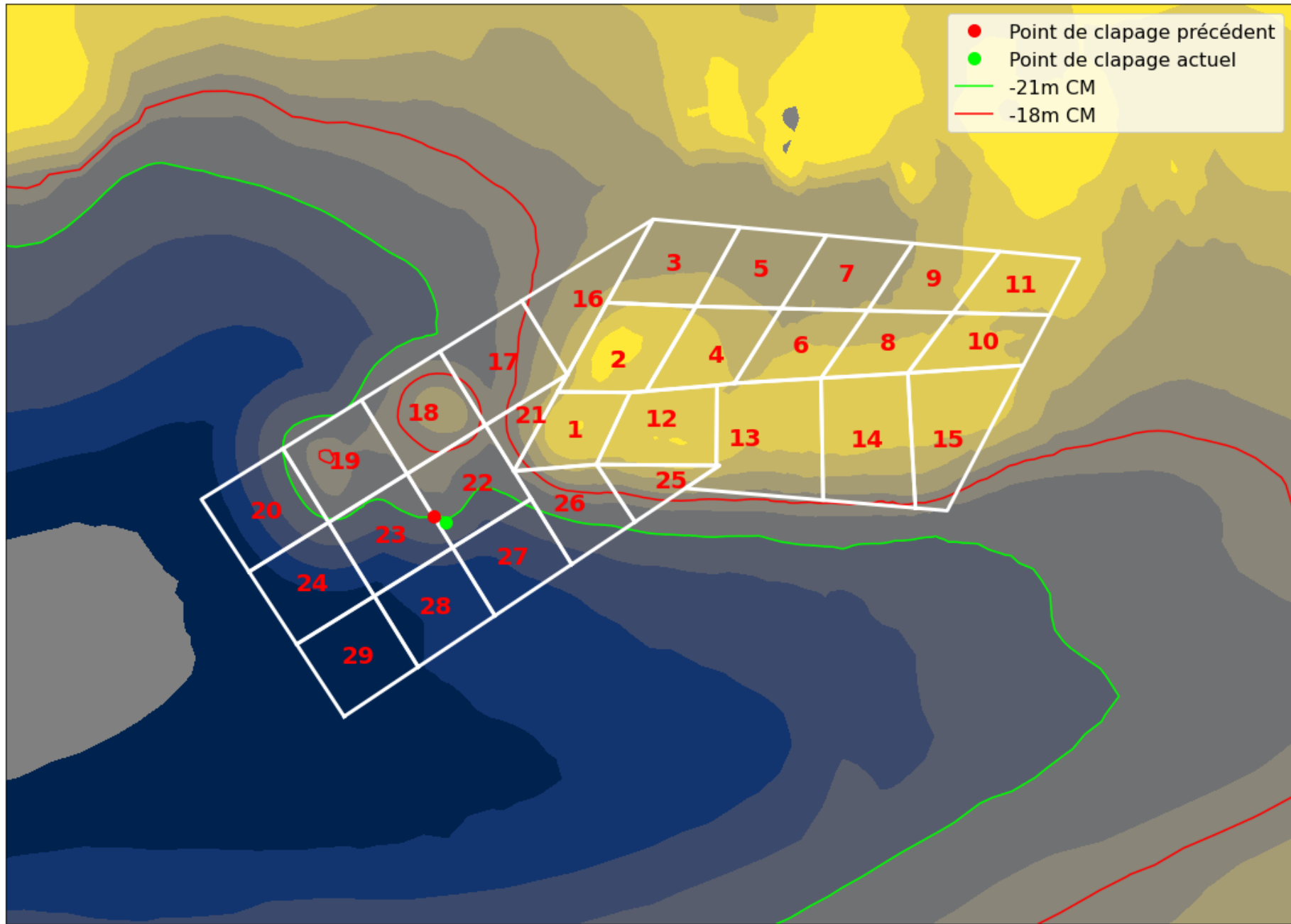




Date de changement de point : 02-10-2025

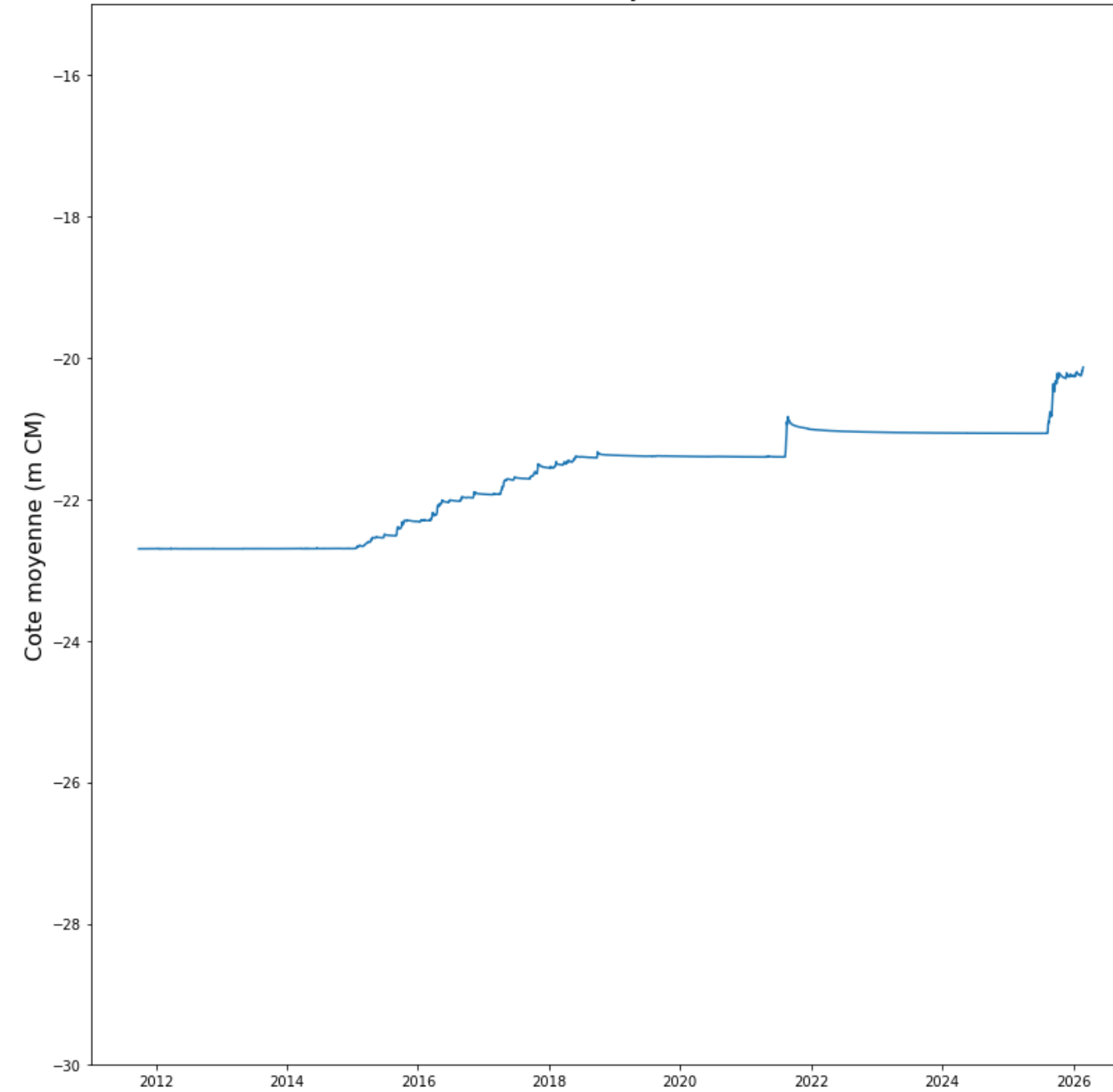
Evolution de la cote moyenne de la zone 22



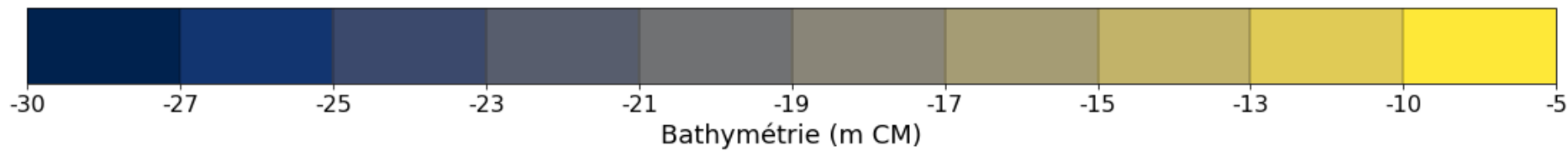
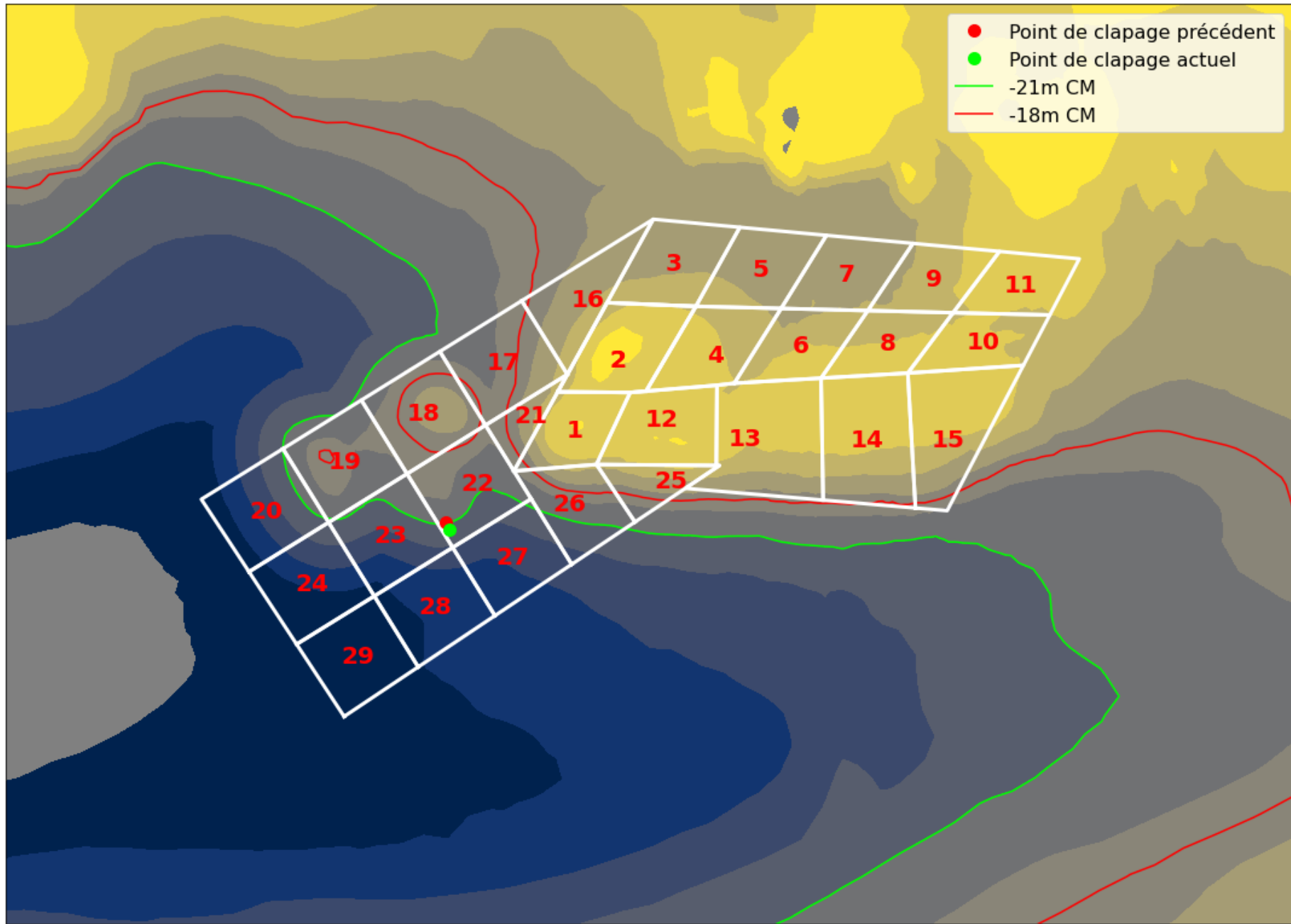


Date de changement de point : 26-02-2026

Evolution de la cote moyenne de la zone 22

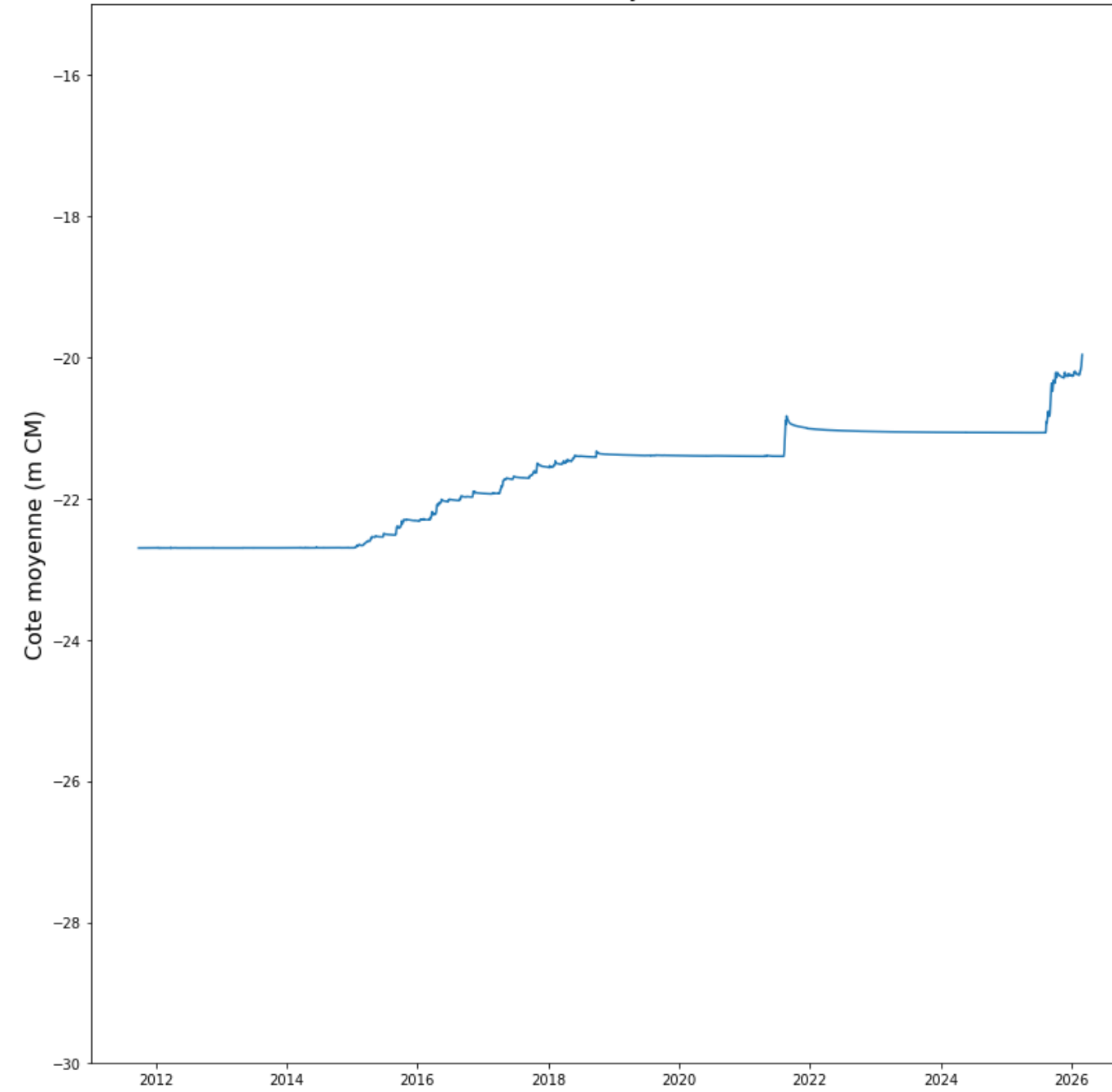


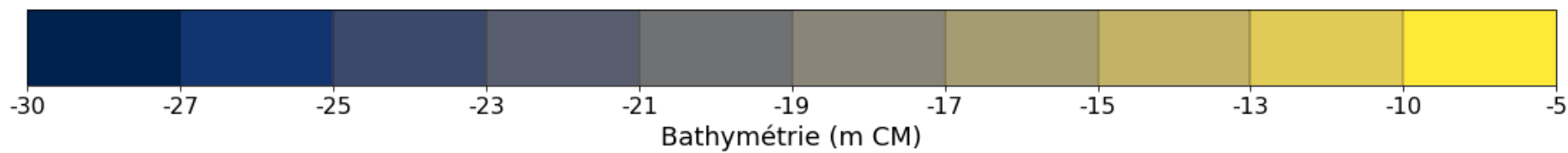
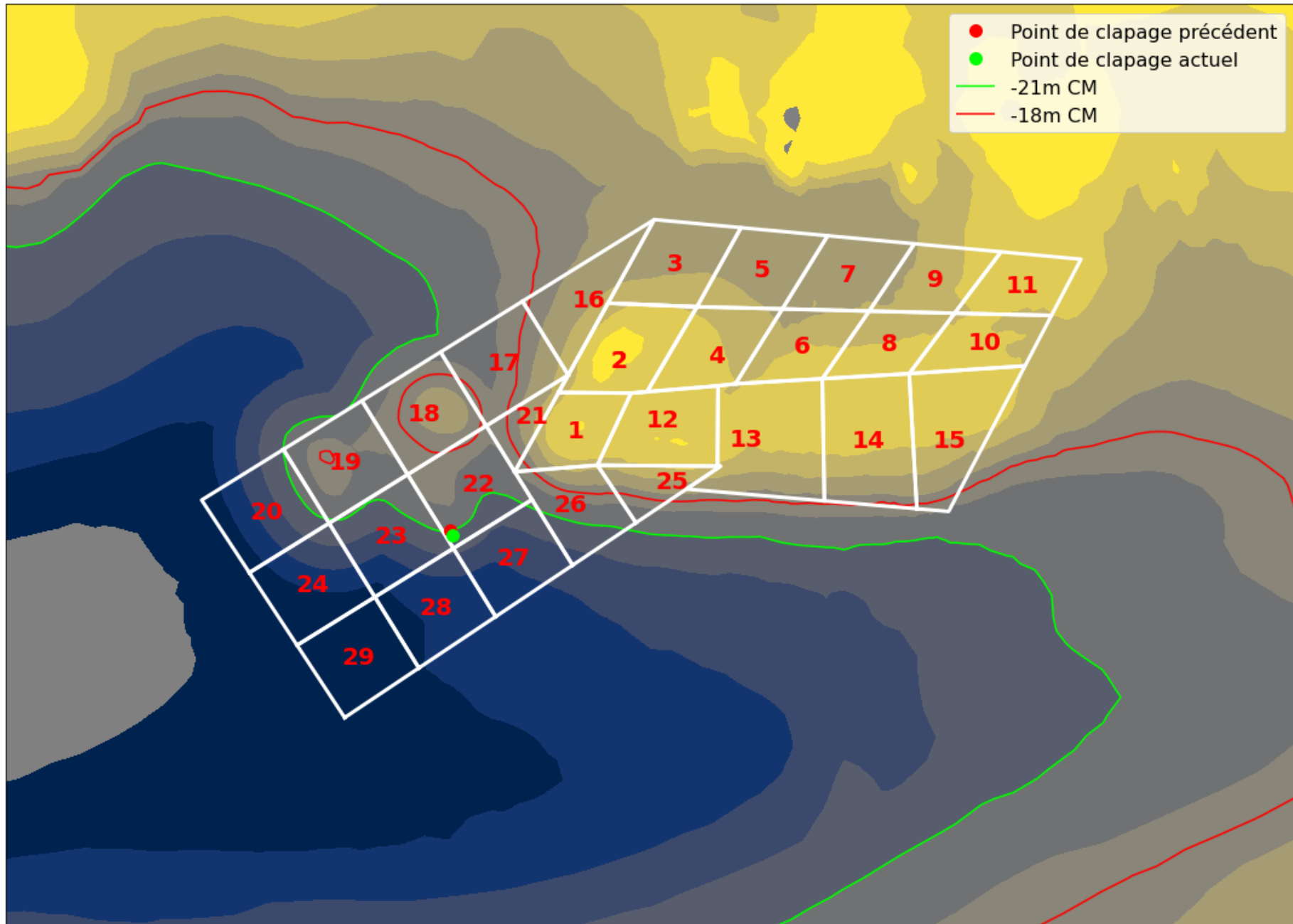




Date de changement de point : 02-03-2026

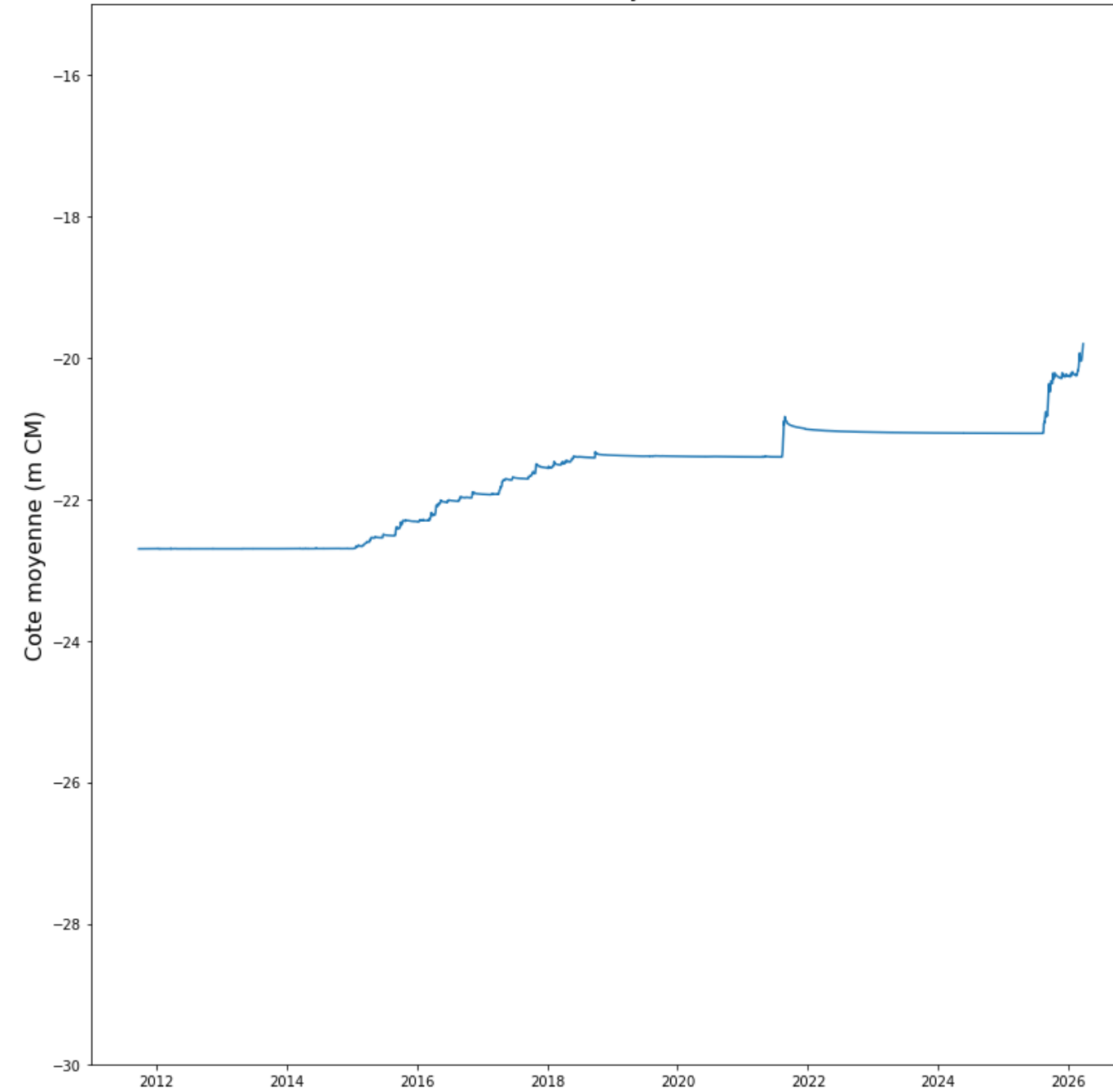
Evolution de la cote moyenne de la zone 22



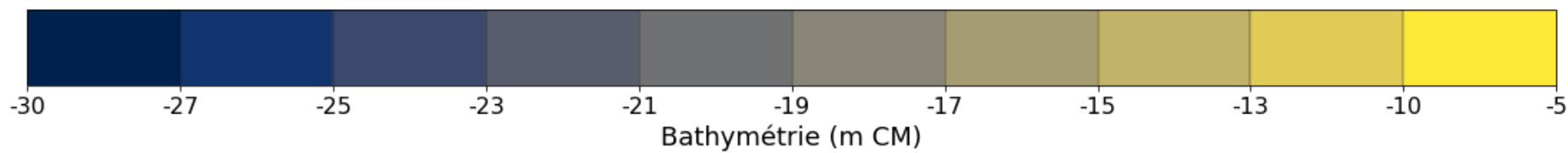
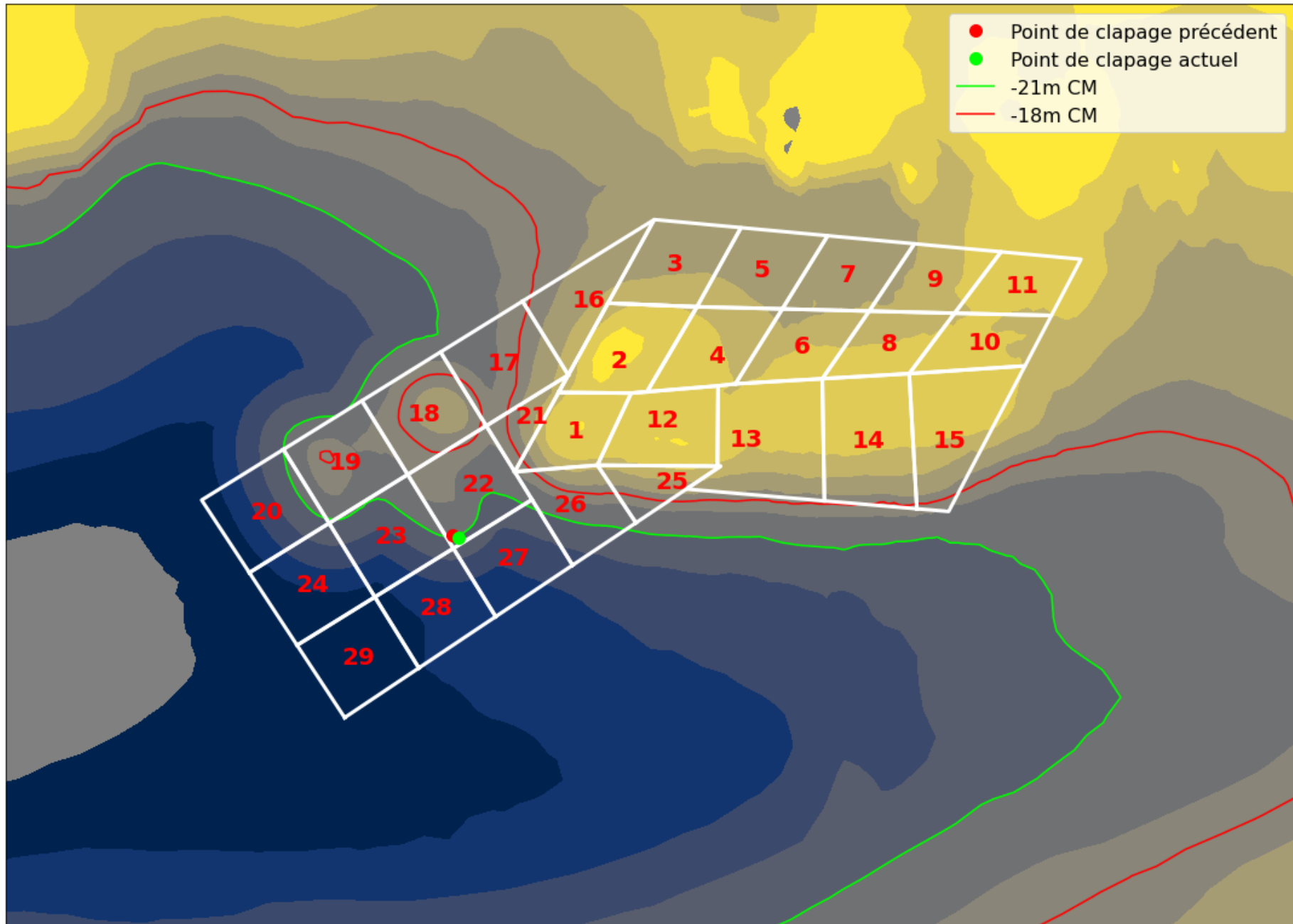


Date de changement de point : 23-03-2026

Evolution de la cote moyenne de la zone 22

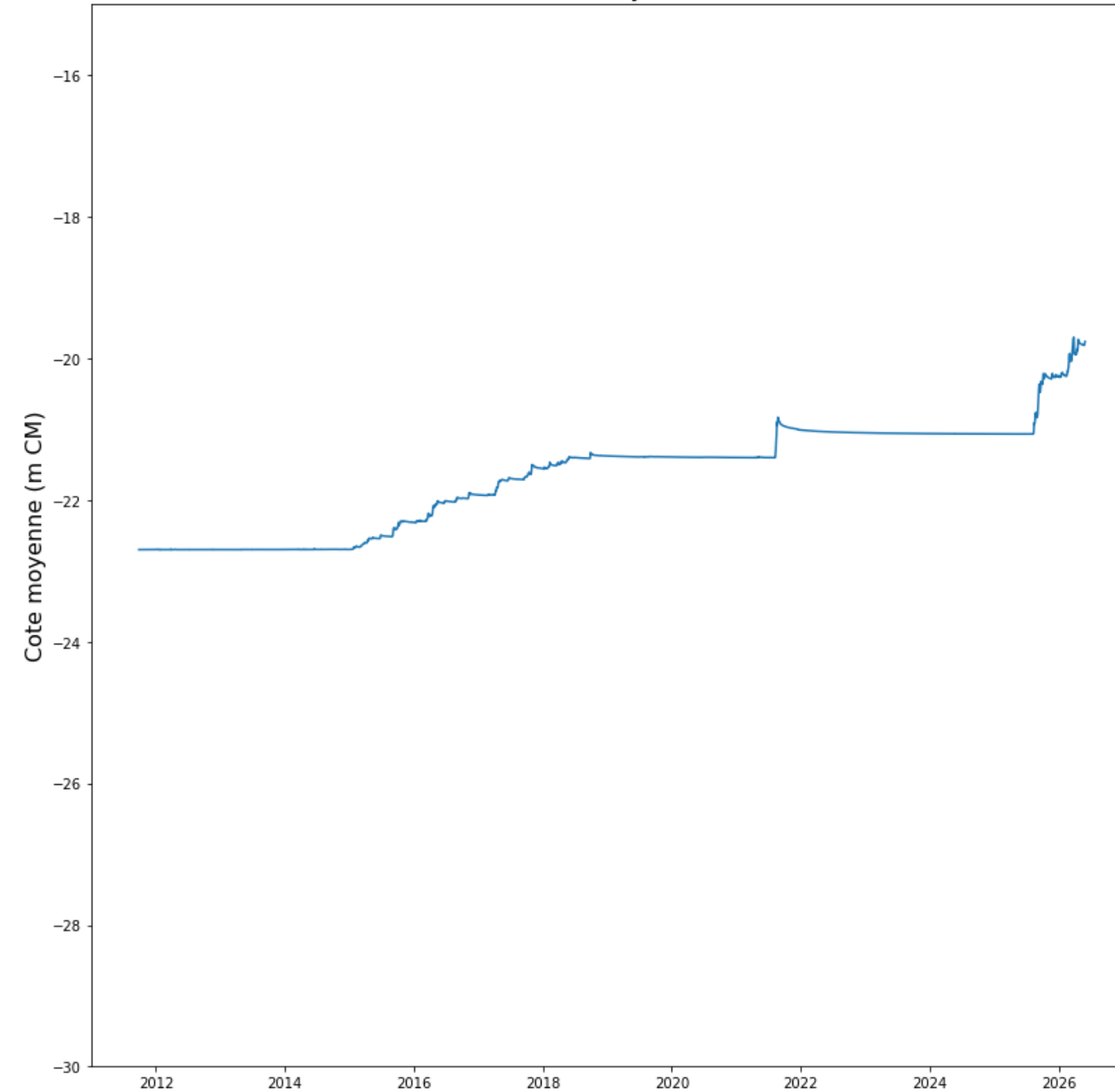


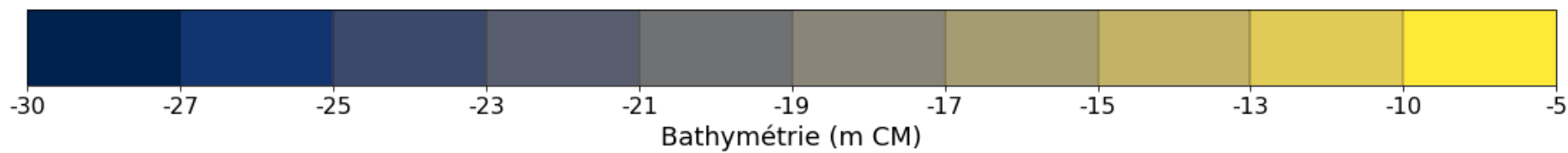
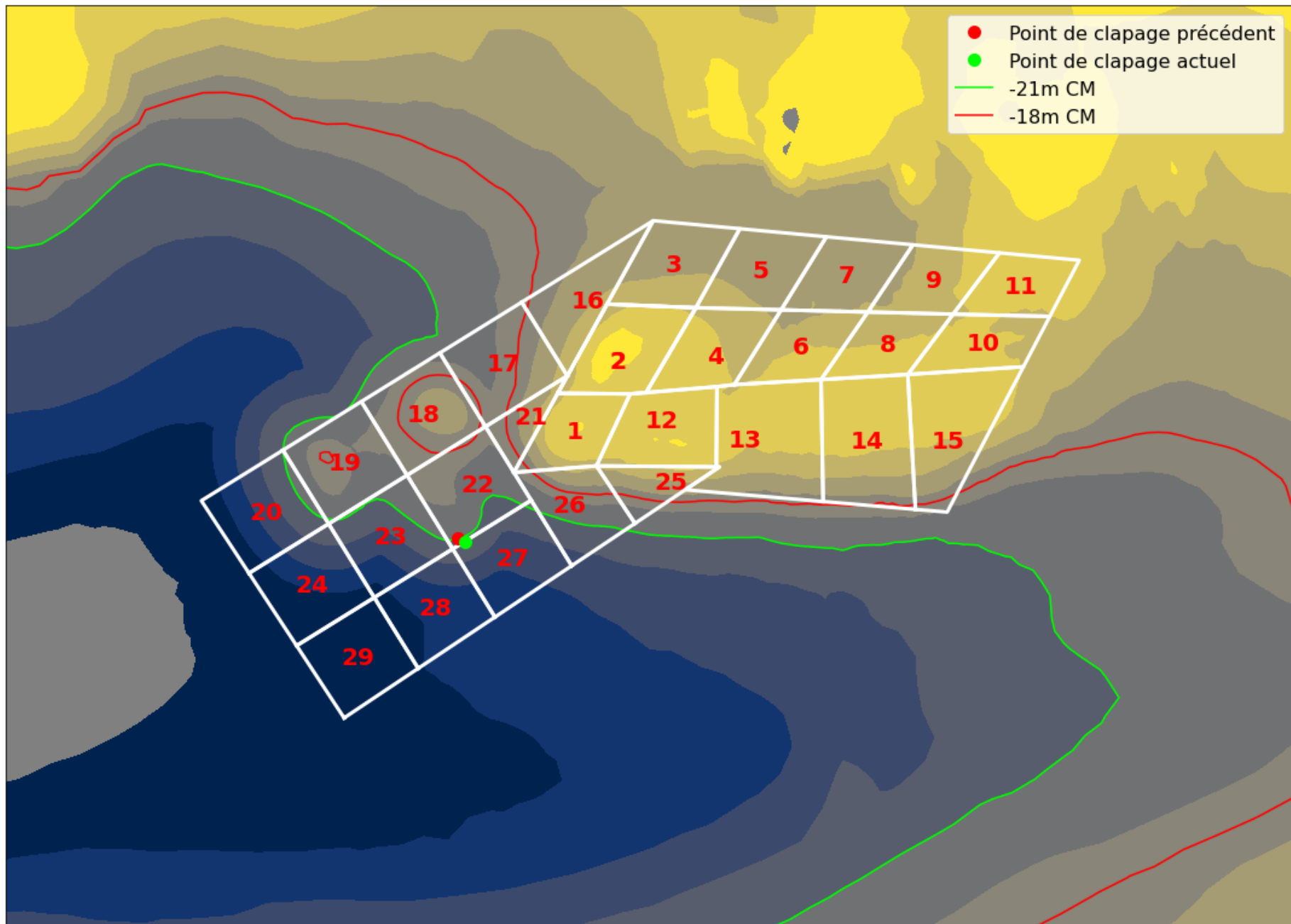




Date de changement de point : 31-05-2026

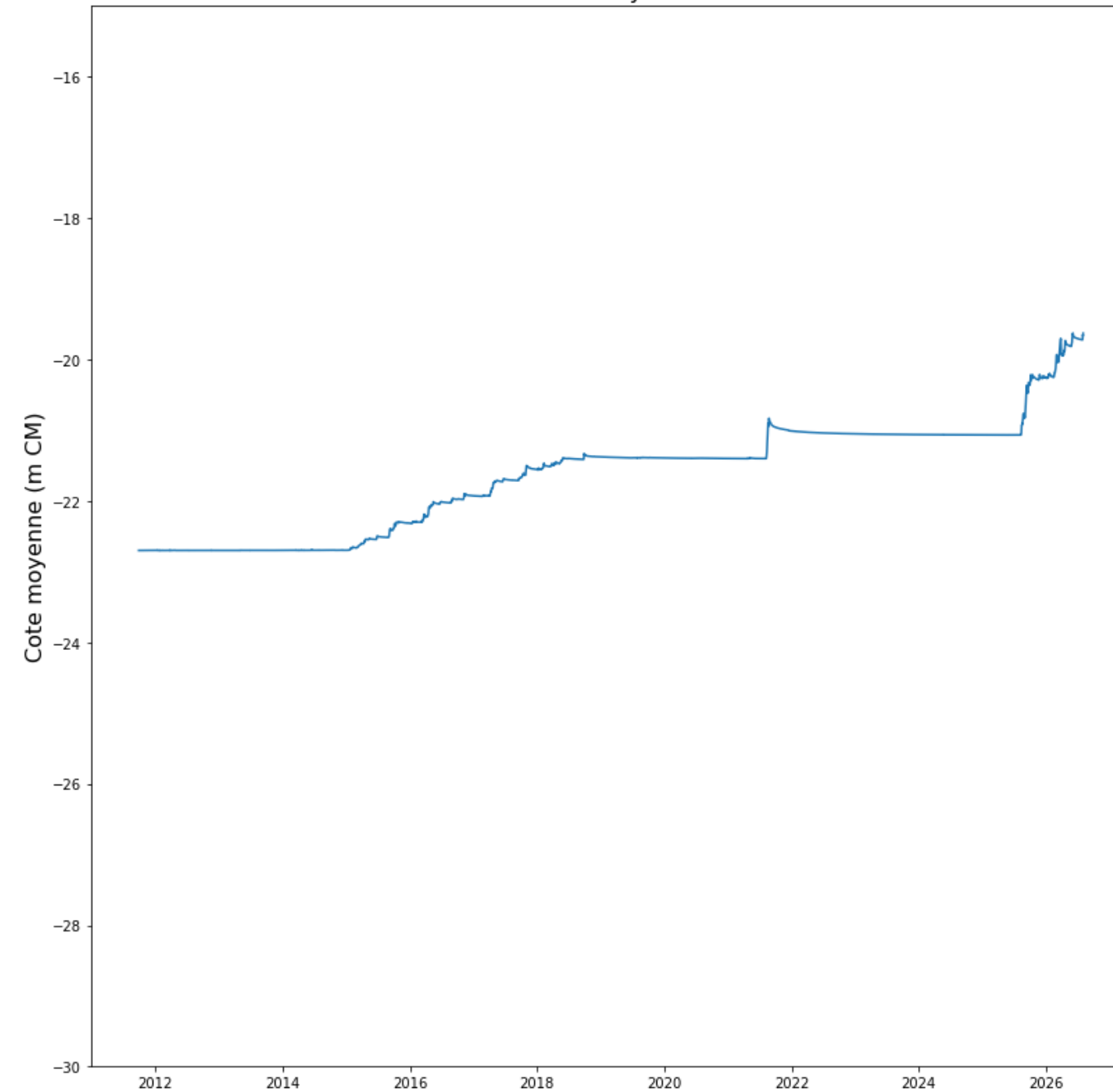
Evolution de la cote moyenne de la zone 22

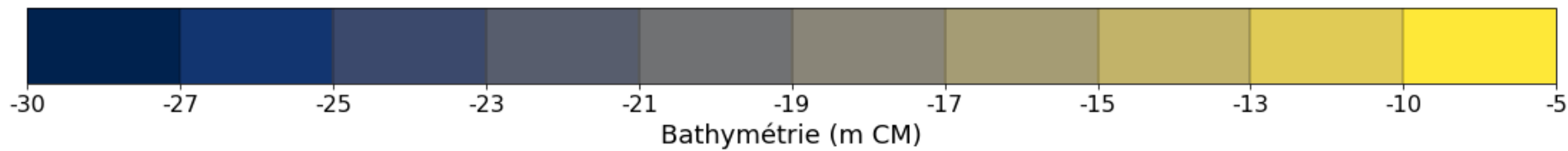
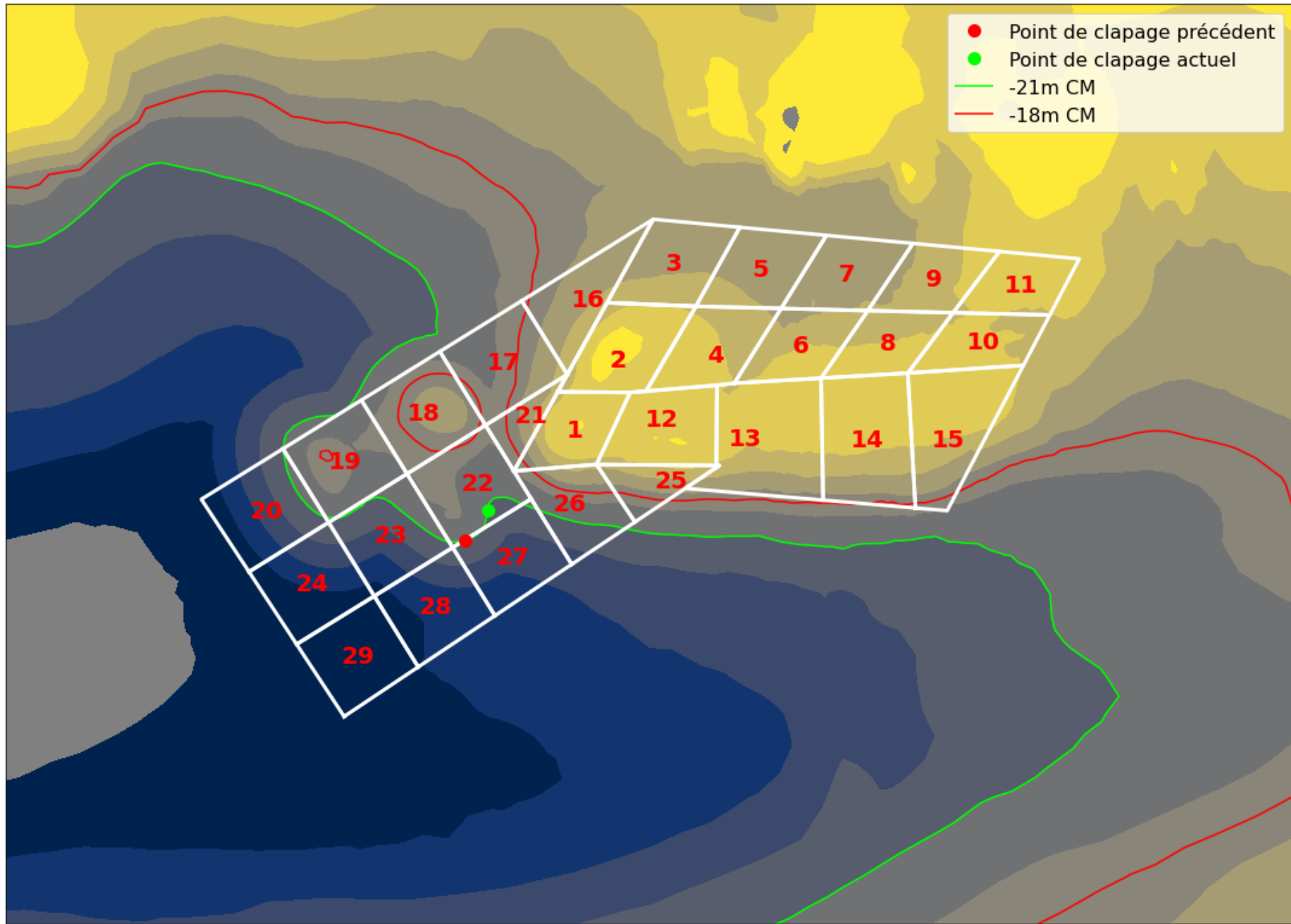




Date de changement de point : 02-08-2026

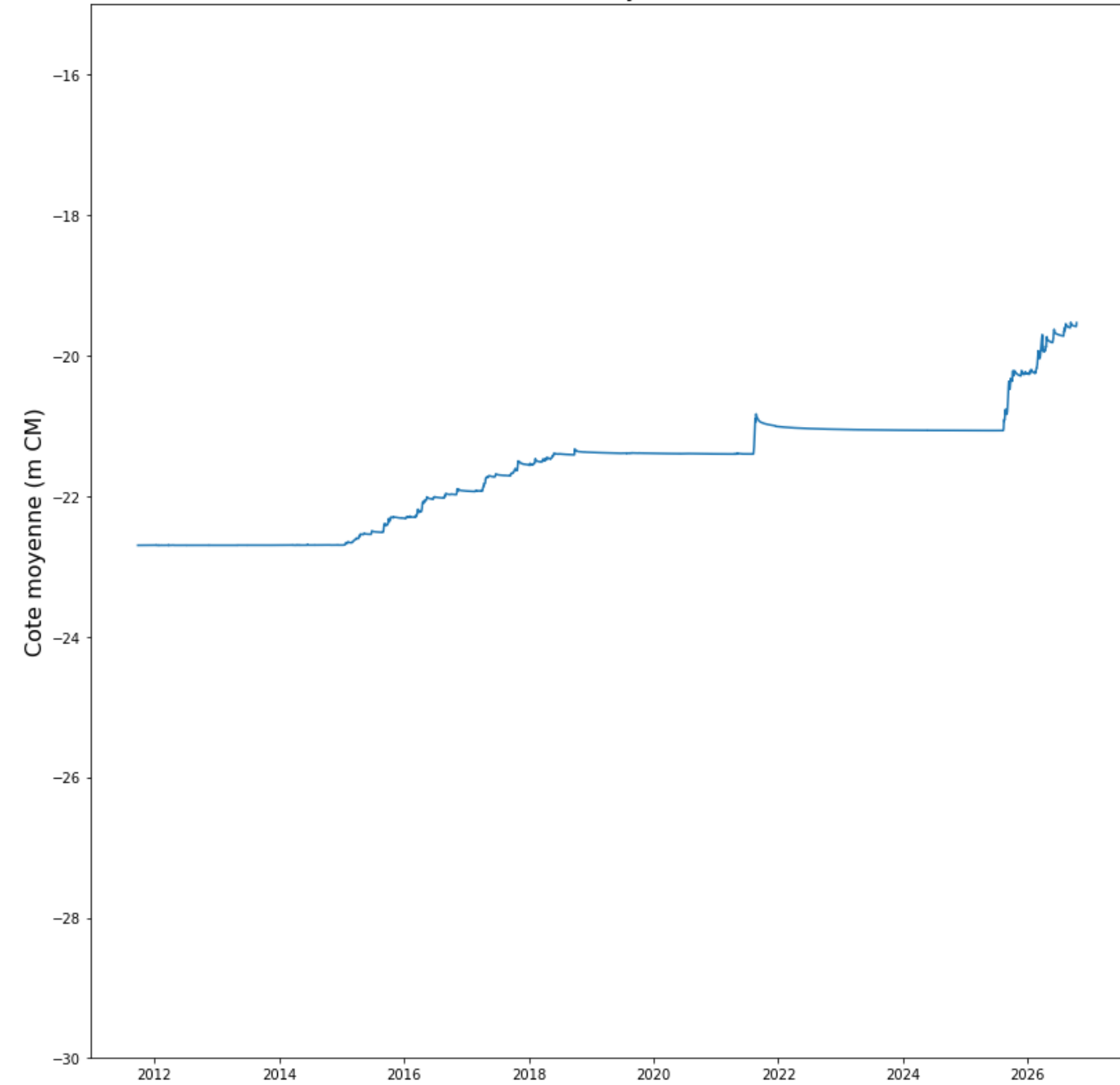
Evolution de la cote moyenne de la zone 22

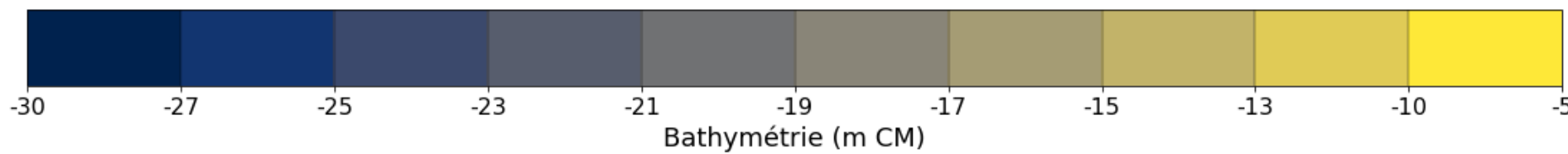
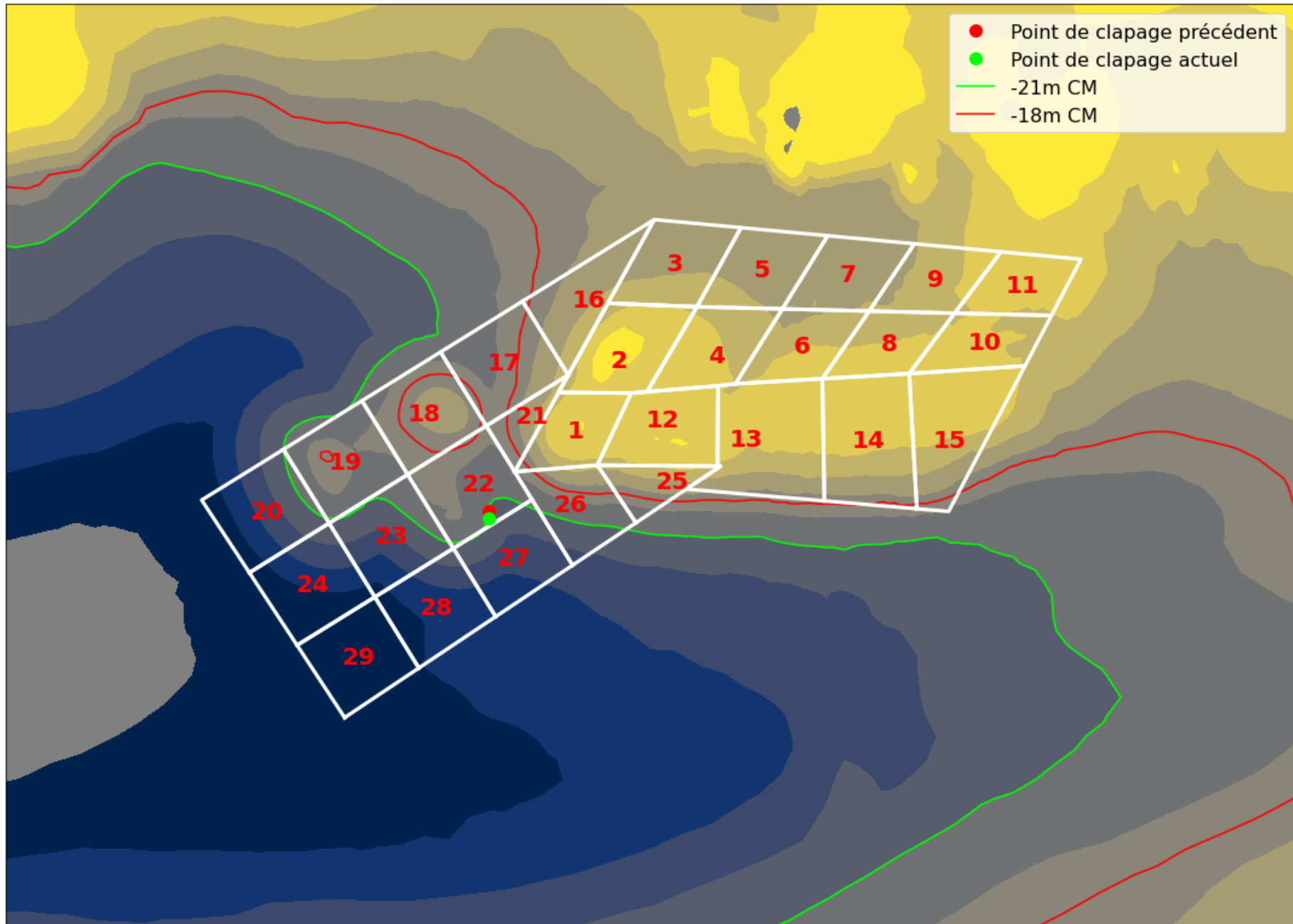




Date de changement de point : 14-10-2026

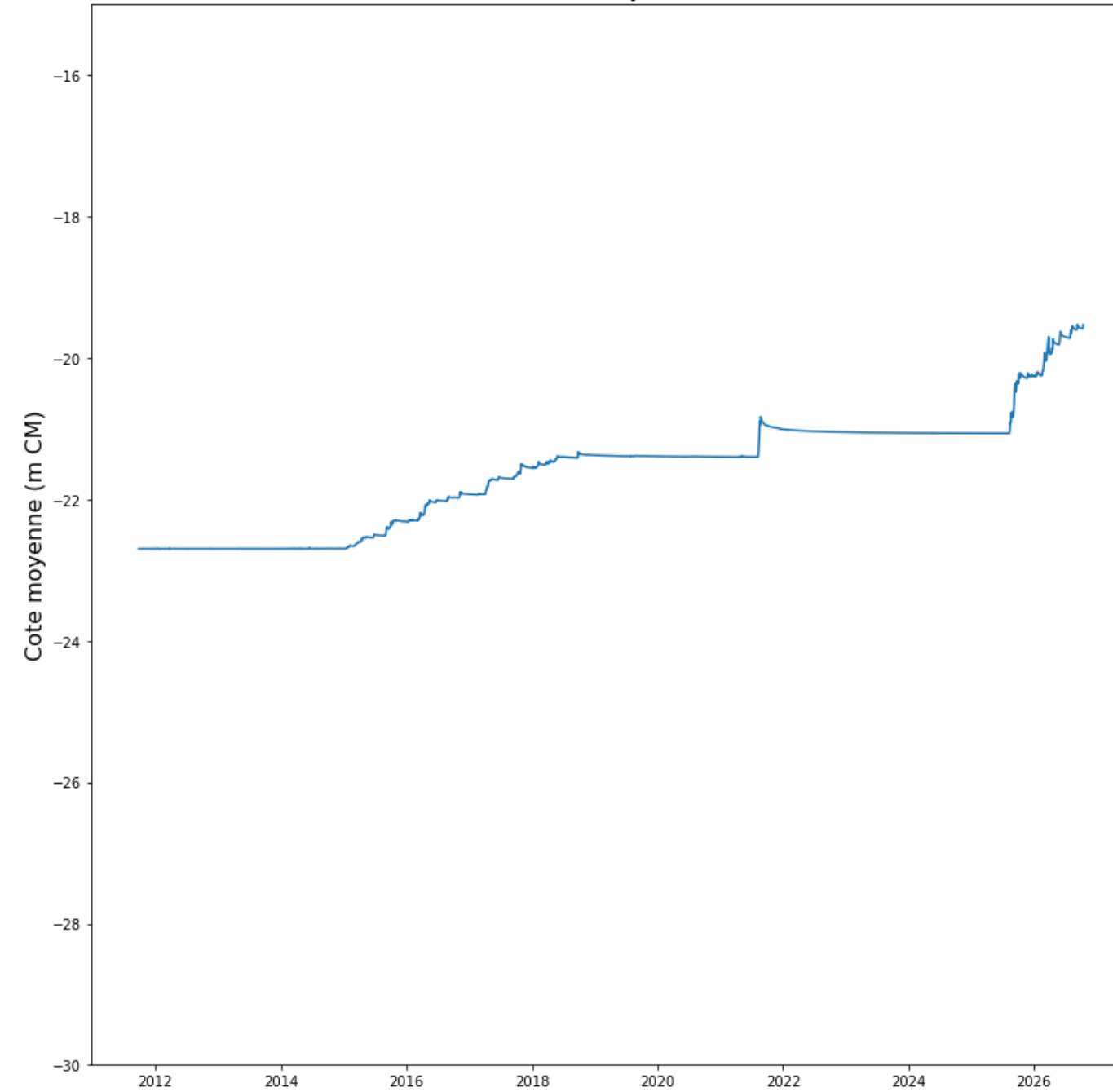
Evolution de la cote moyenne de la zone 22

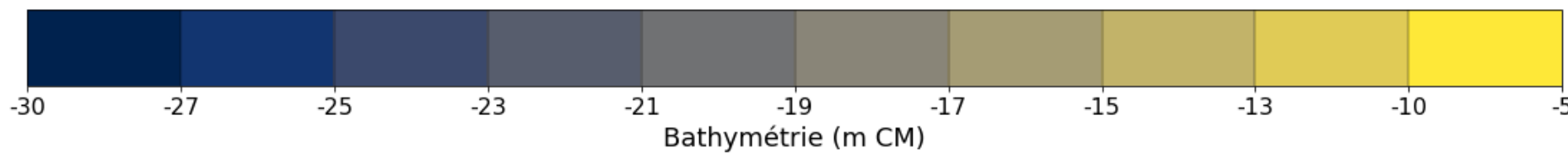
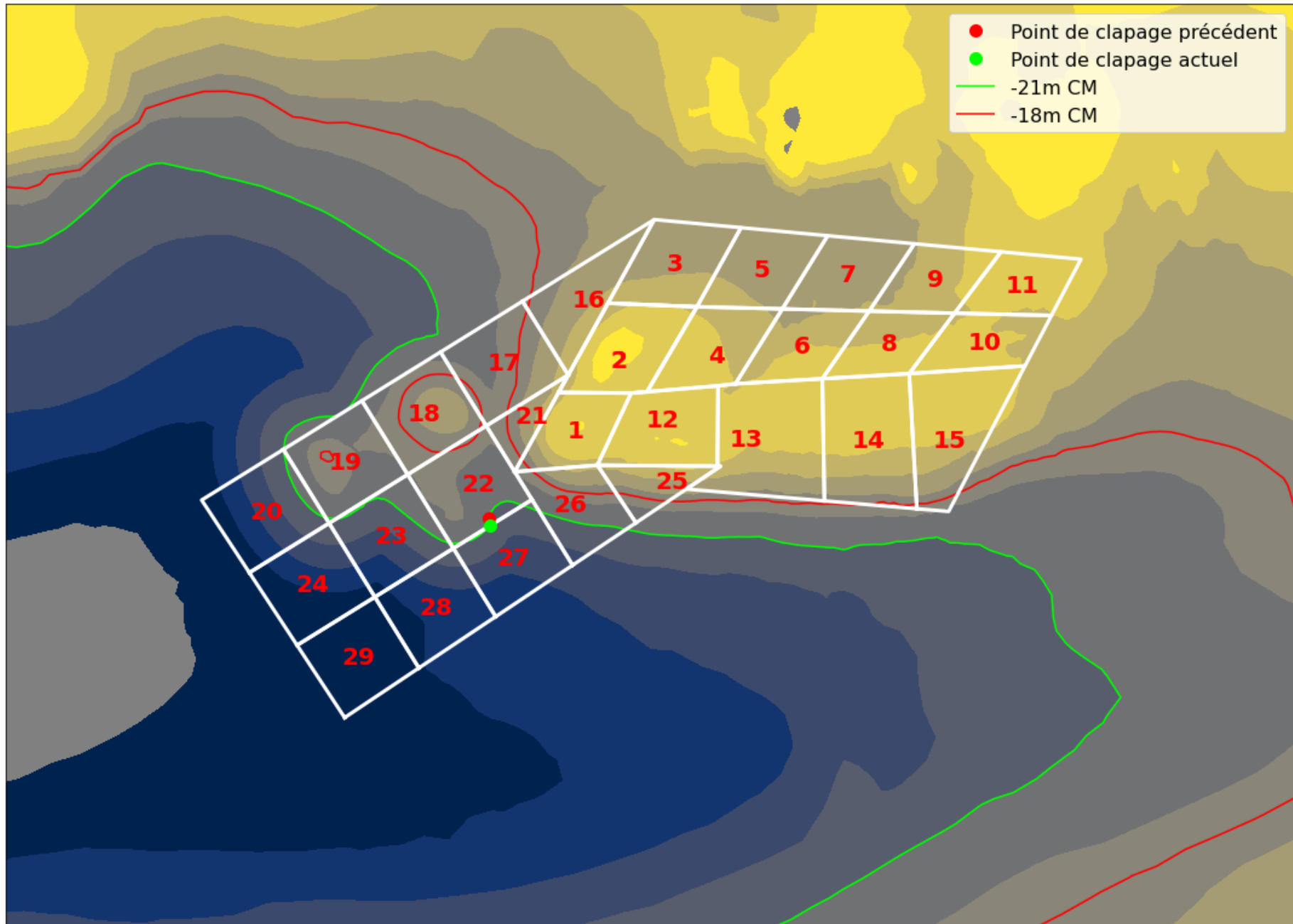




Date de changement de point : 14-10-2026

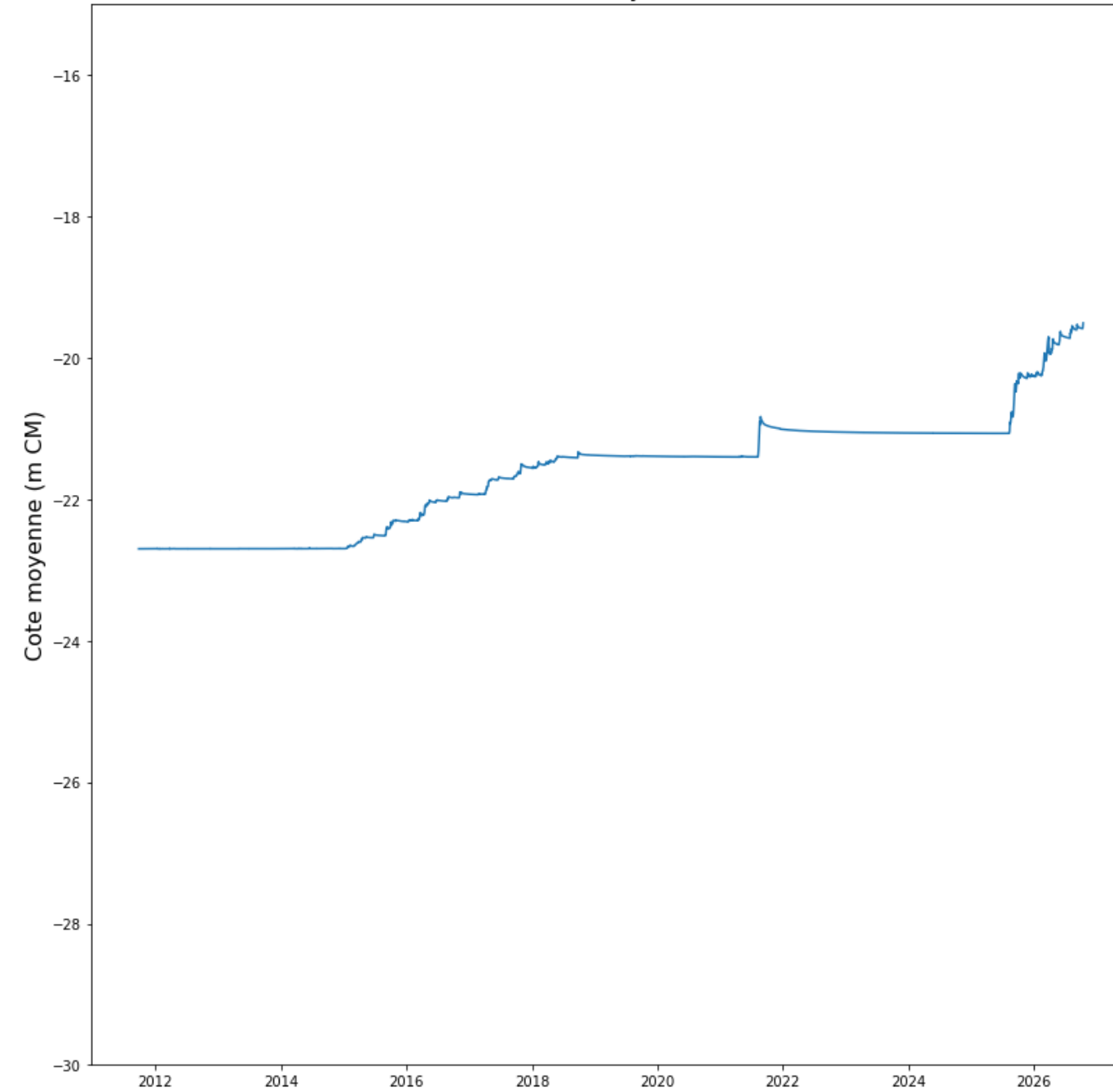
Evolution de la cote moyenne de la zone 22

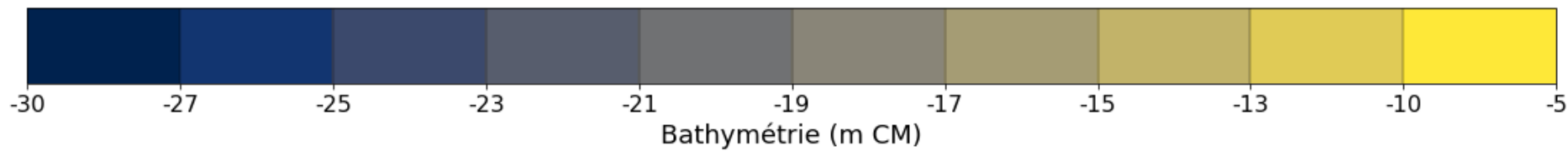
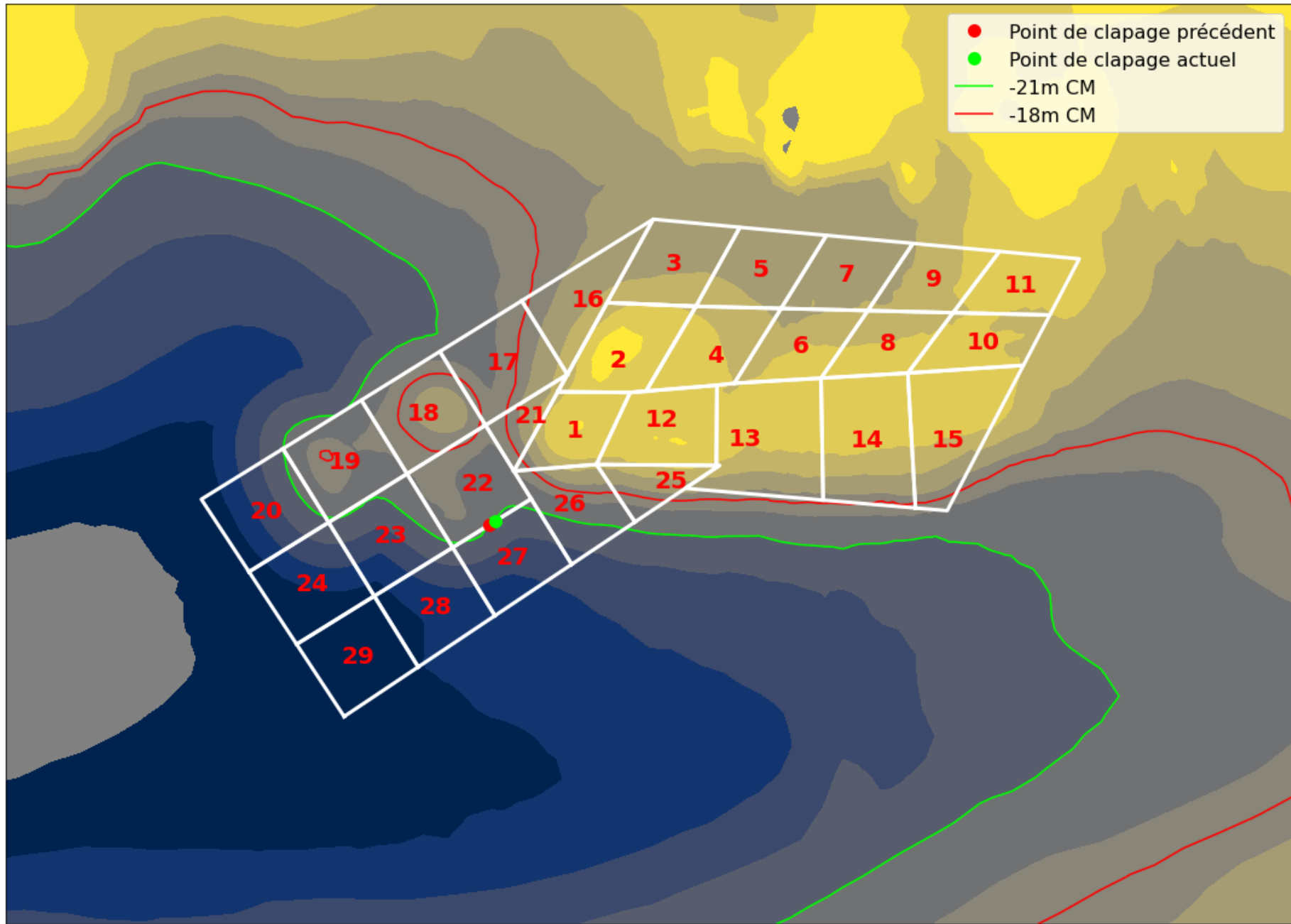




Date de changement de point : 15-10-2026

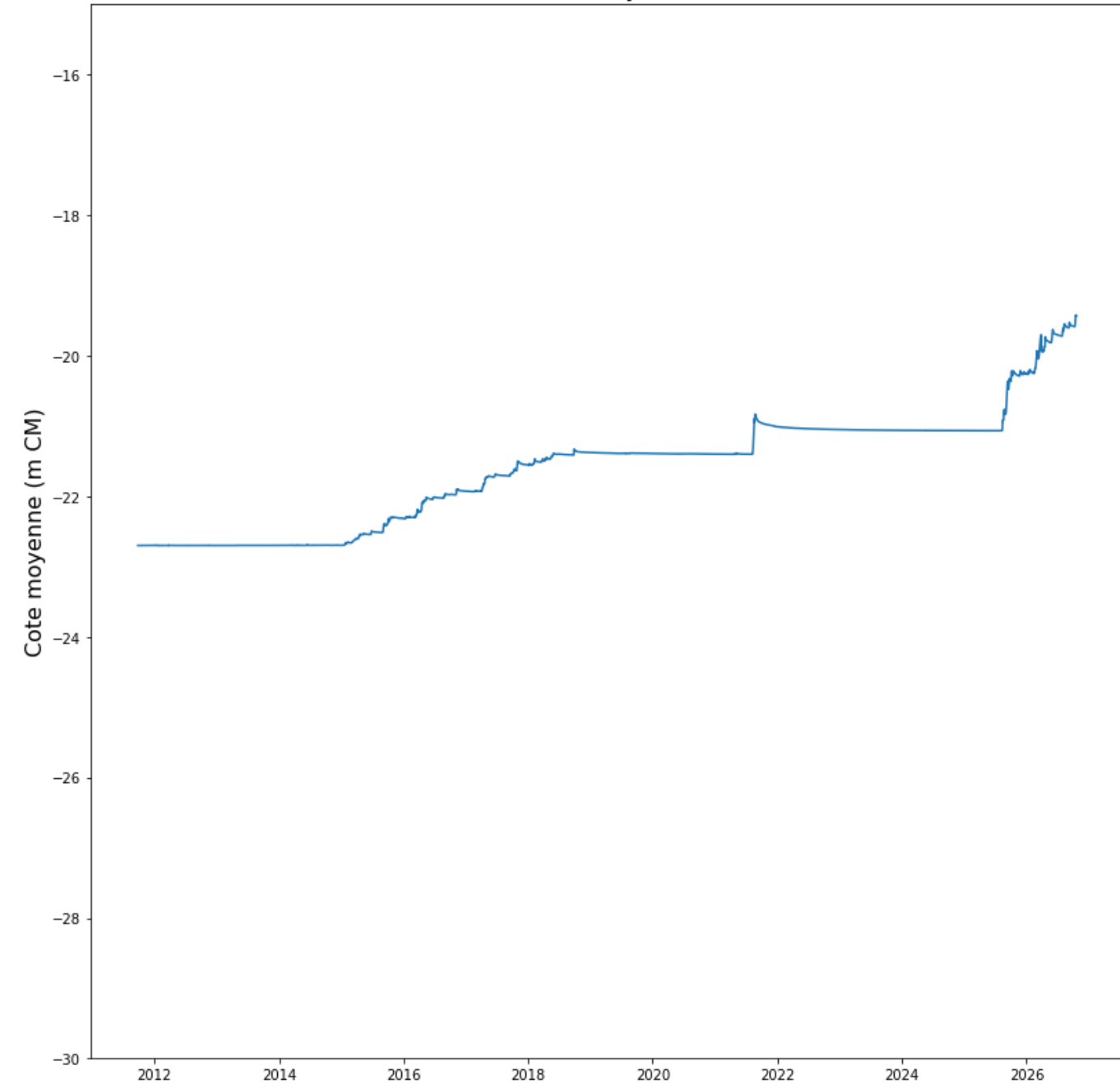
Evolution de la cote moyenne de la zone 22



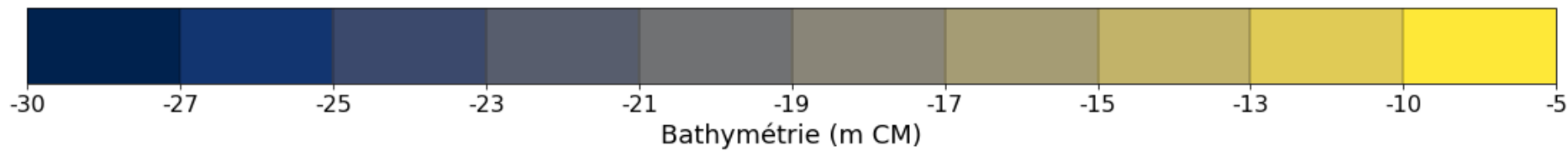
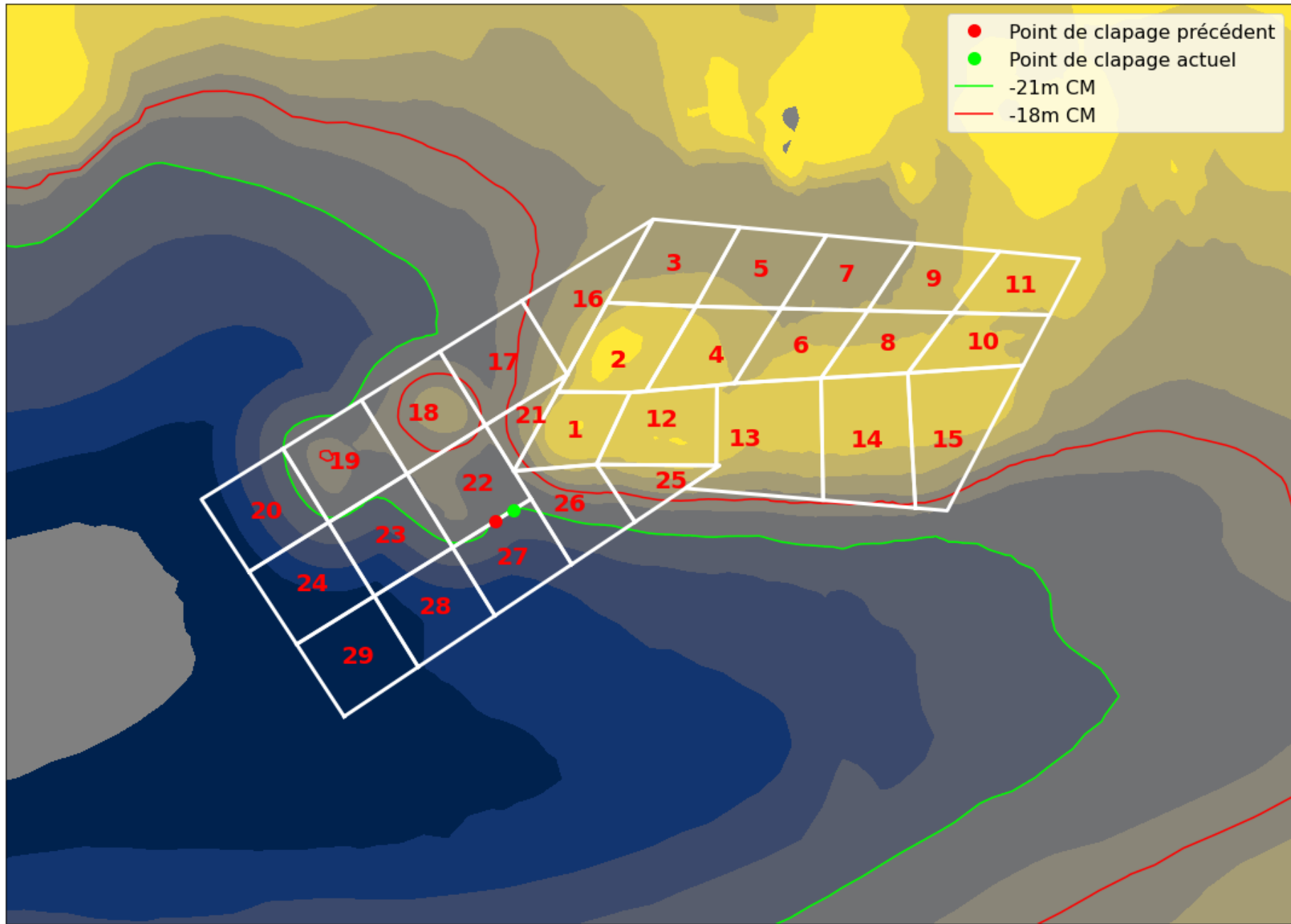


Date de changement de point : 22-10-2026

Evolution de la cote moyenne de la zone 22

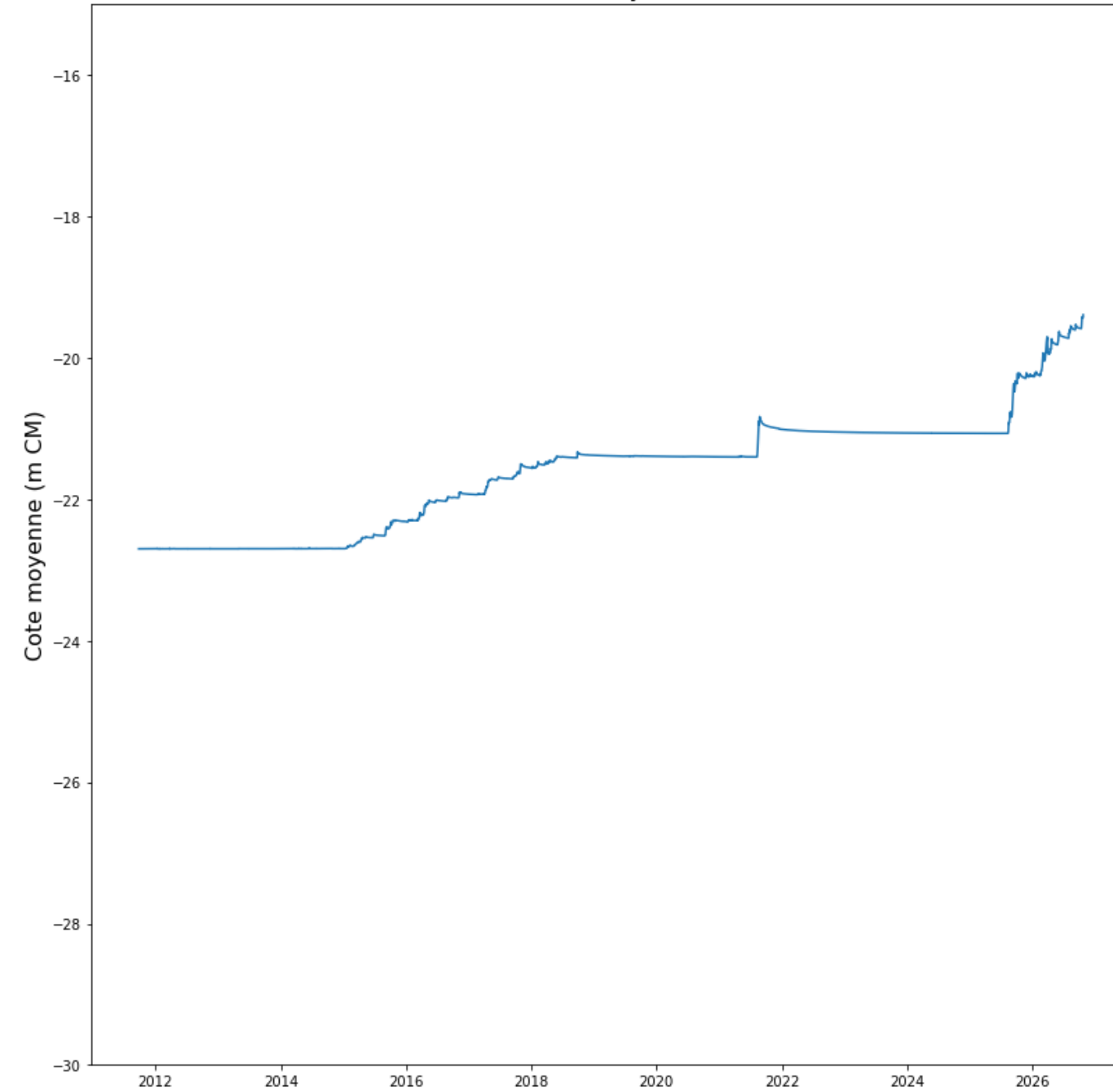


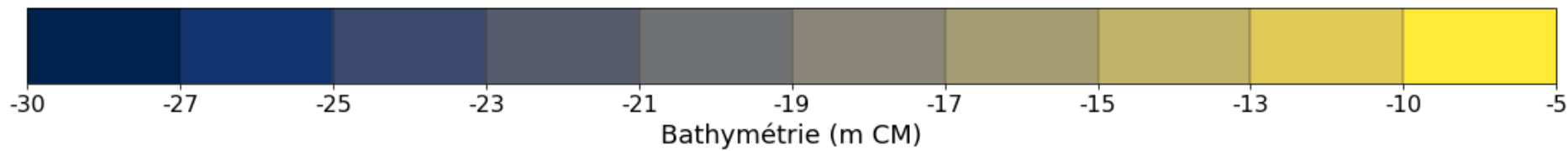
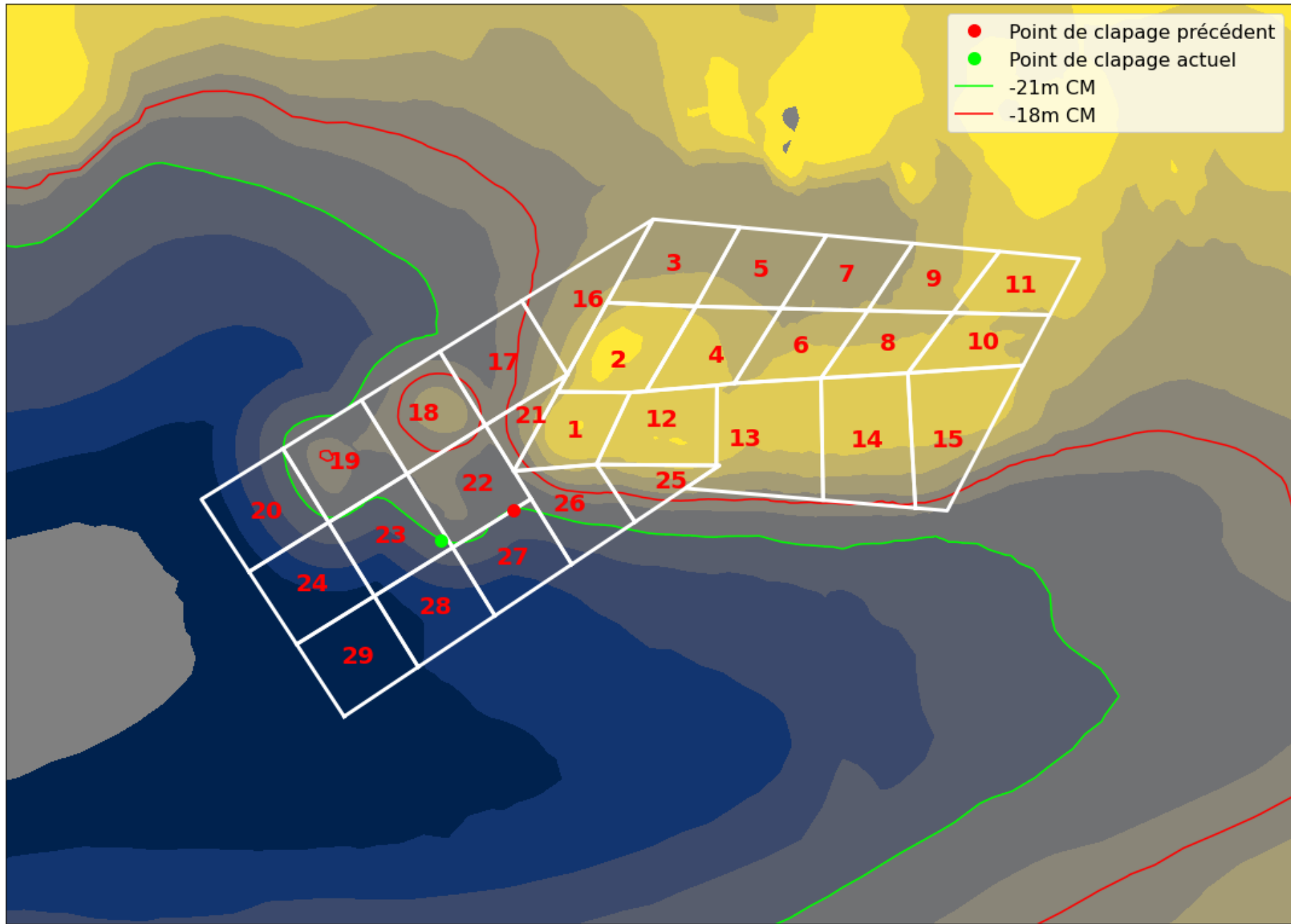




Date de changement de point : 23-10-2026

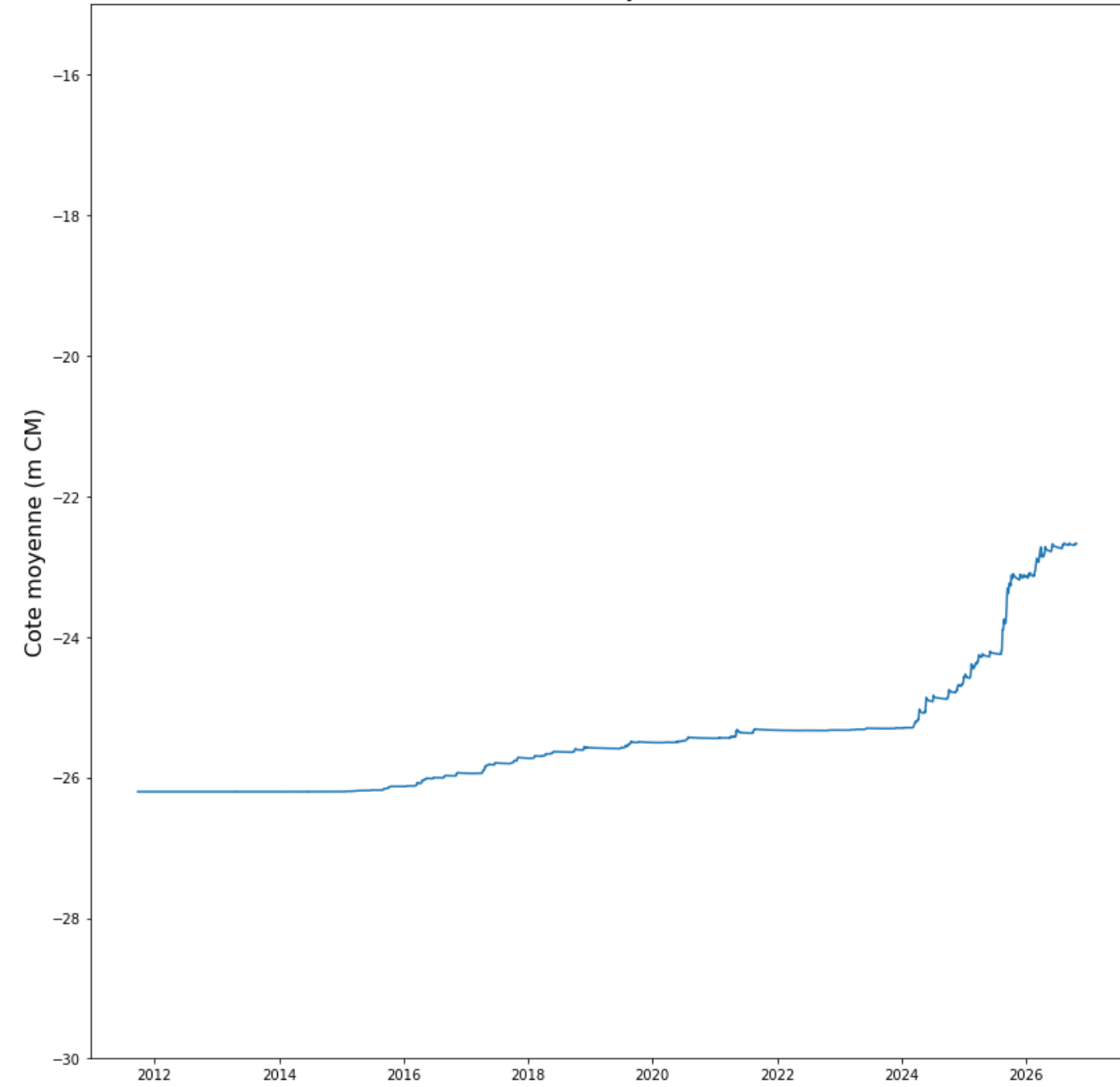
Evolution de la cote moyenne de la zone 22



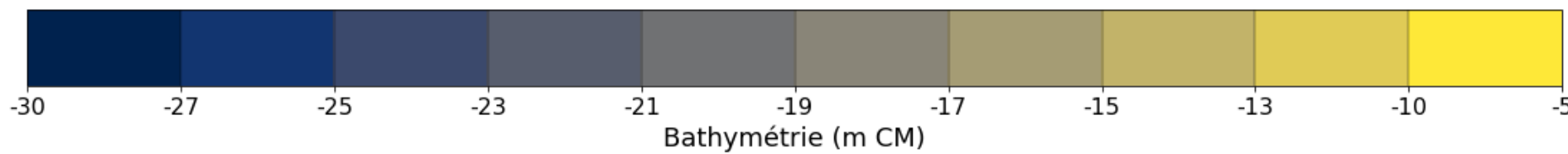
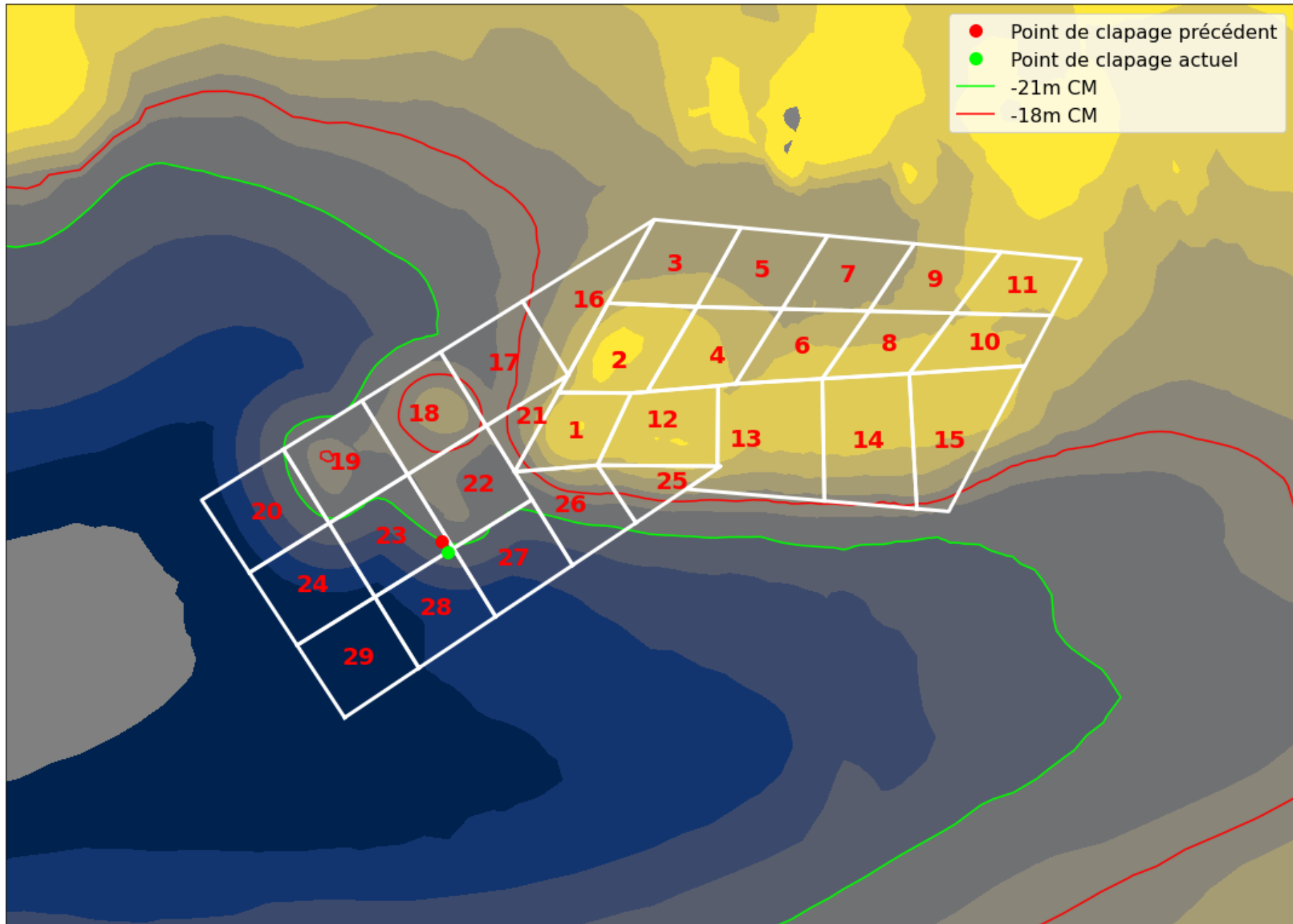


Date de changement de point : 23-10-2026

Evolution de la cote moyenne de la zone 23

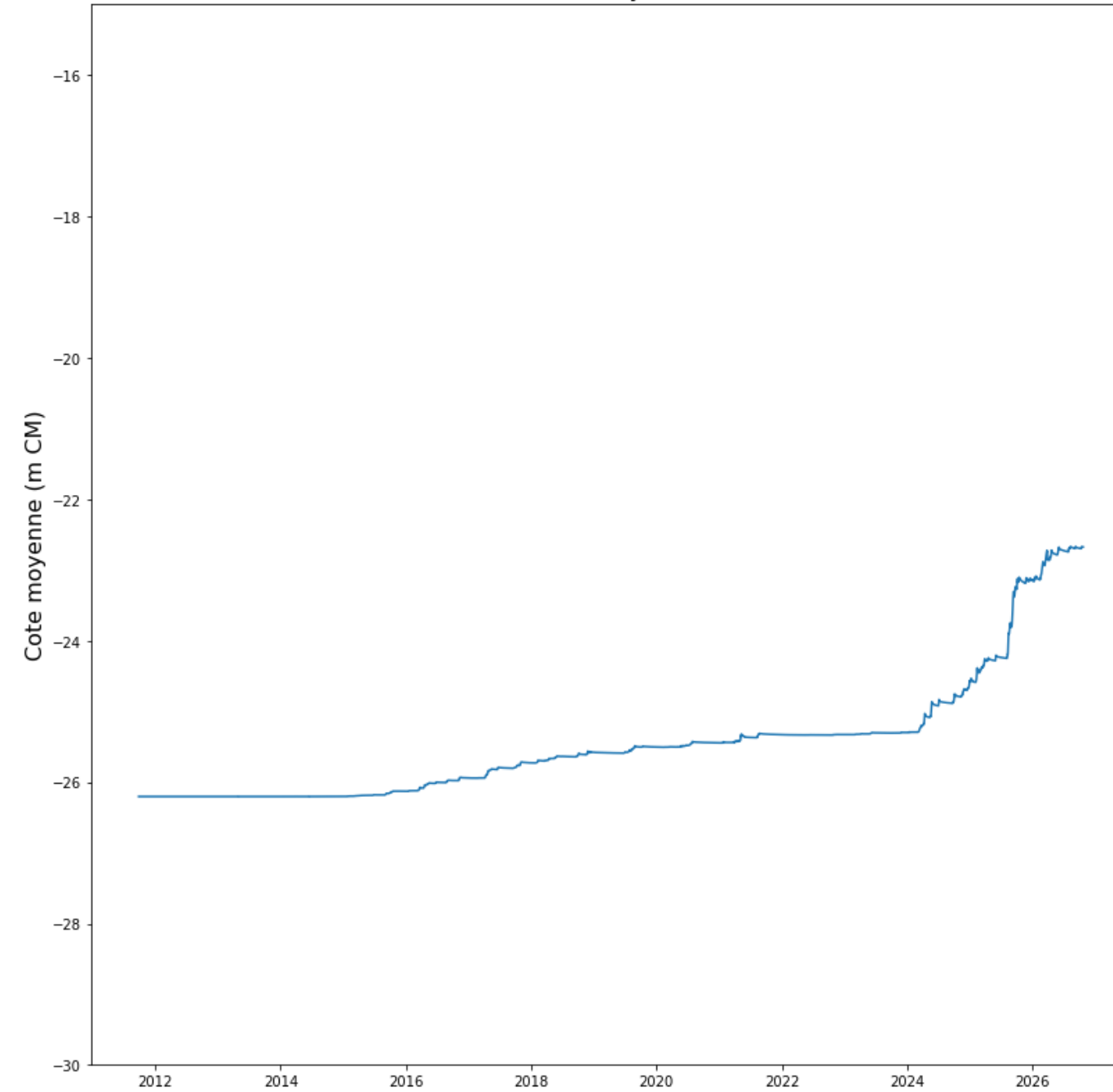


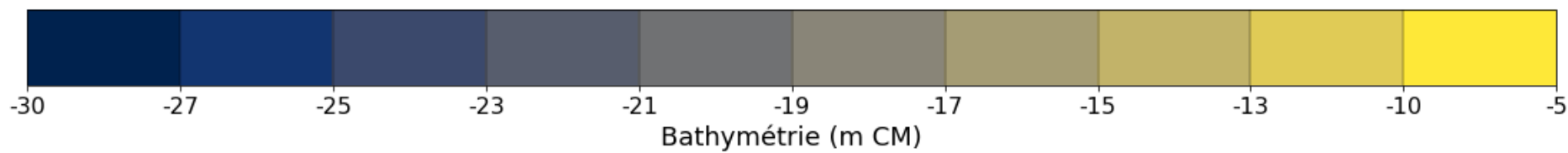
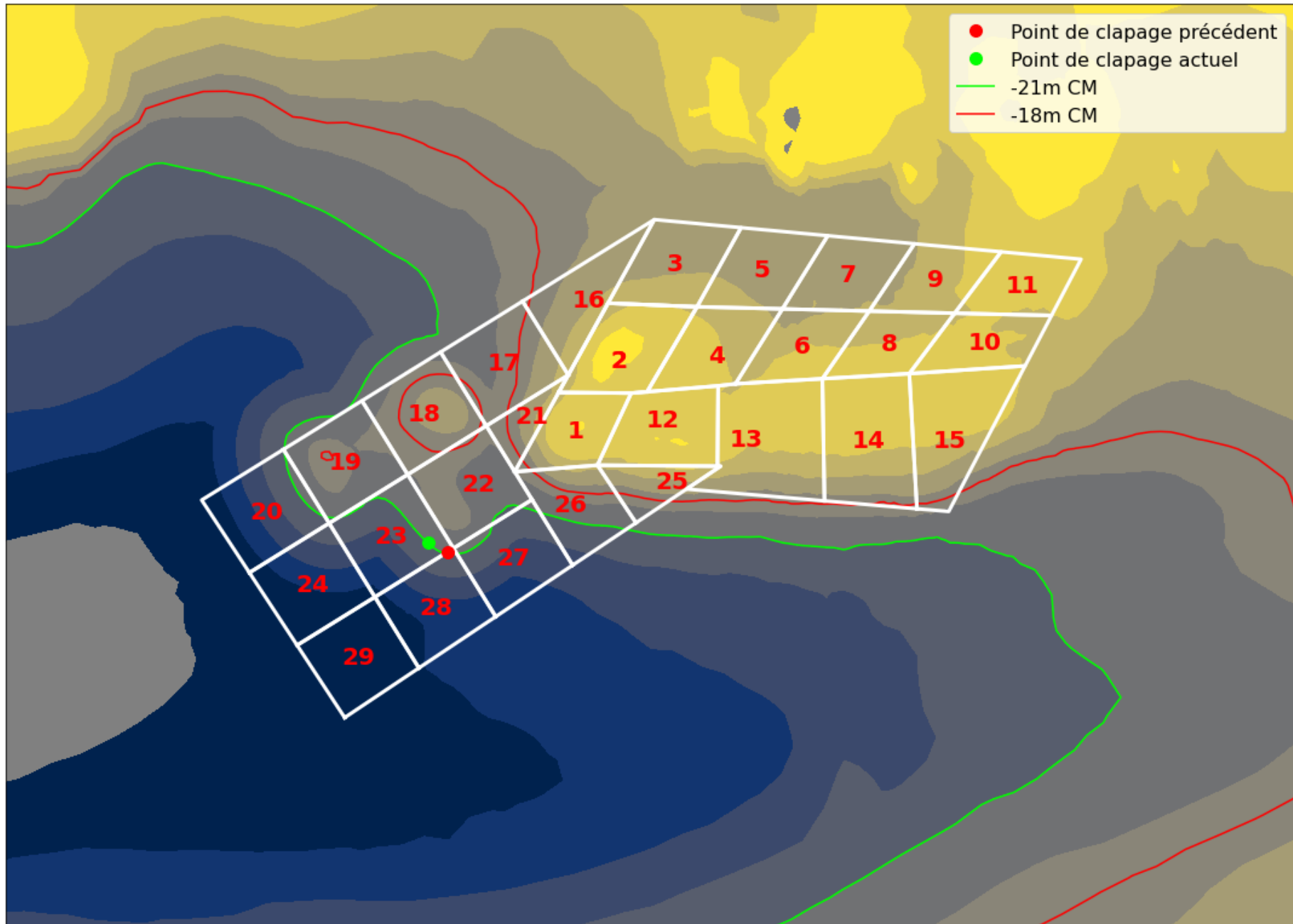




Date de changement de point : 24-10-2026

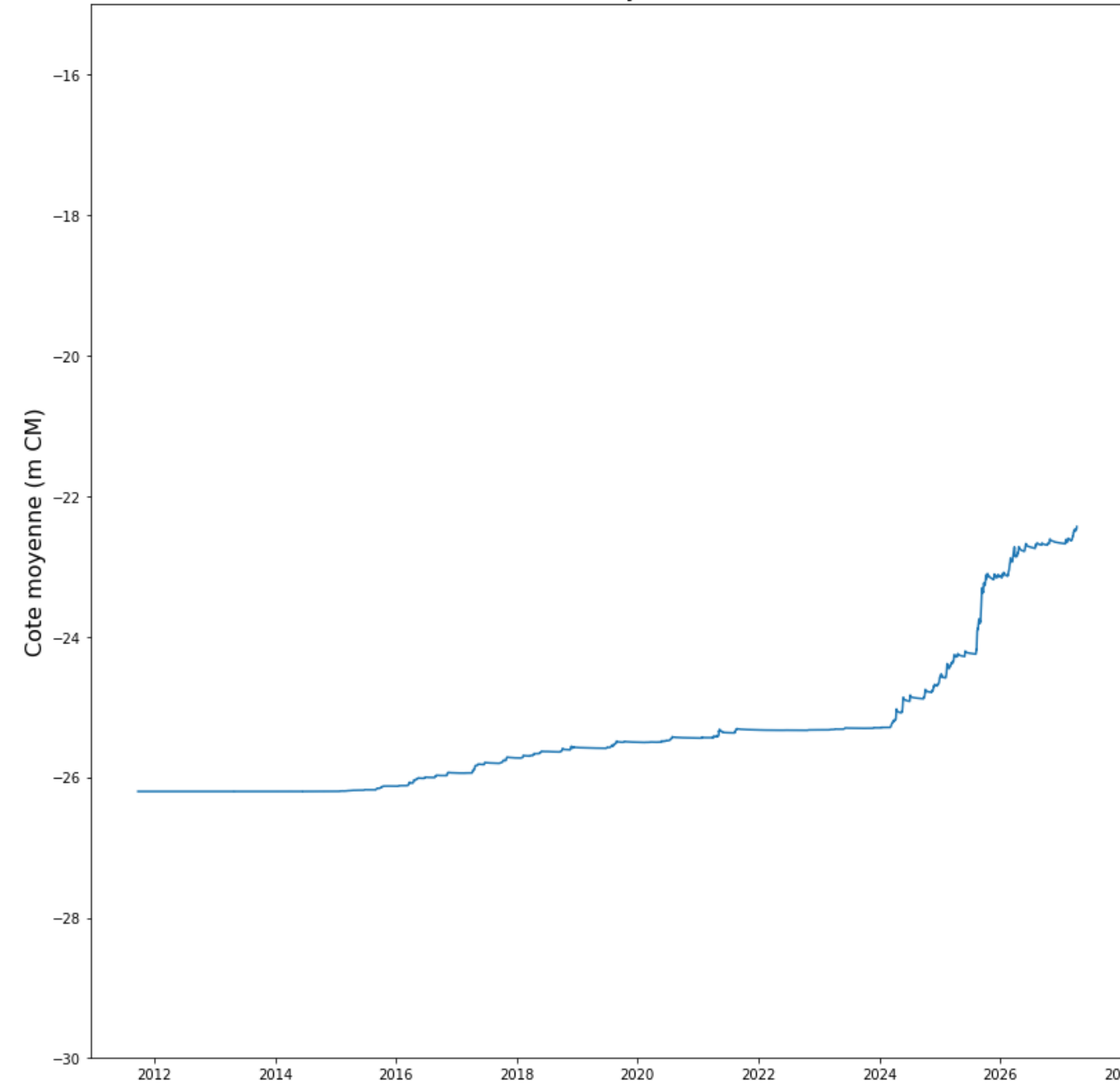
Evolution de la cote moyenne de la zone 23

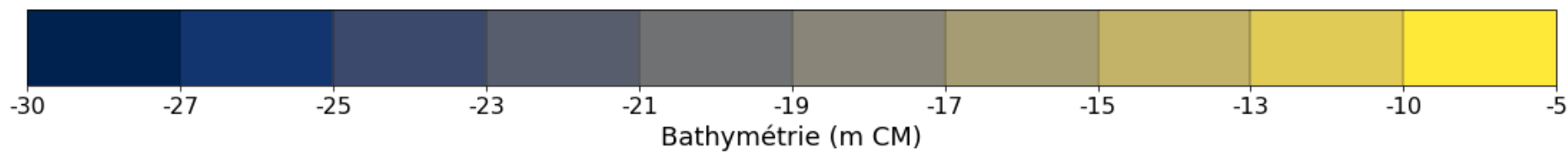
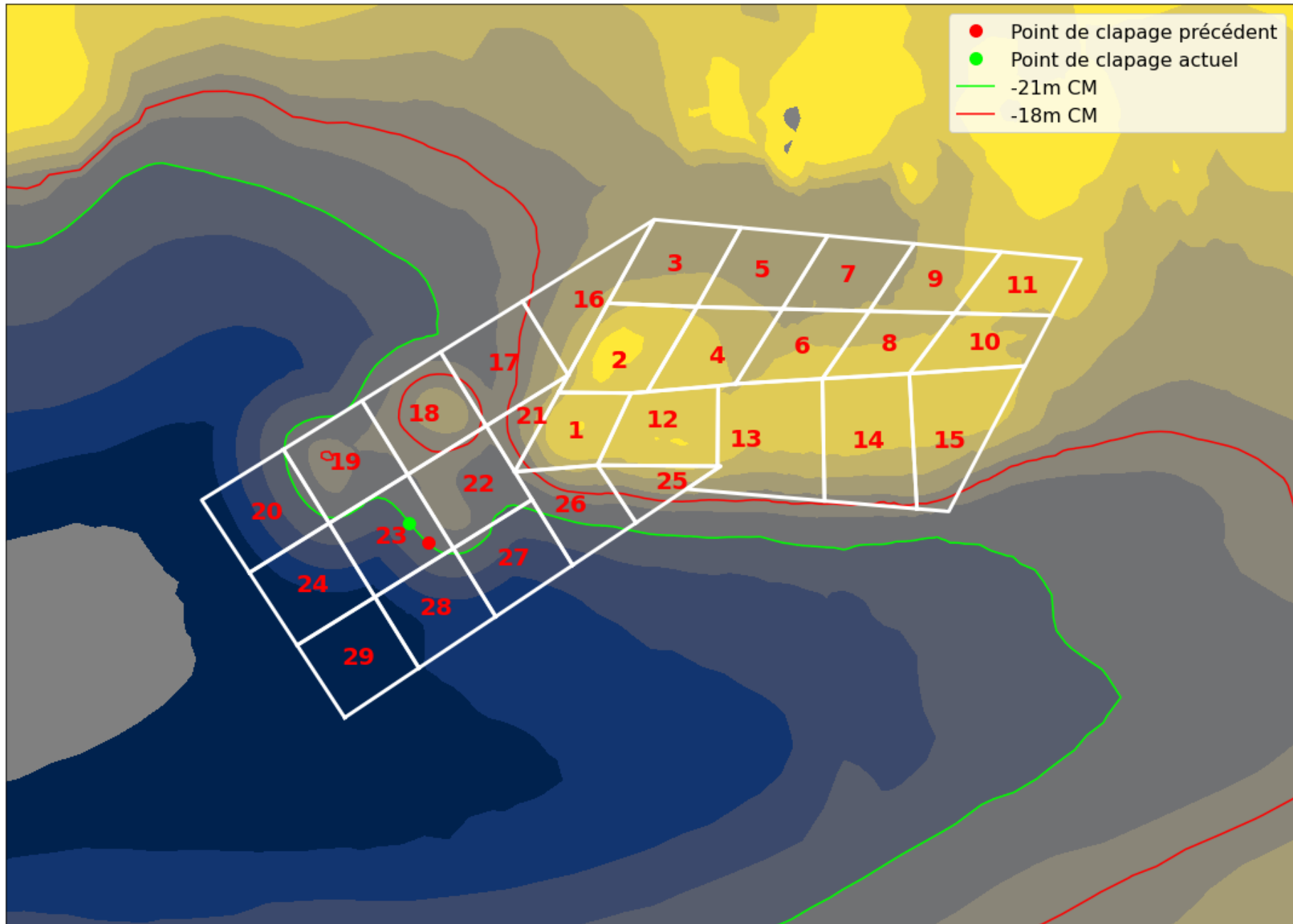




Date de changement de point : 07-04-2027

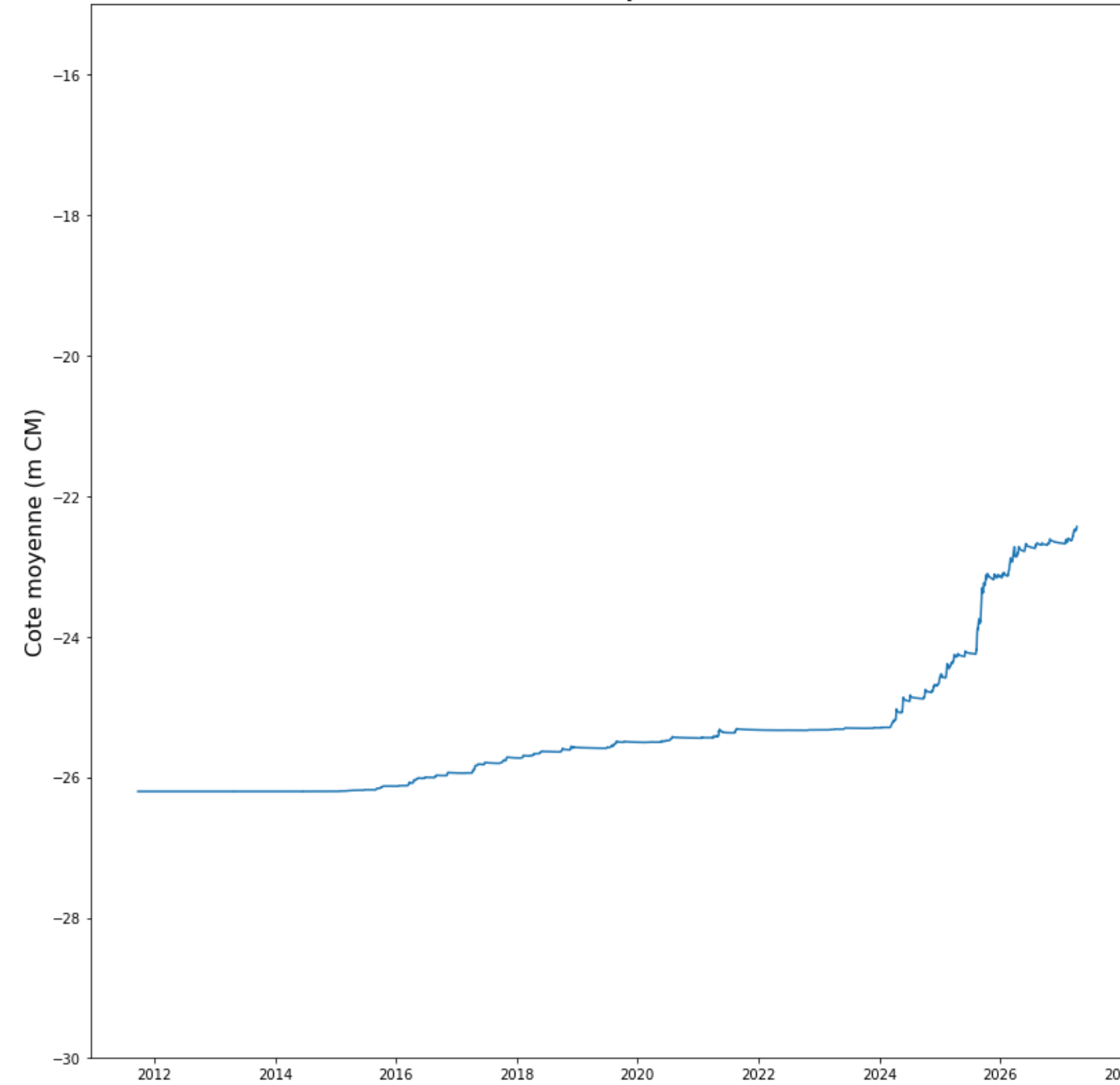
Evolution de la cote moyenne de la zone 23

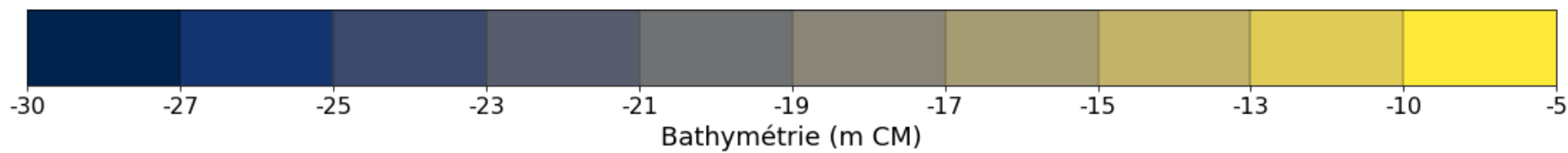
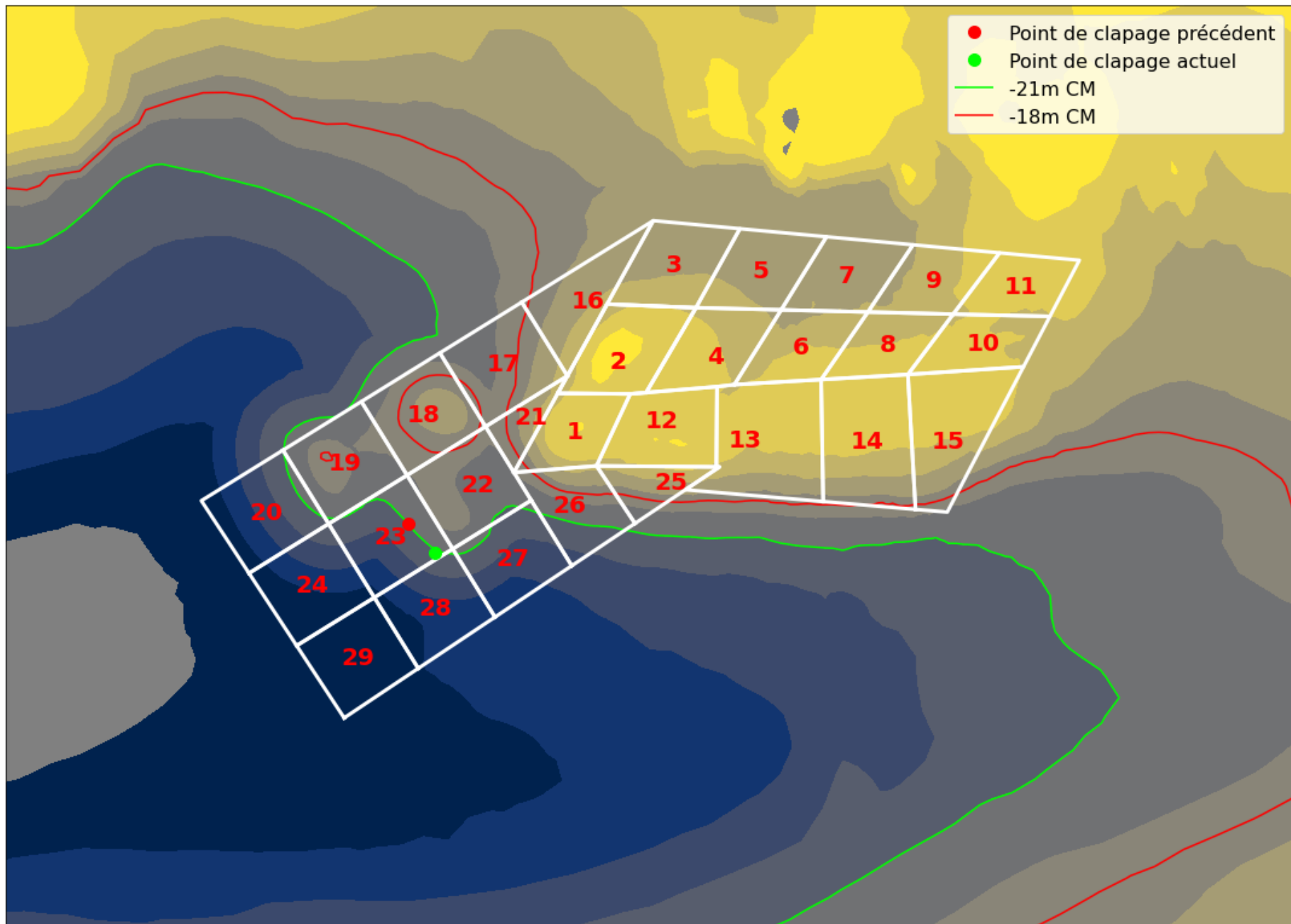




Date de changement de point : 08-04-2027

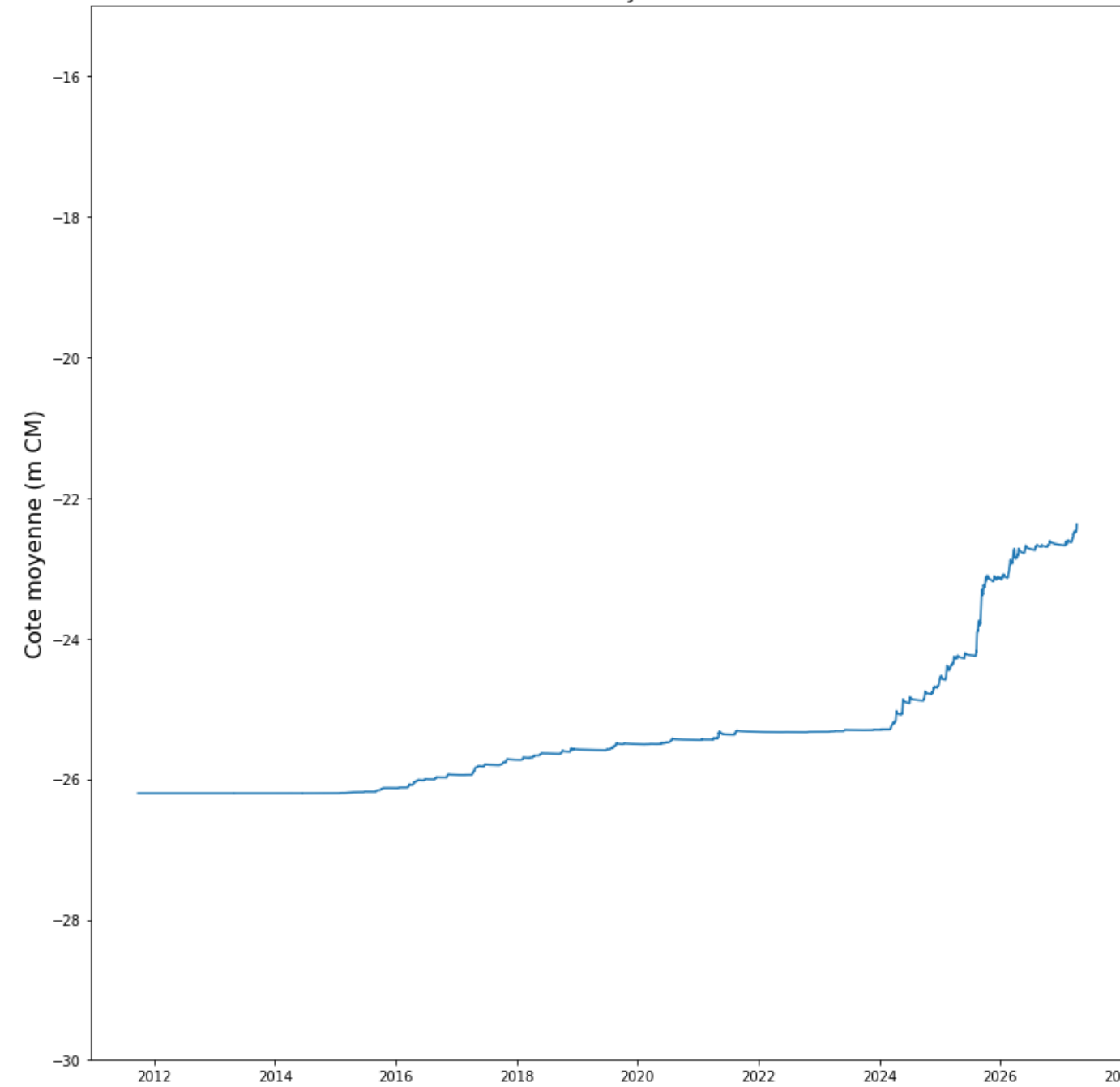
Evolution de la cote moyenne de la zone 23

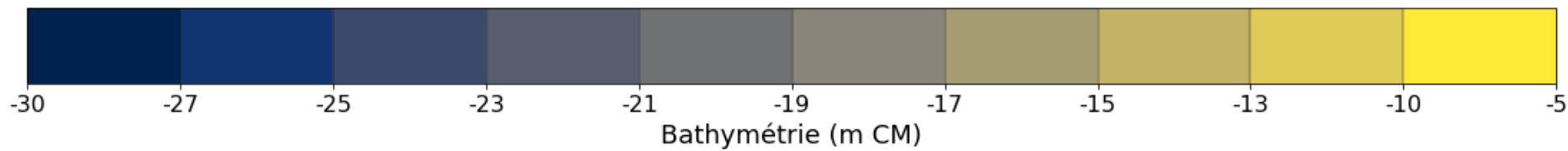
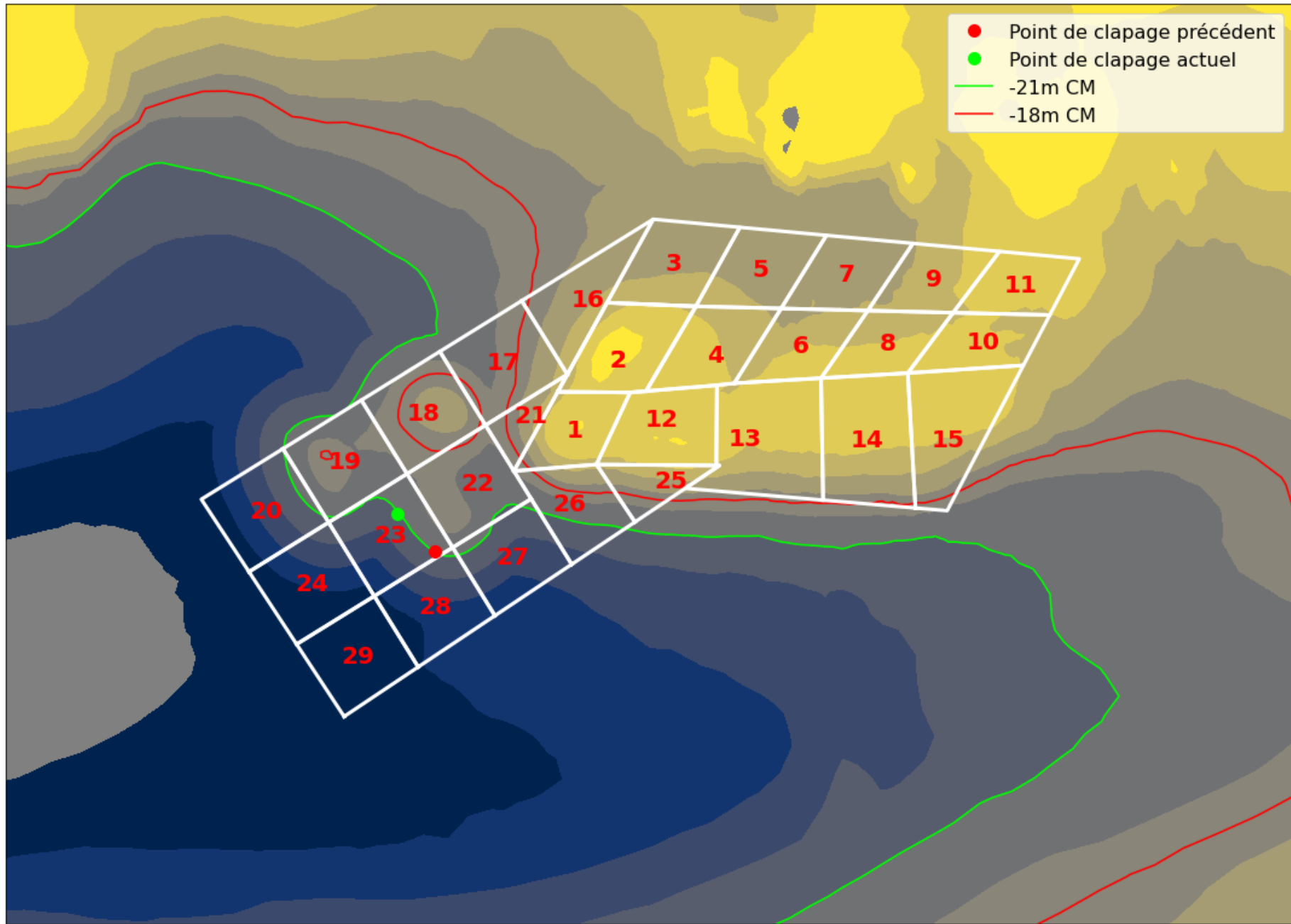




Date de changement de point : 08-04-2027

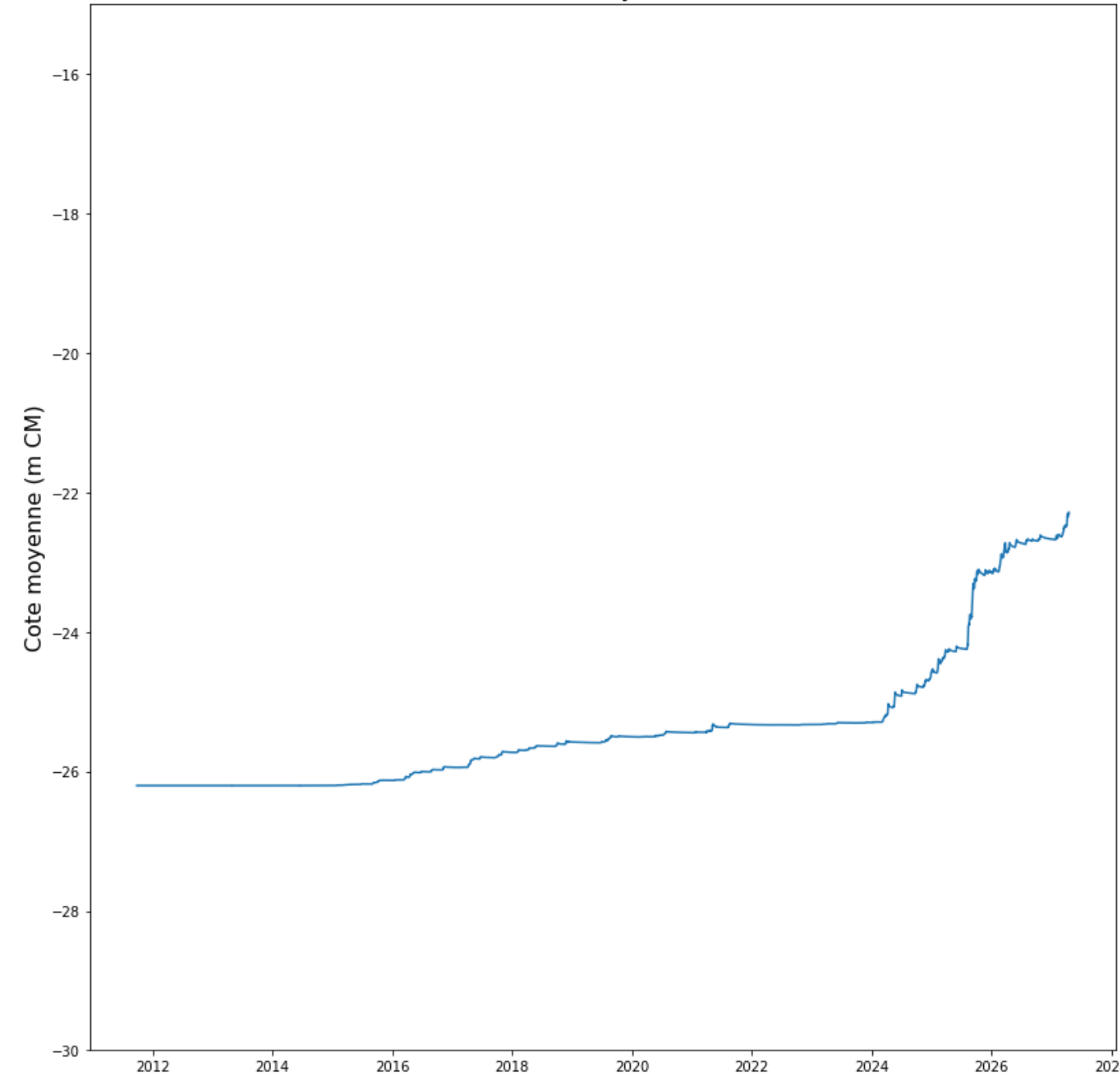
Evolution de la cote moyenne de la zone 23

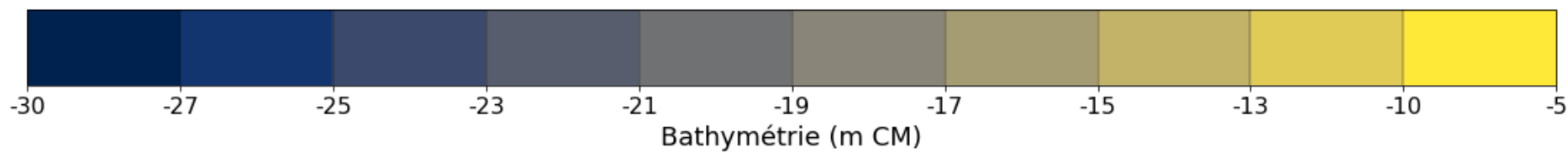
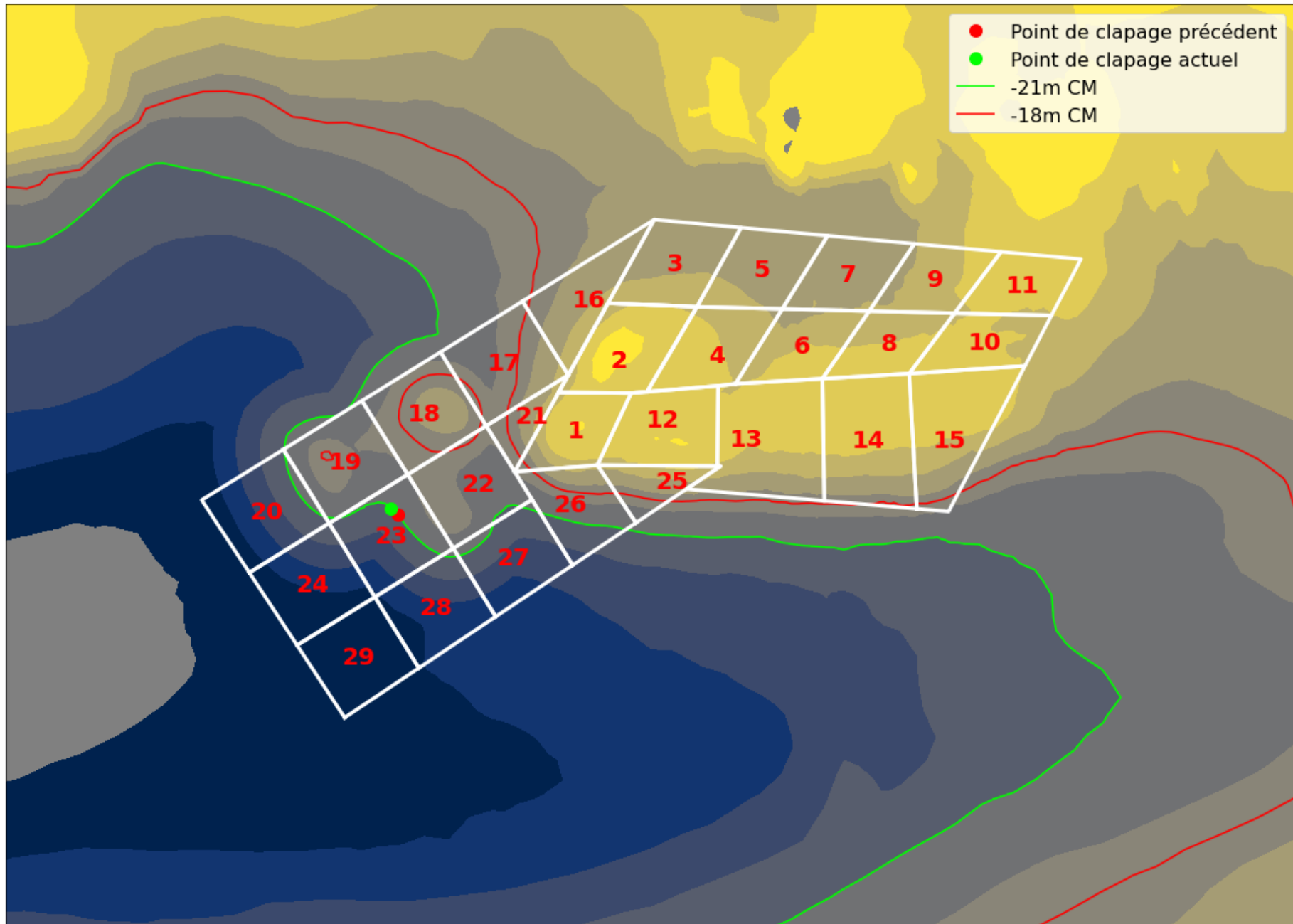




Date de changement de point : 19-04-2027

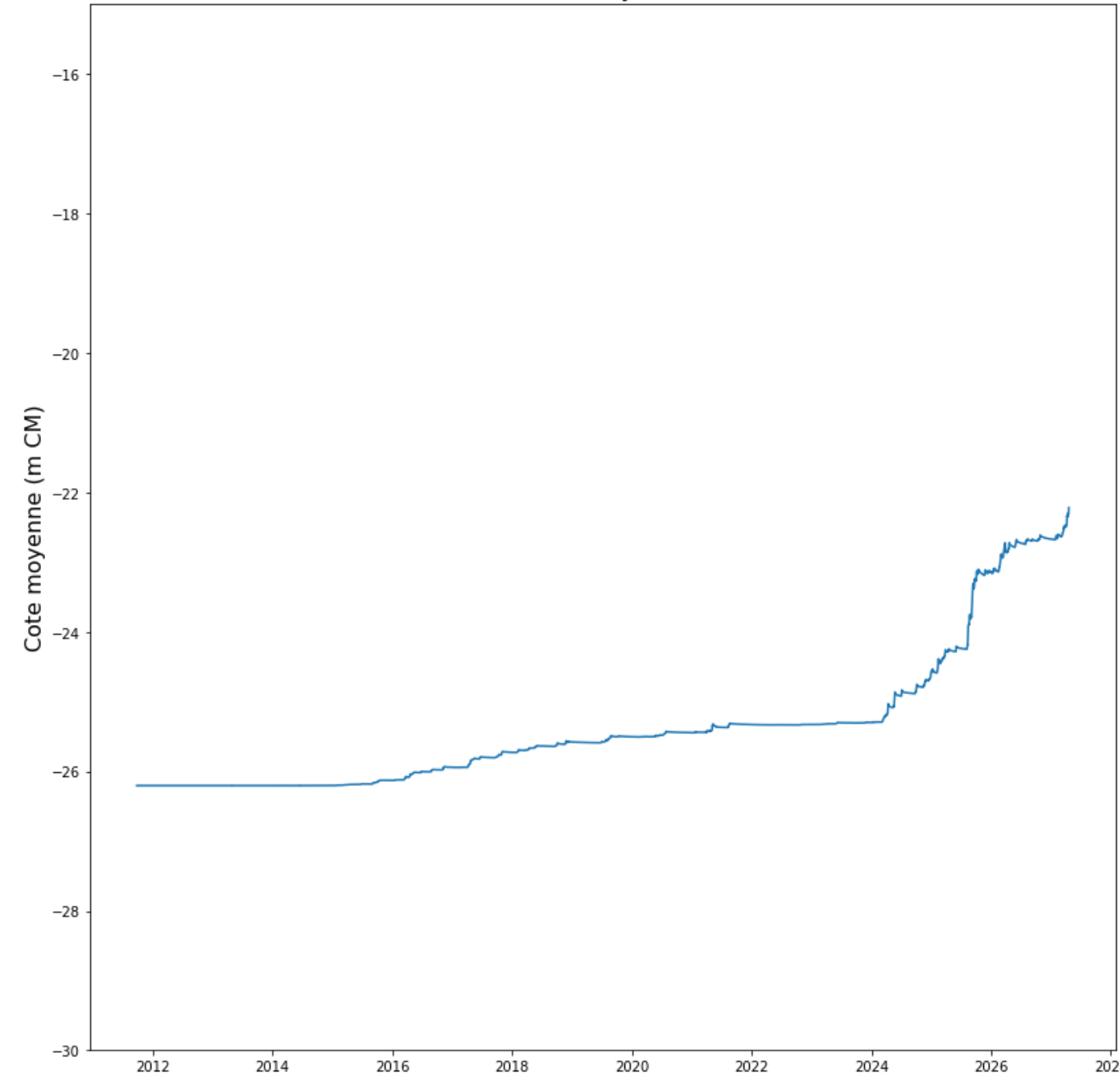
Evolution de la cote moyenne de la zone 23



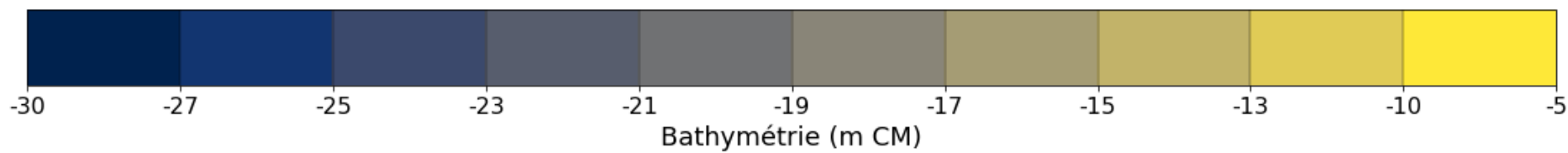
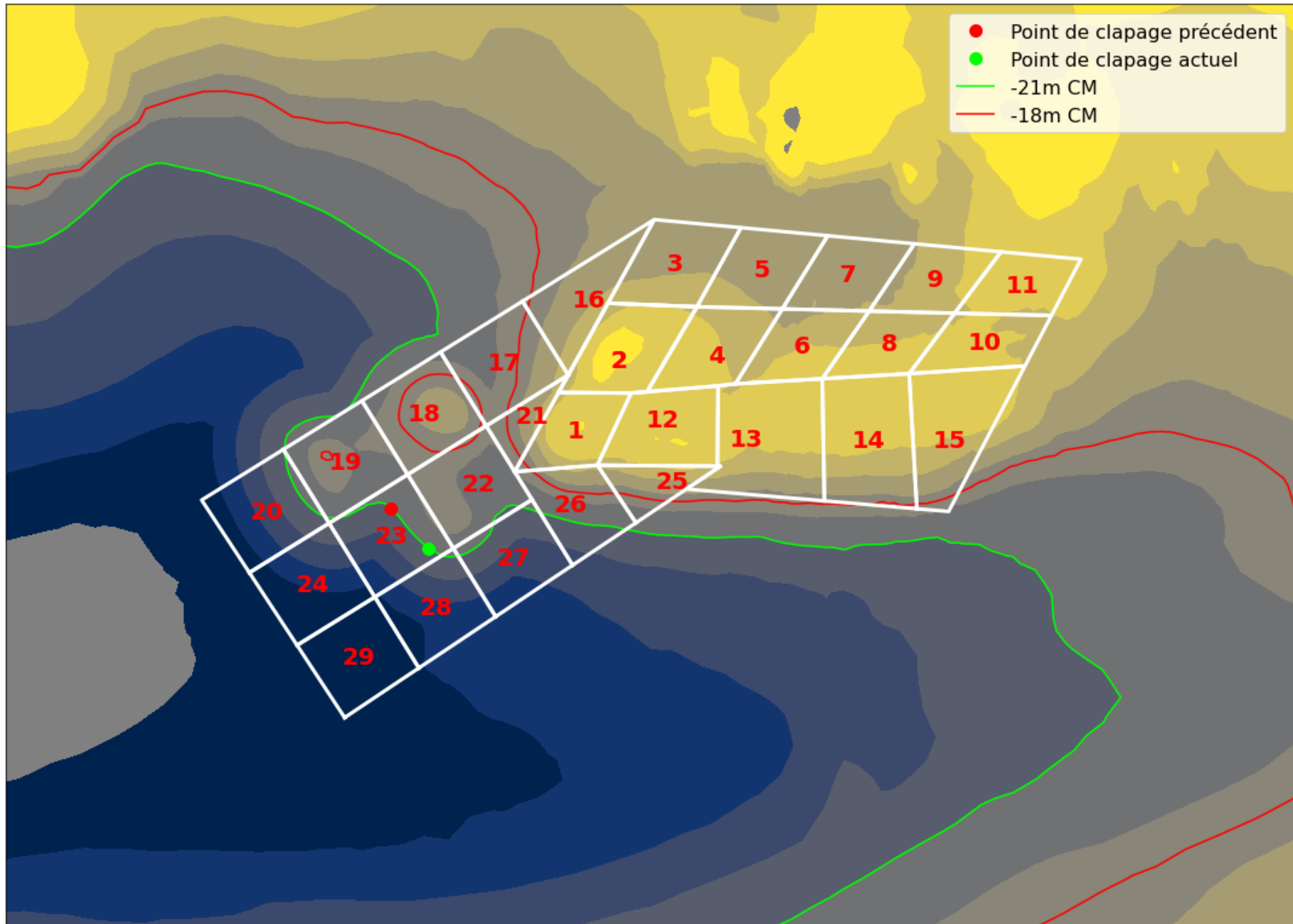


Date de changement de point : 20-04-2027

Evolution de la cote moyenne de la zone 23

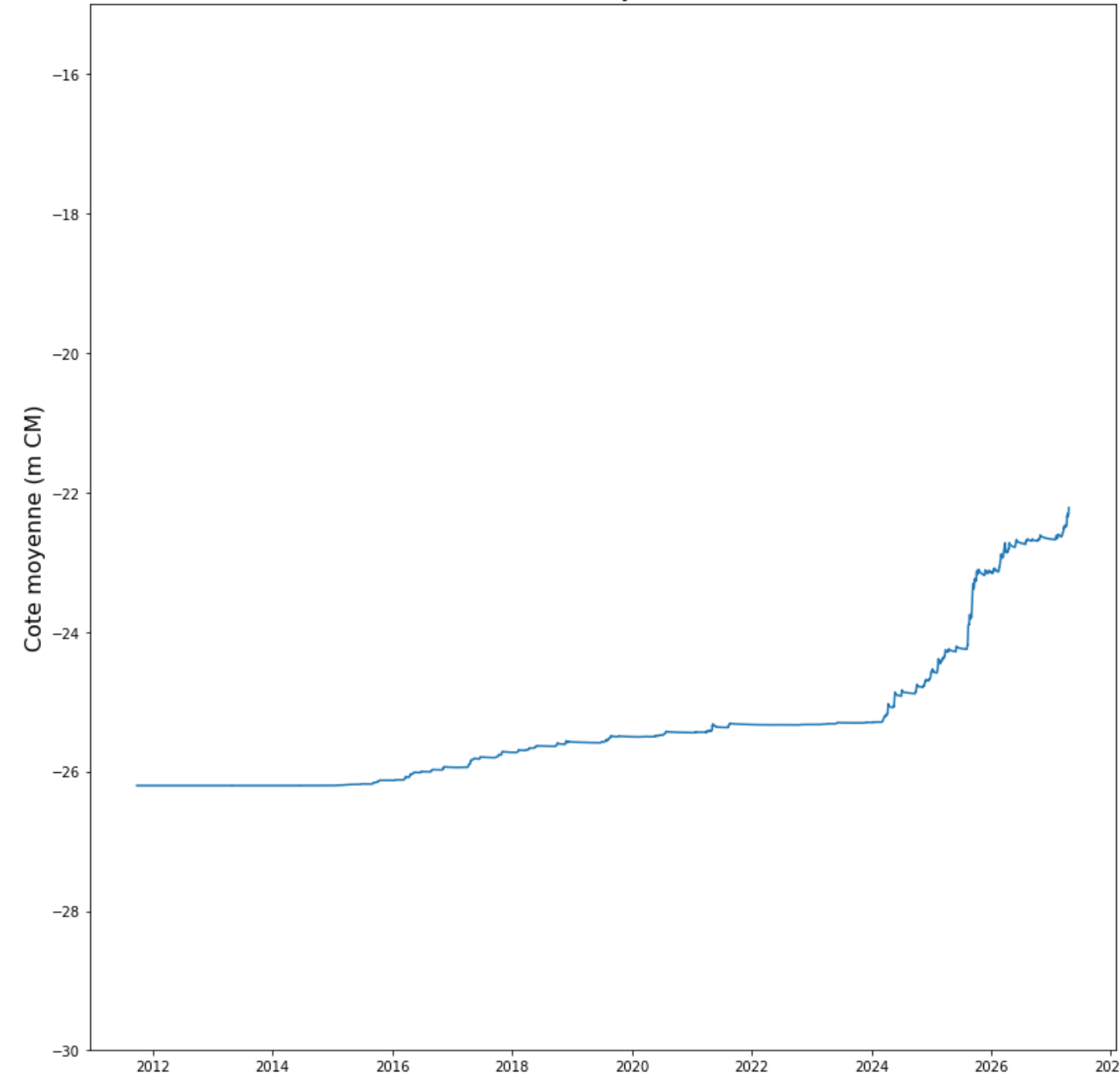




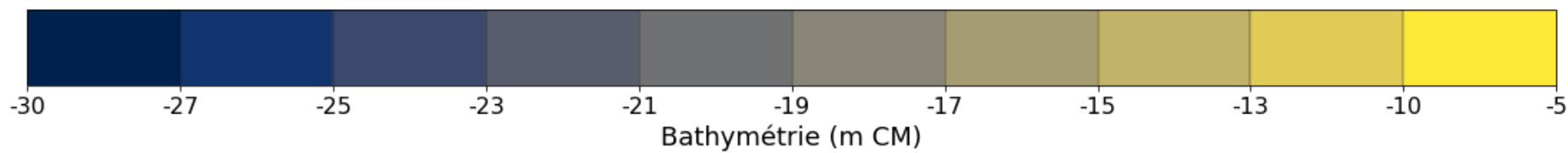
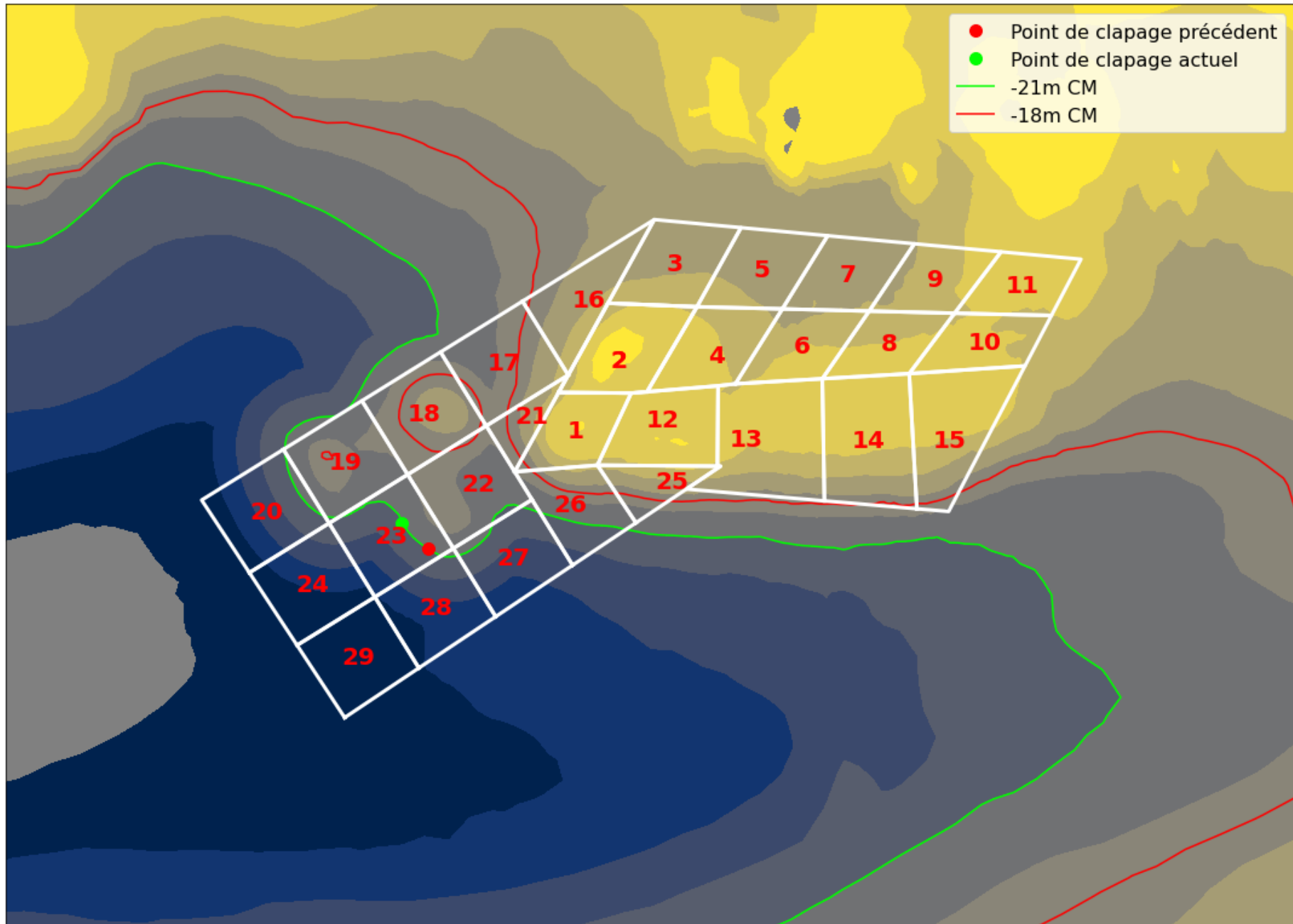


Date de changement de point : 20-04-2027

Evolution de la cote moyenne de la zone 23

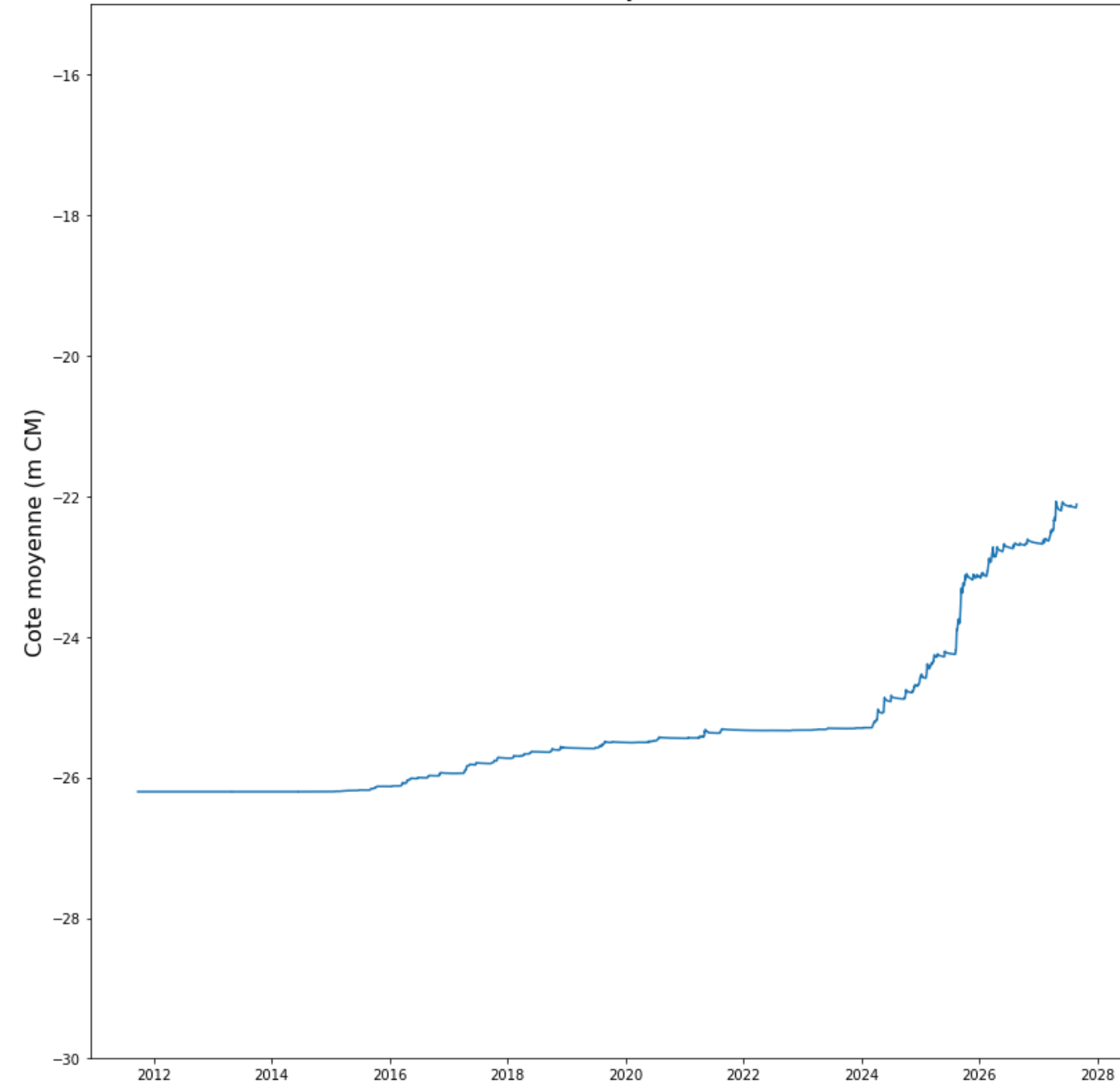


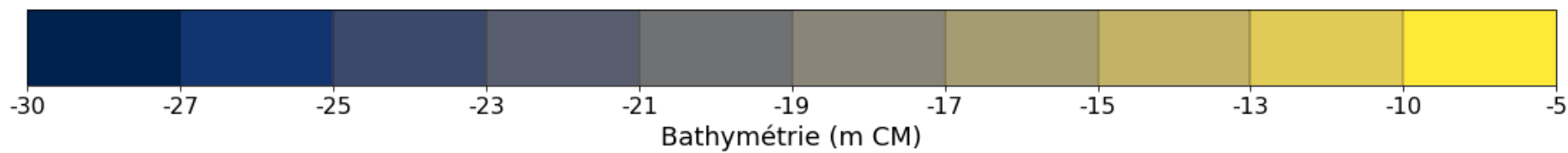
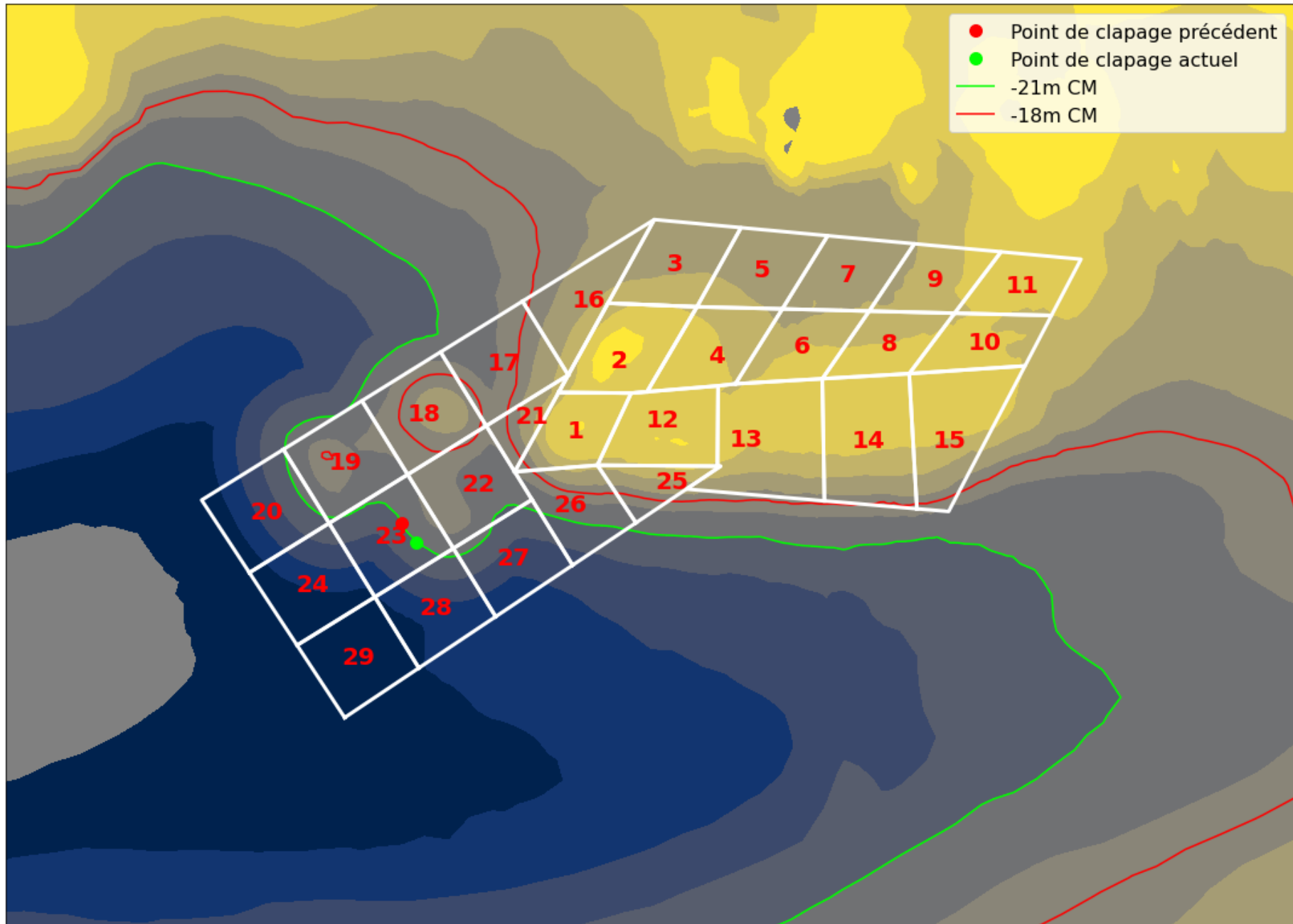




Date de changement de point : 26-08-2027

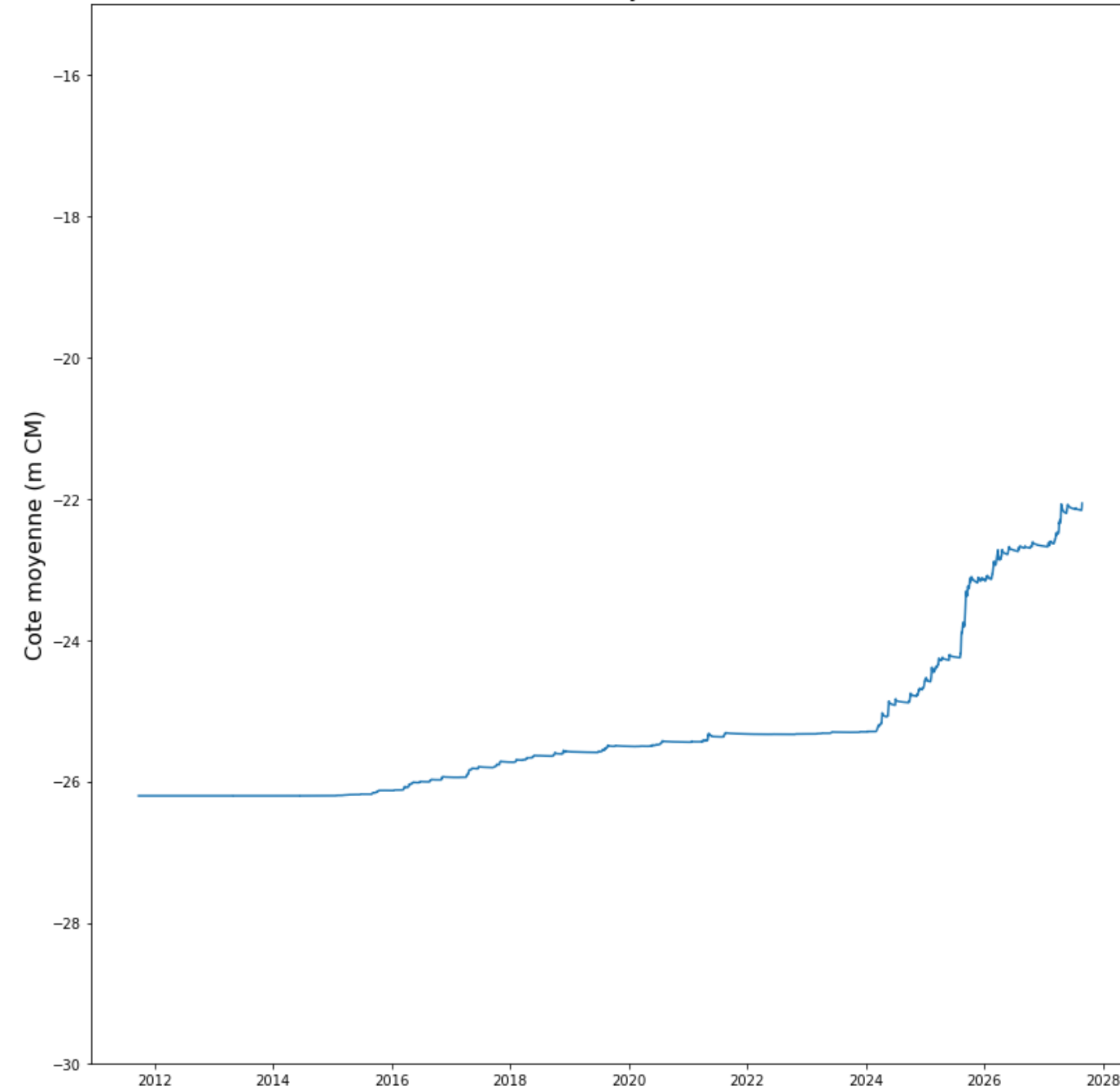
Evolution de la cote moyenne de la zone 23

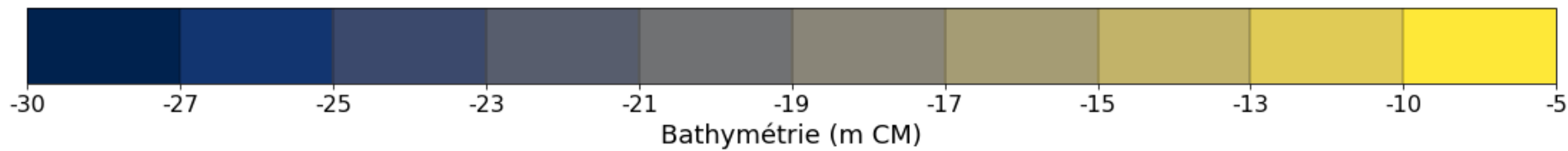
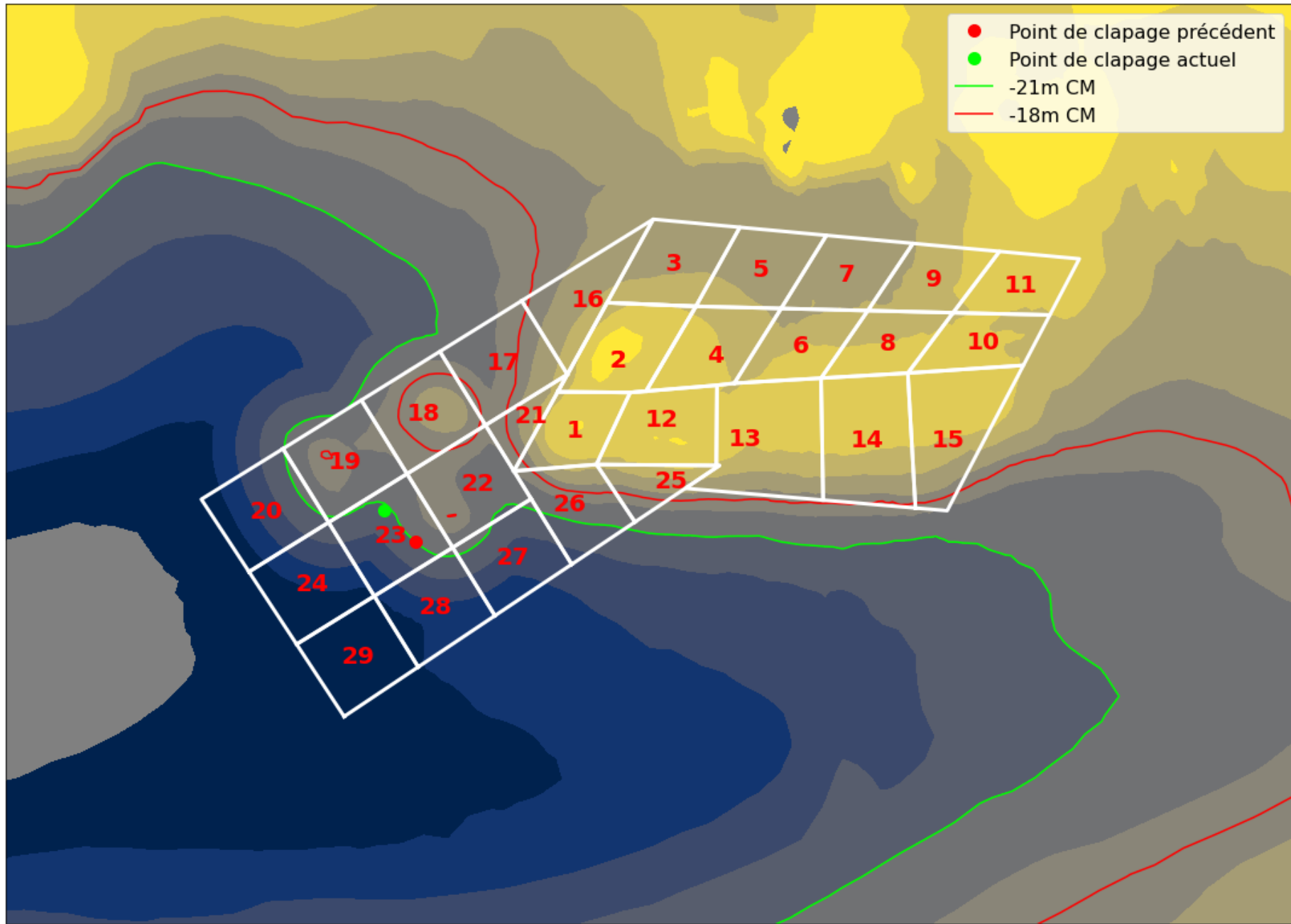




Date de changement de point : 27-08-2027

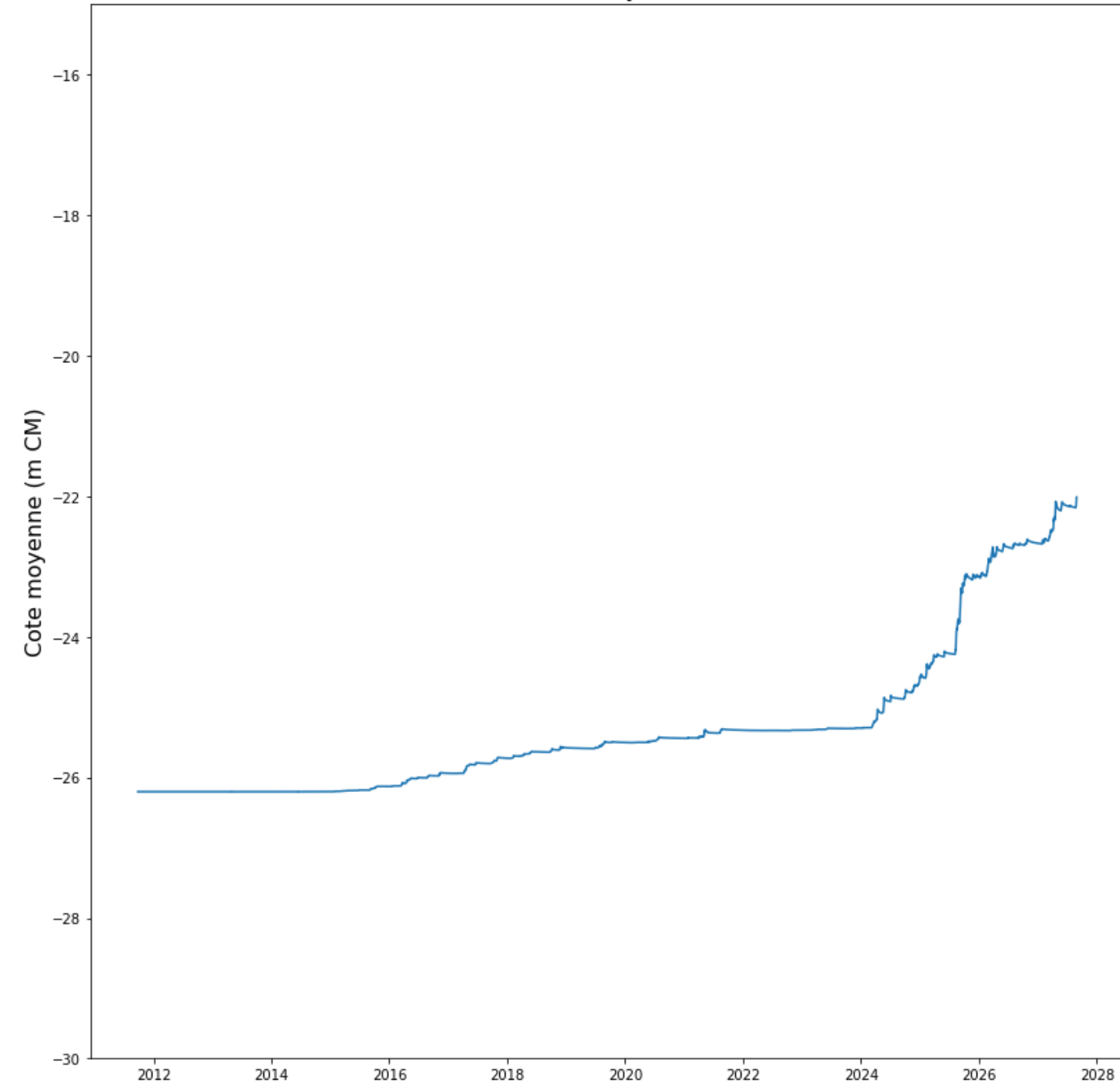
Evolution de la cote moyenne de la zone 23

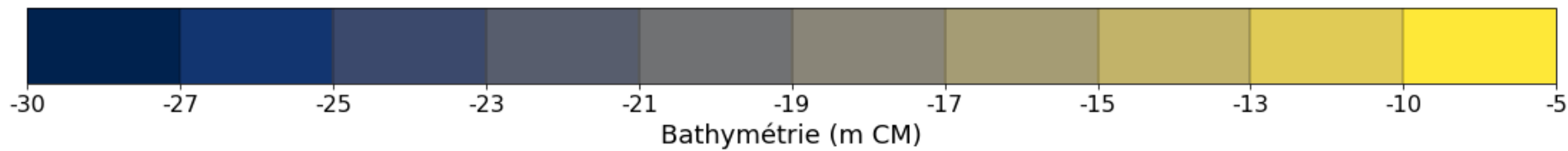
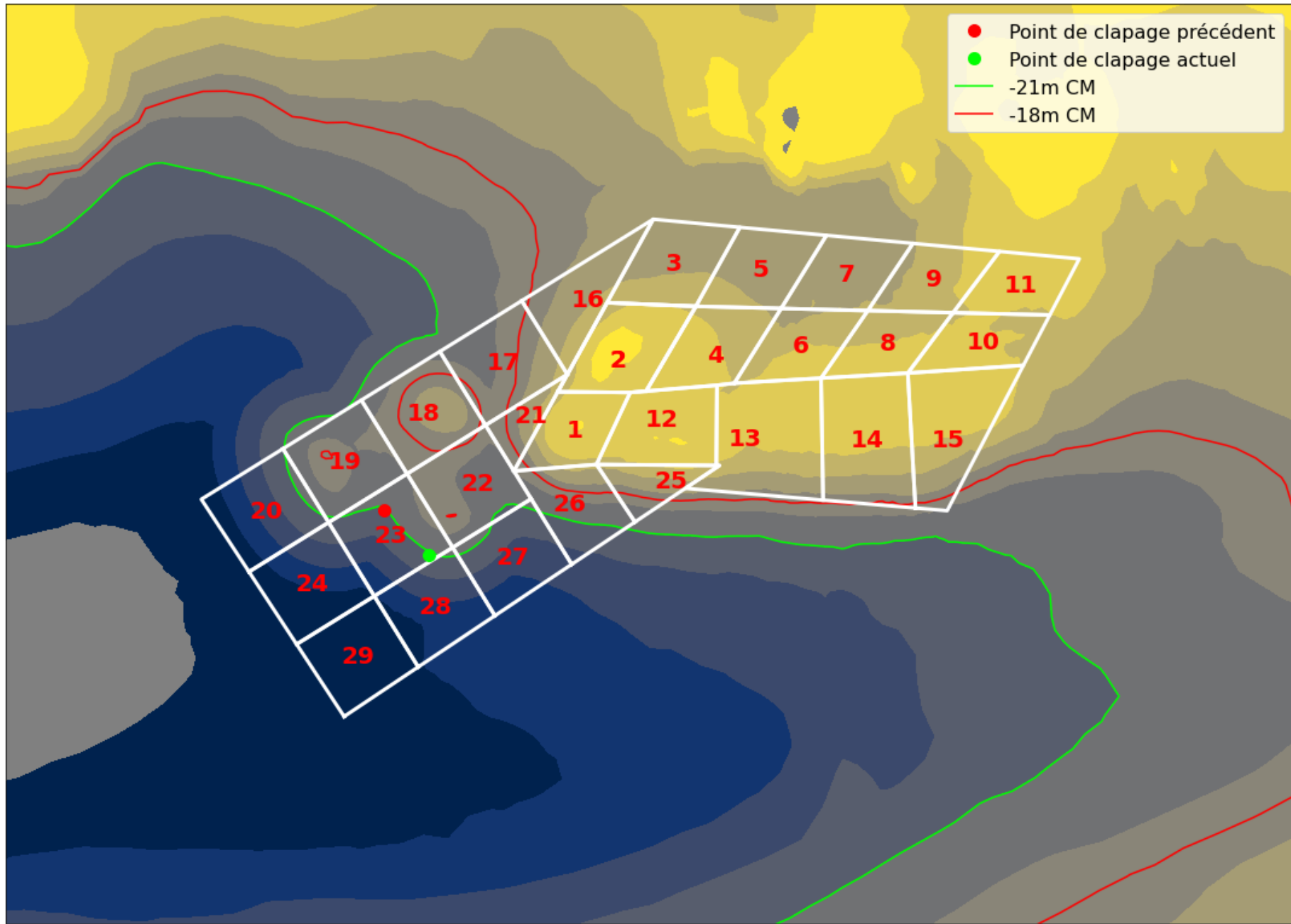




Date de changement de point : 29-08-2027

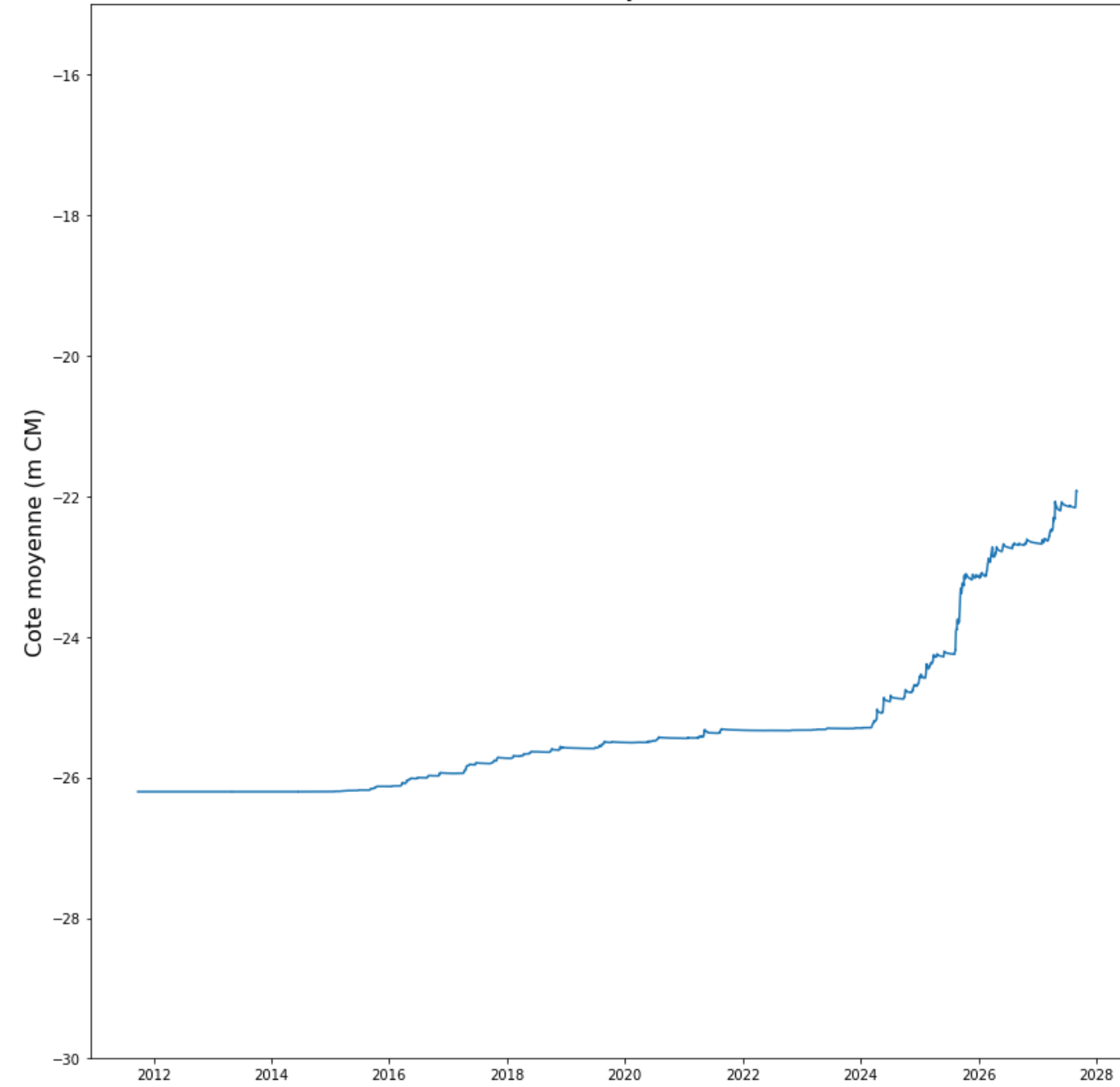
Evolution de la cote moyenne de la zone 23

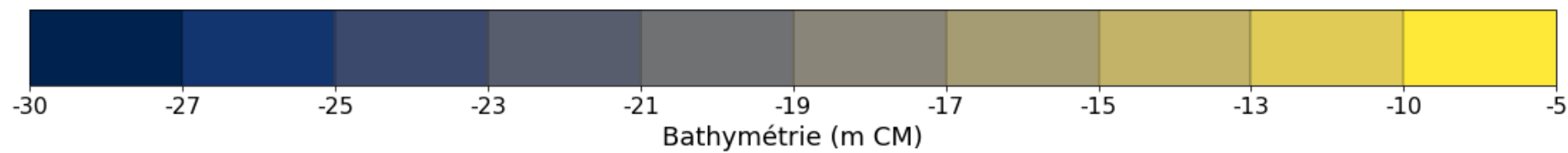
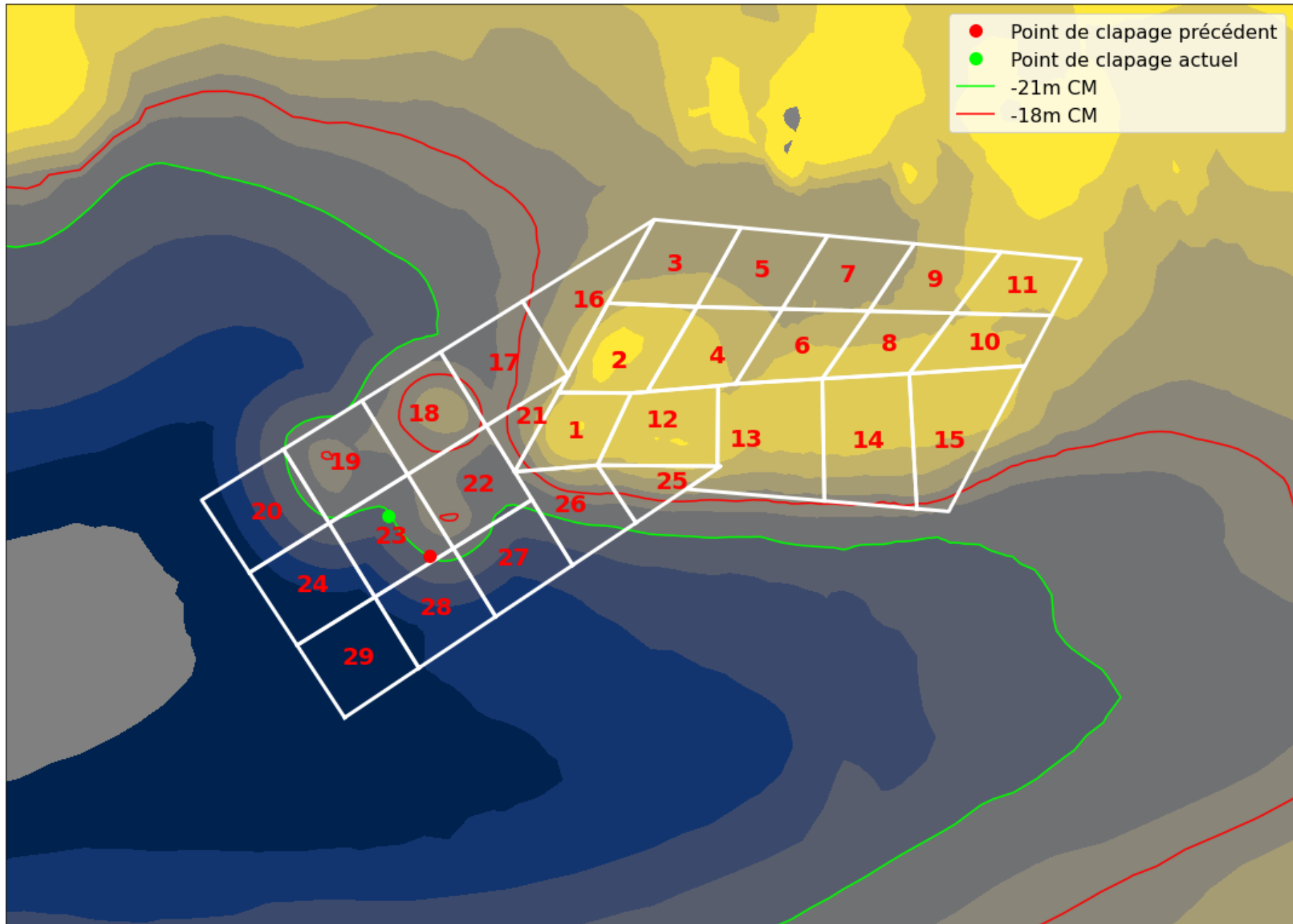




Date de changement de point : 31-08-2027

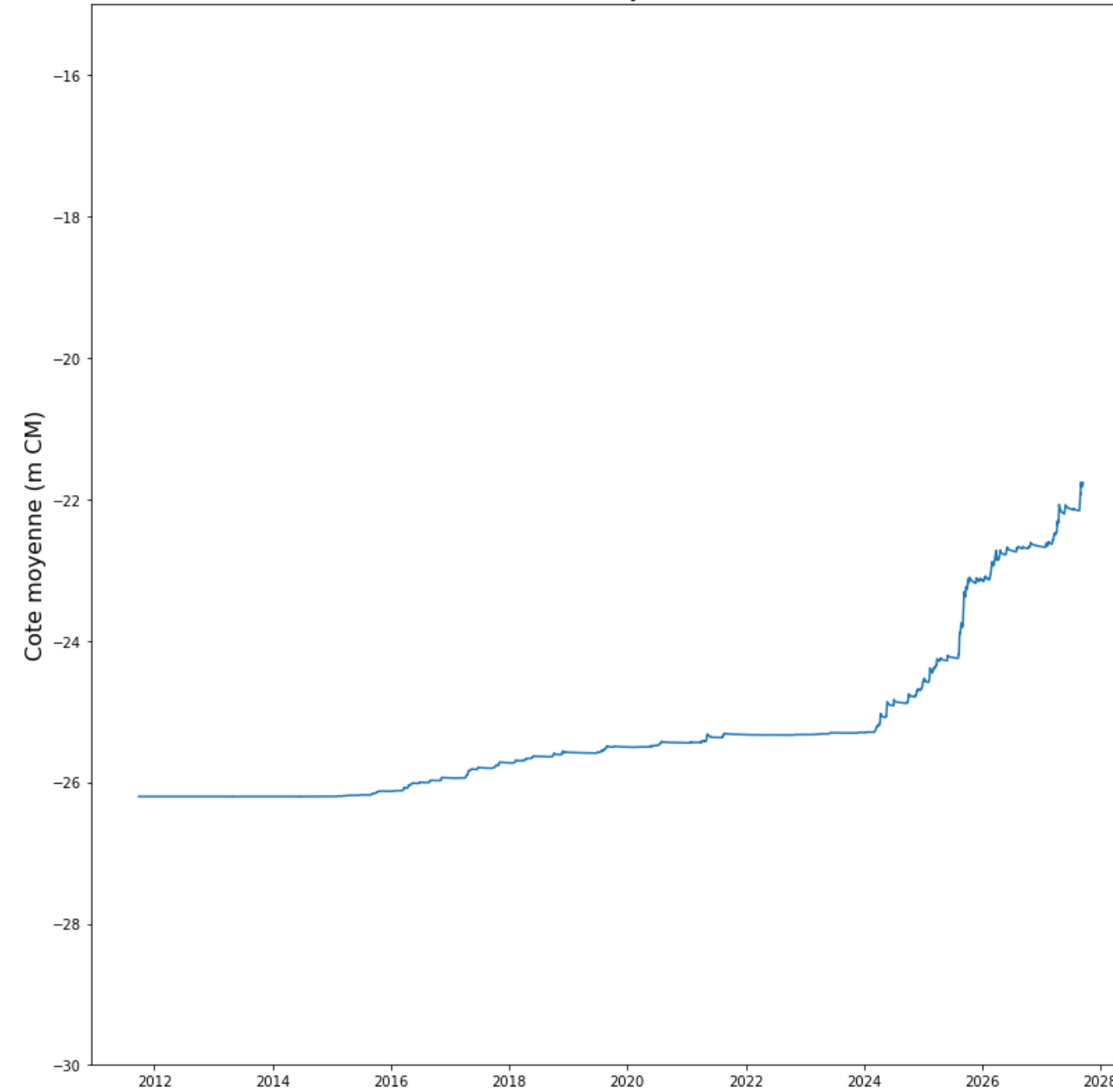
Evolution de la cote moyenne de la zone 23

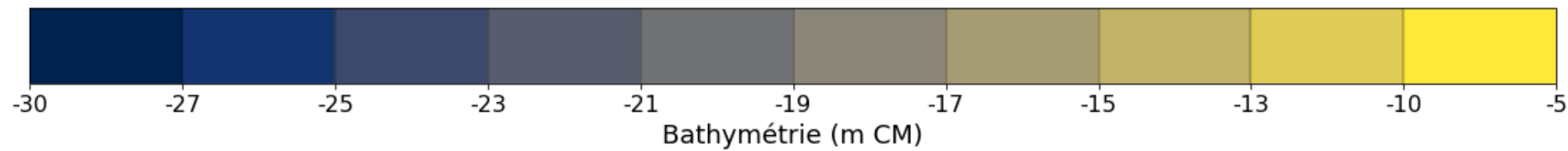
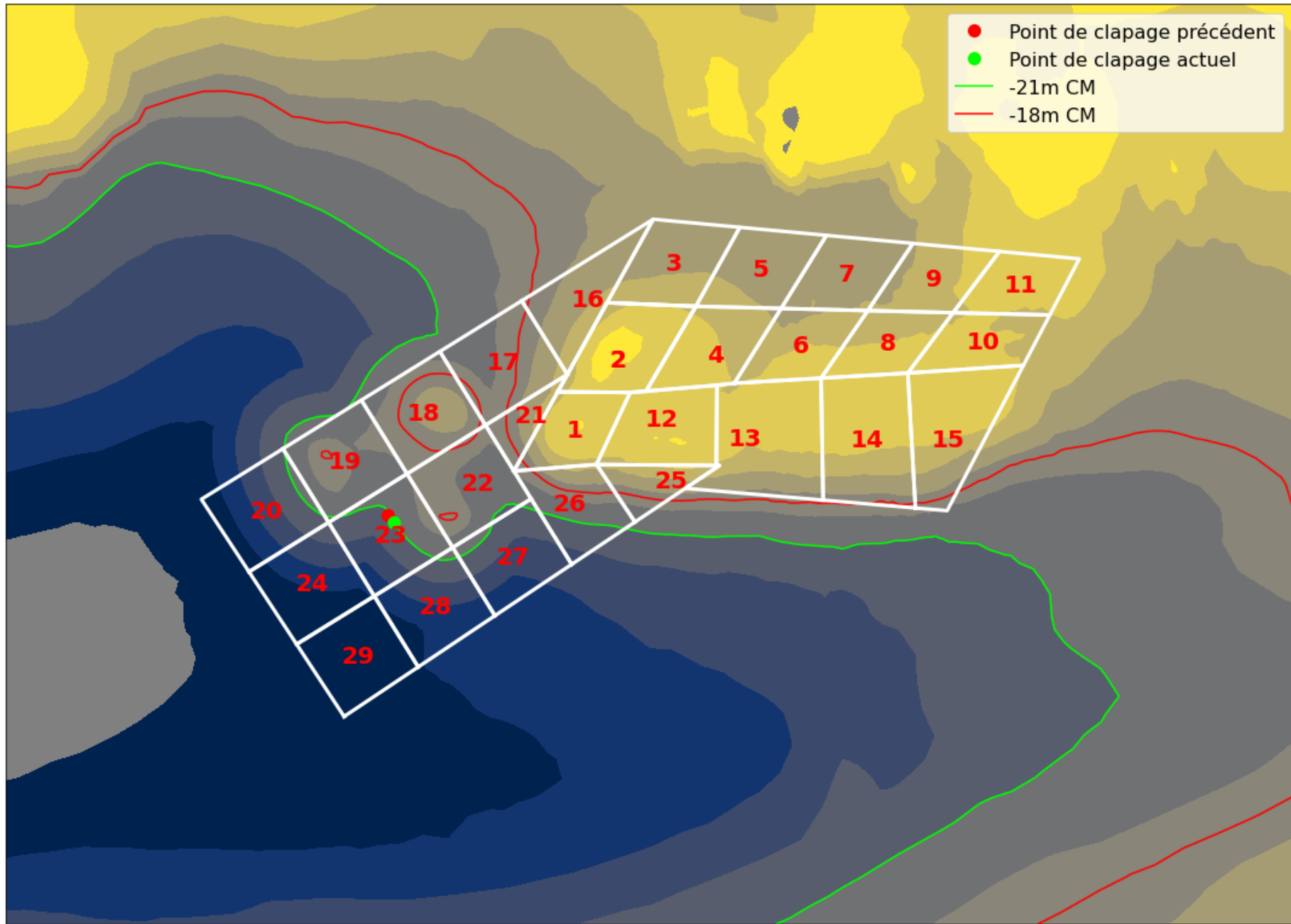




Date de changement de point : 16-09-2027

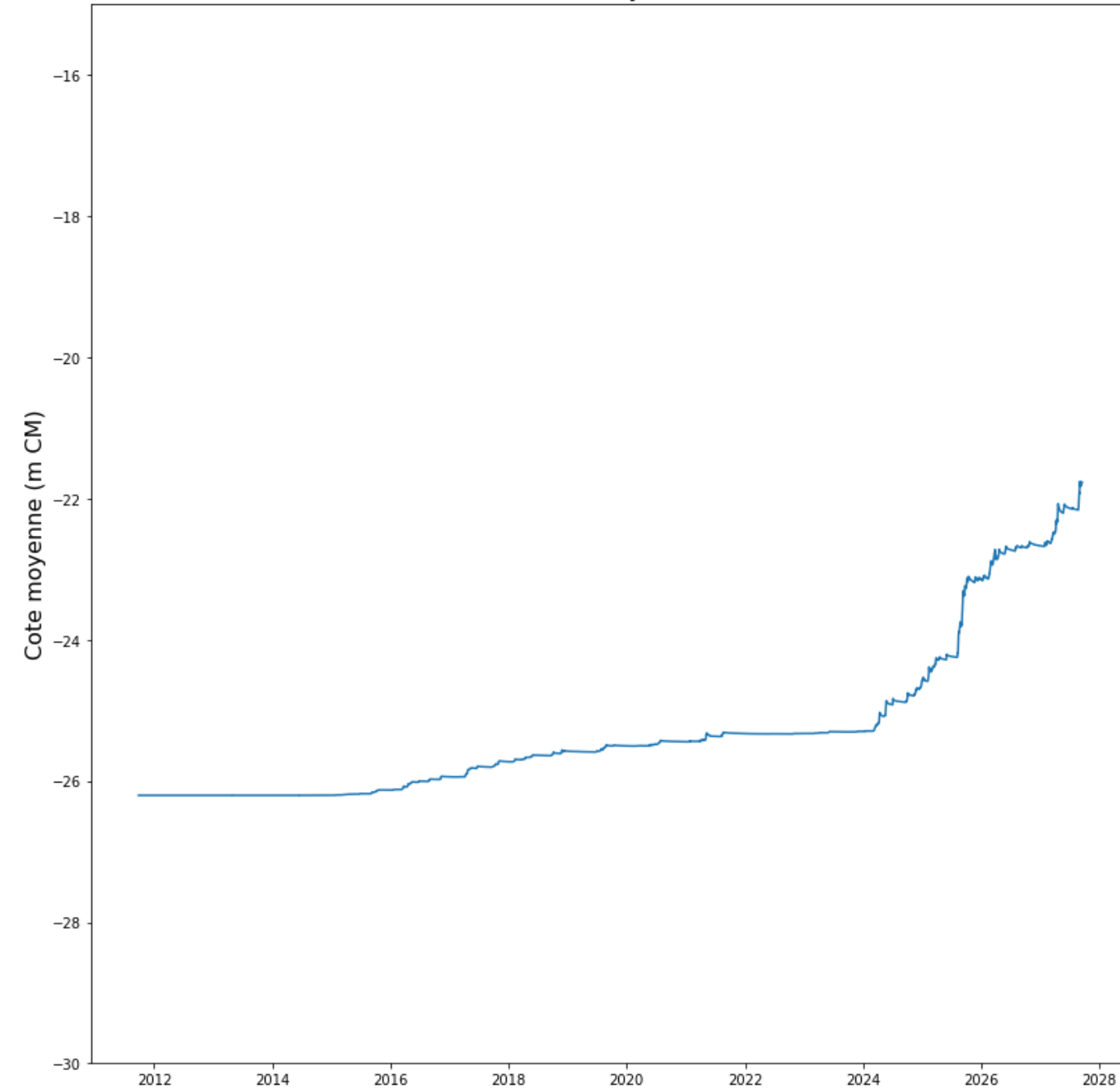
Evolution de la cote moyenne de la zone 23



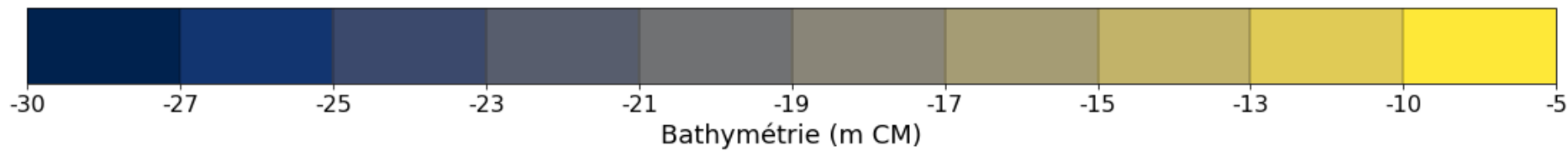
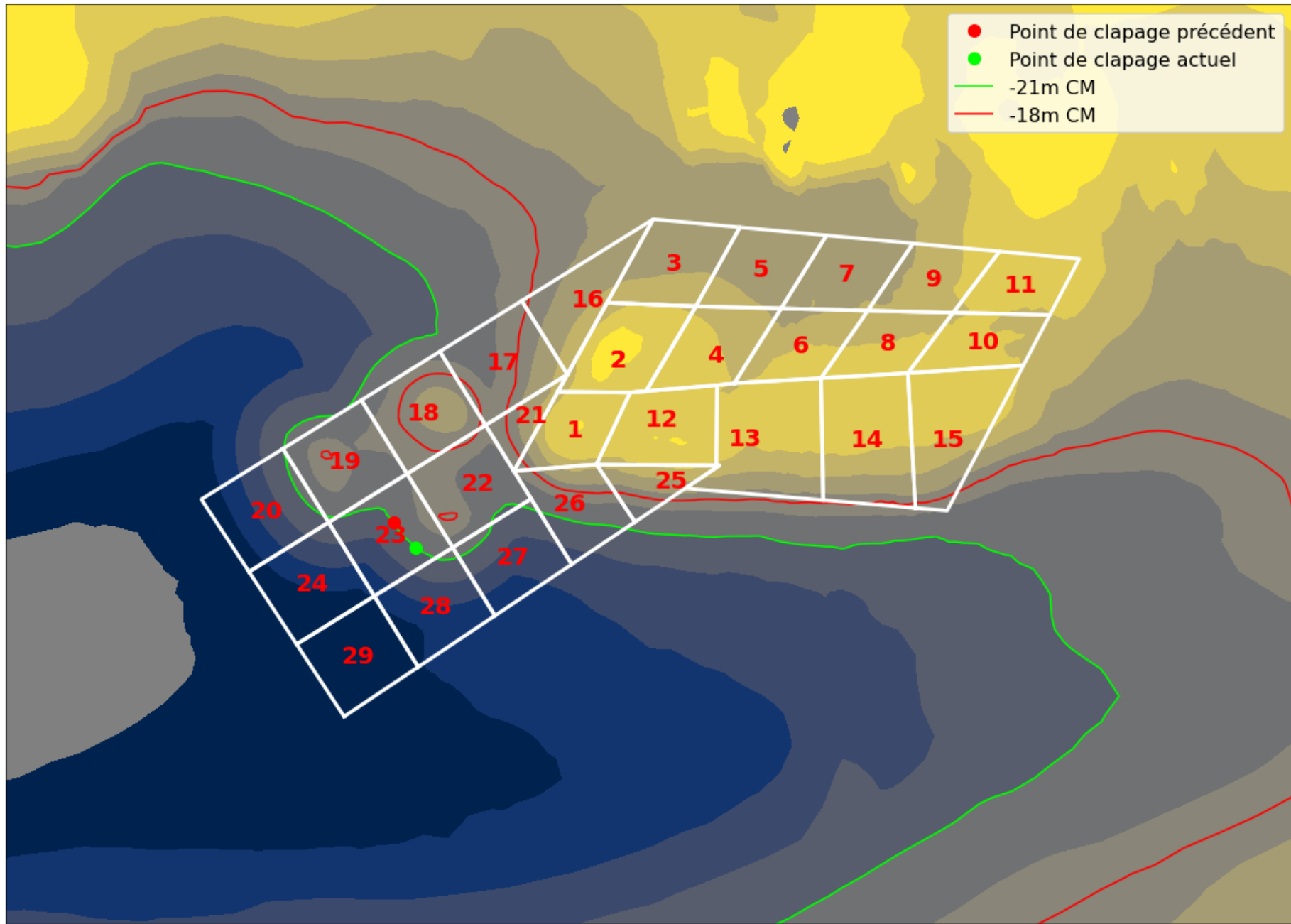


Date de changement de point : 17-09-2027

Evolution de la cote moyenne de la zone 23

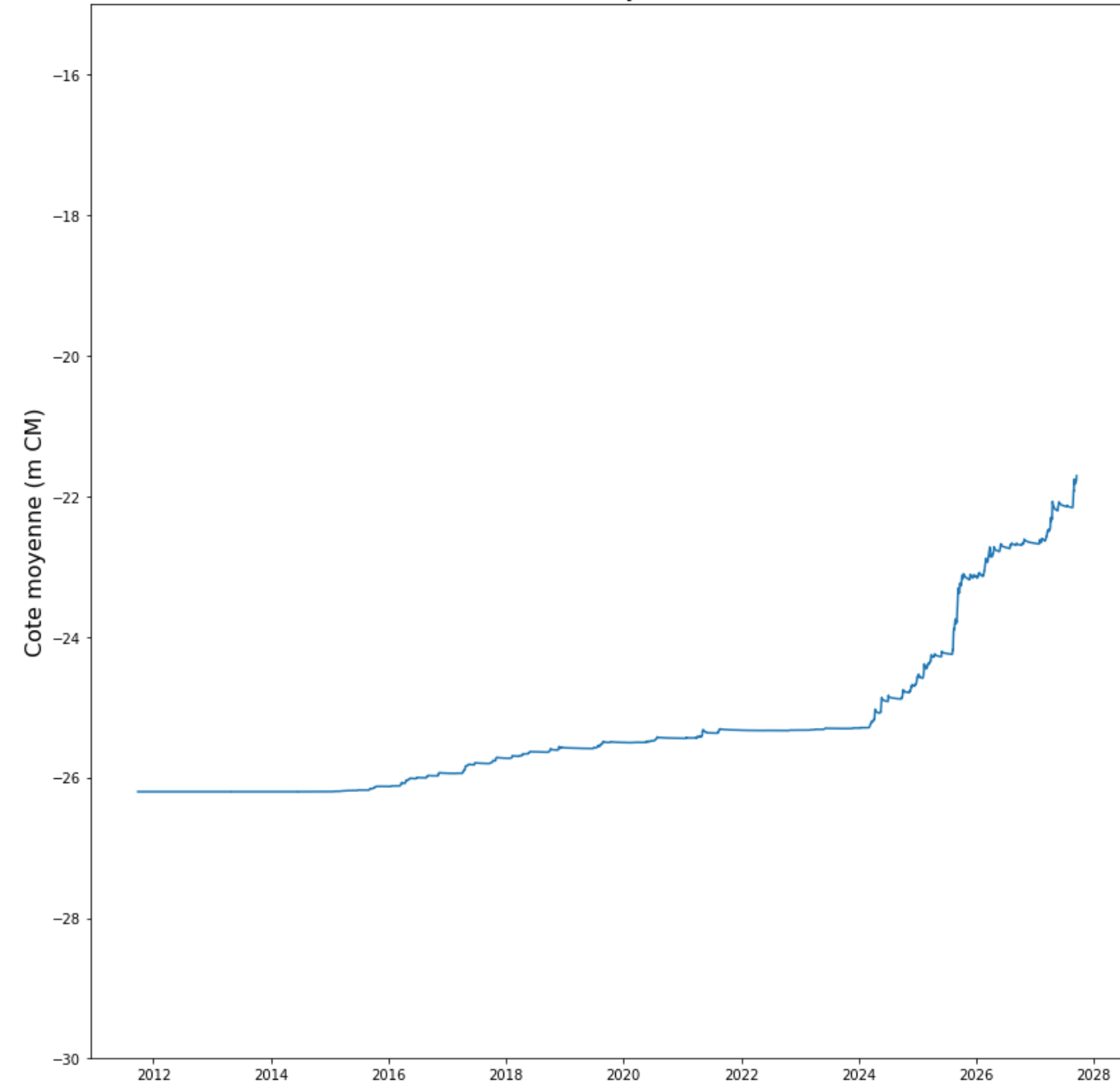




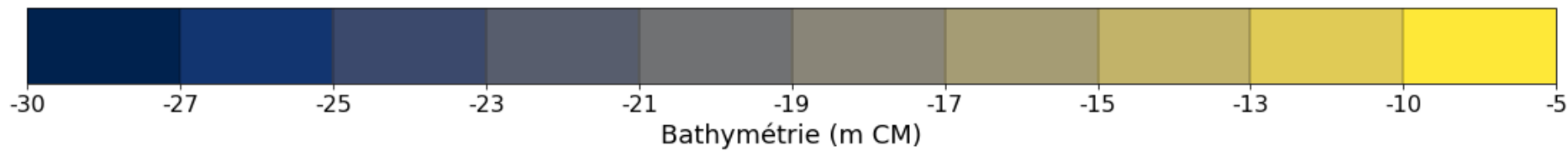
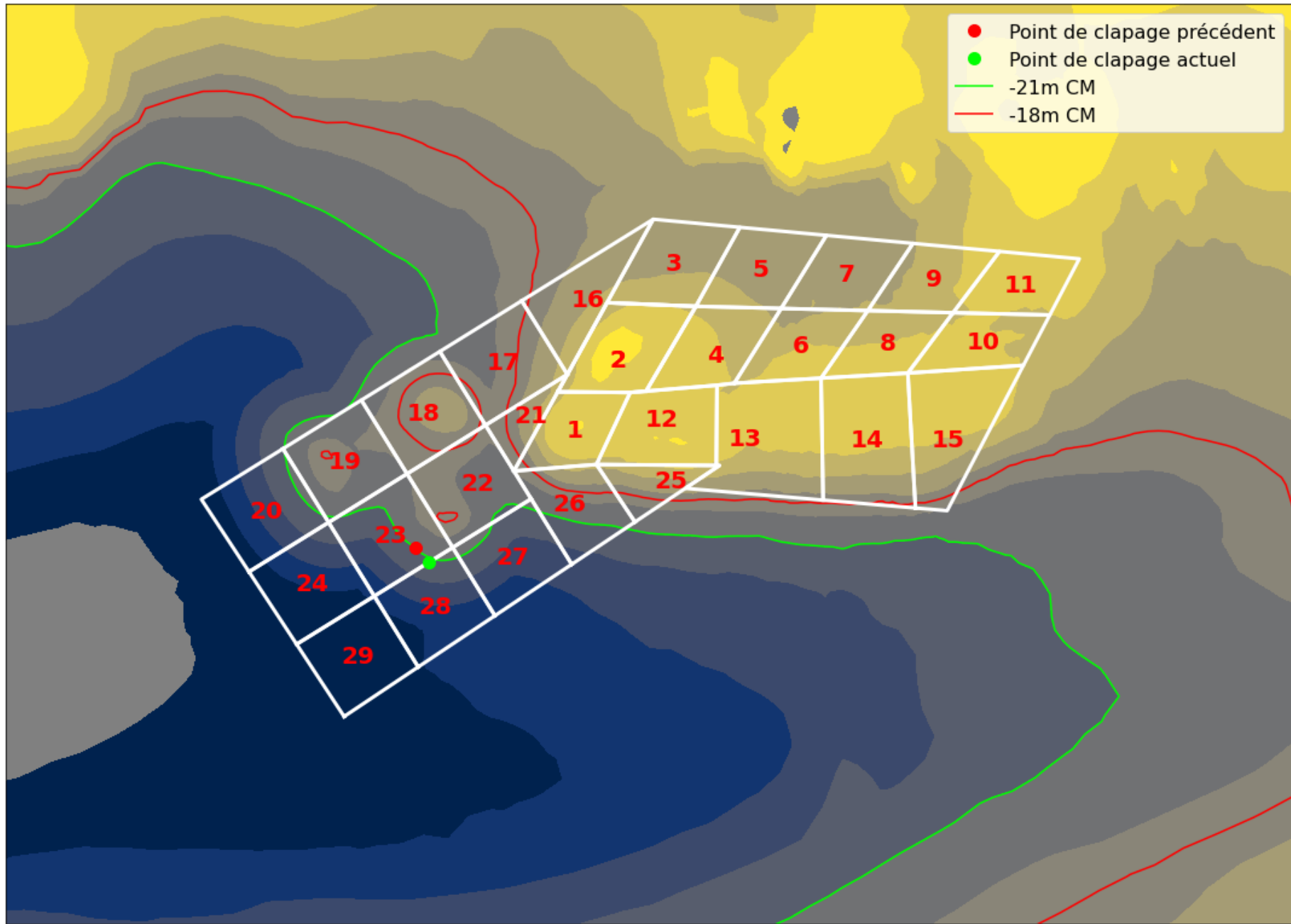


Date de changement de point : 17-09-2027

Evolution de la cote moyenne de la zone 23

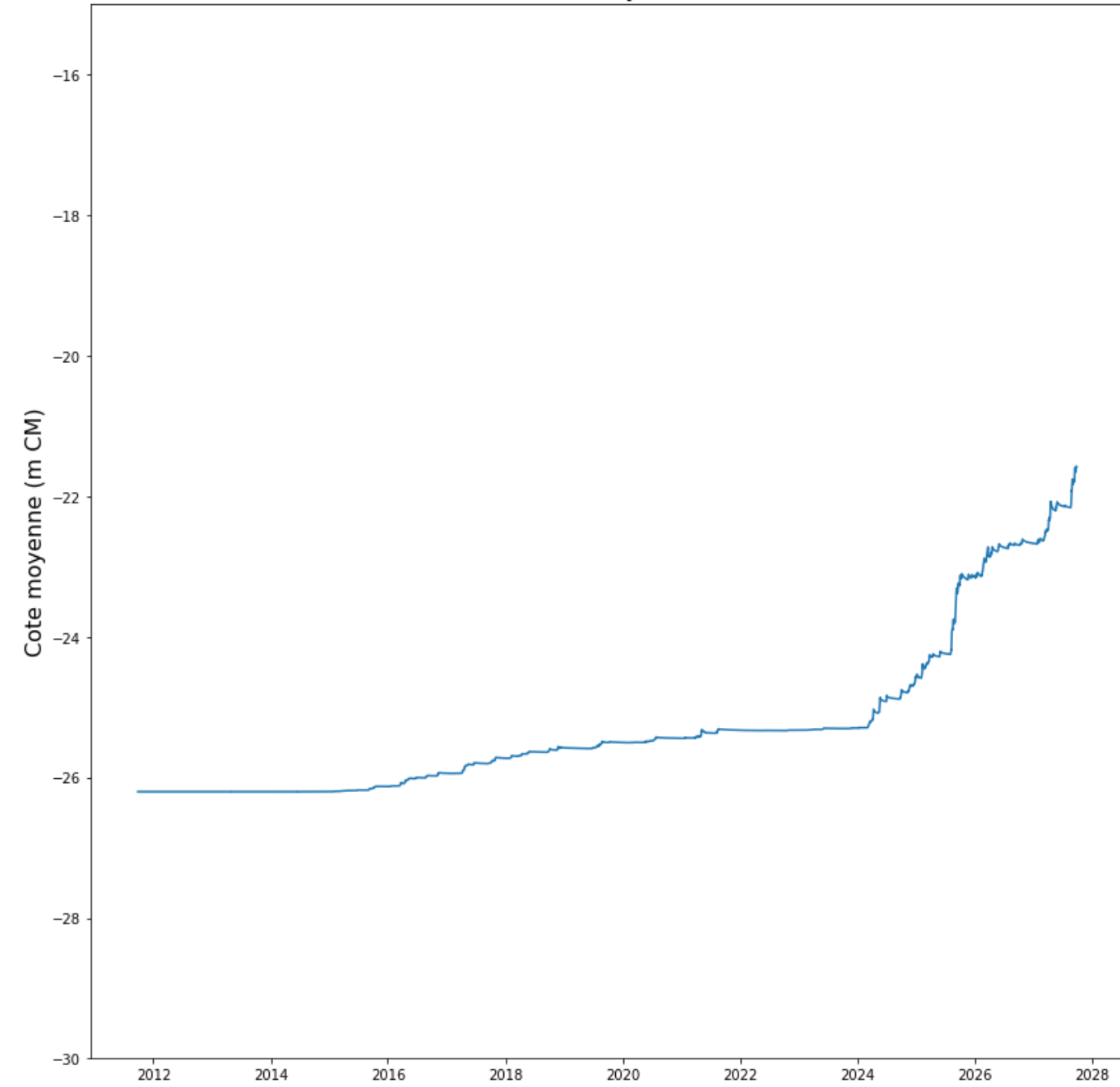


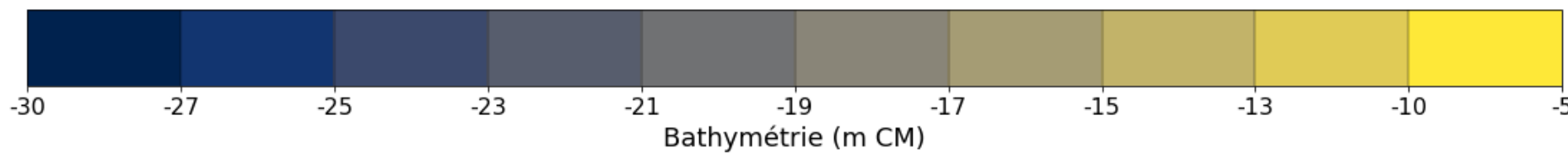
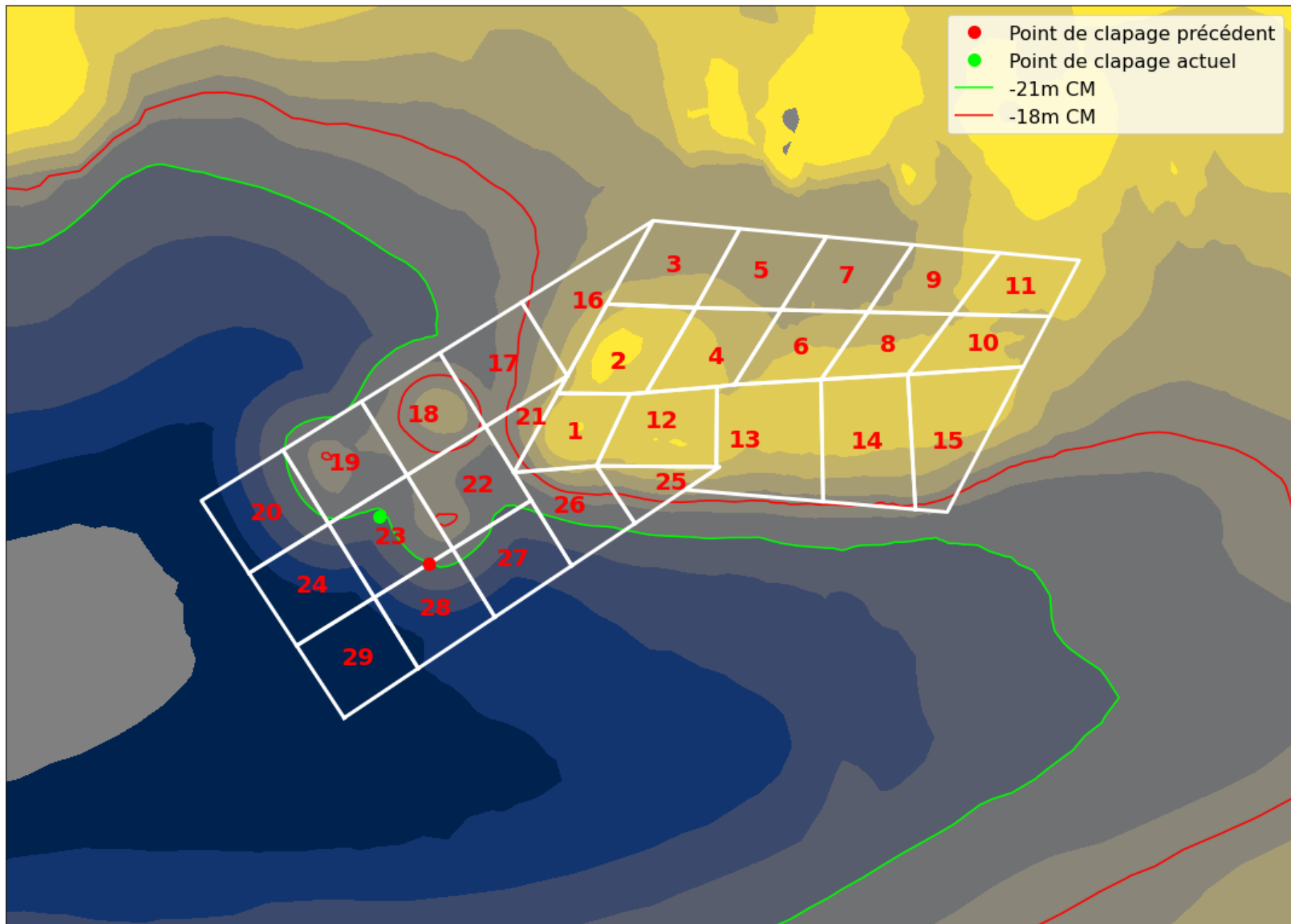




Date de changement de point : 30-09-2027

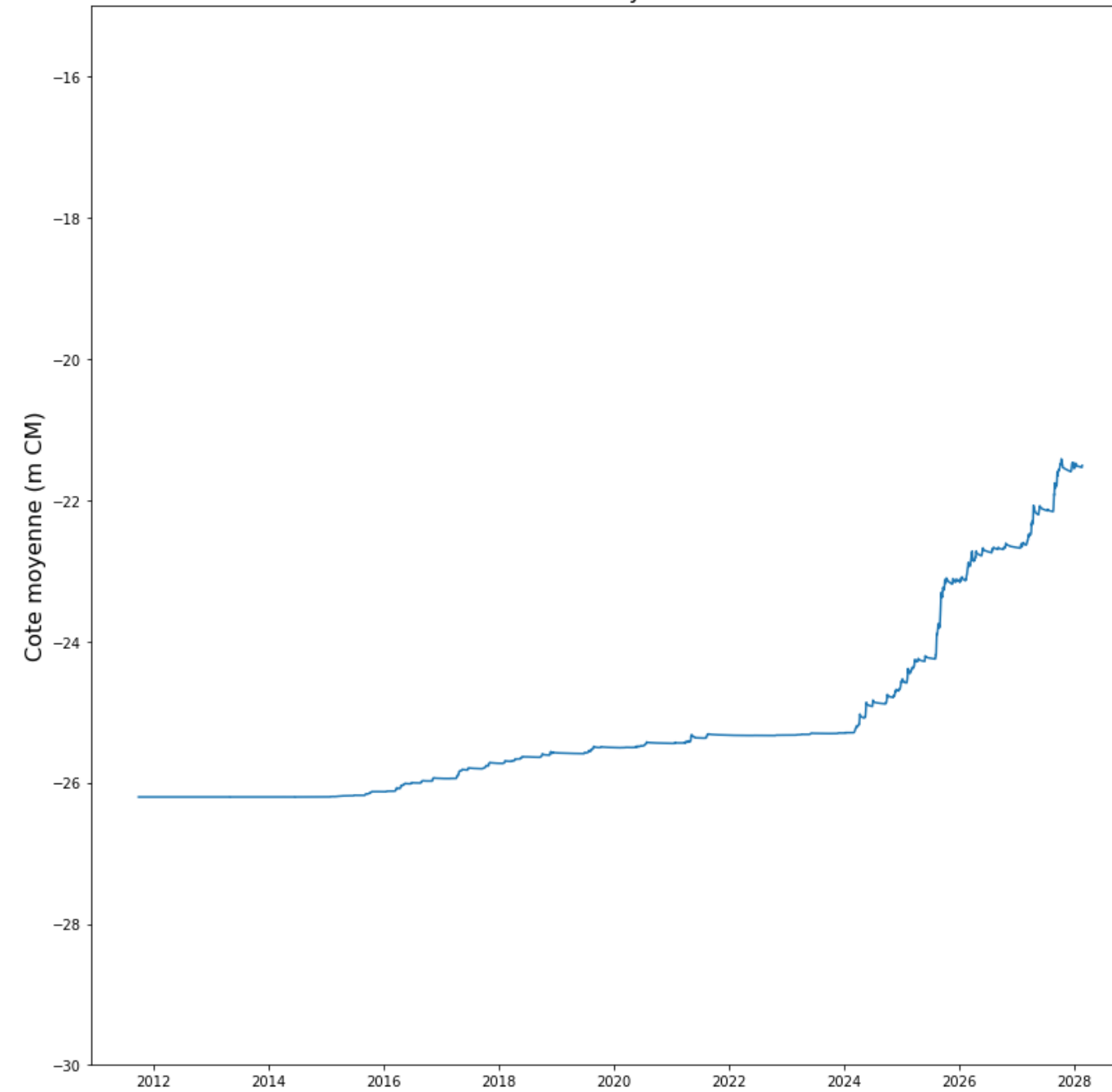
Evolution de la cote moyenne de la zone 23

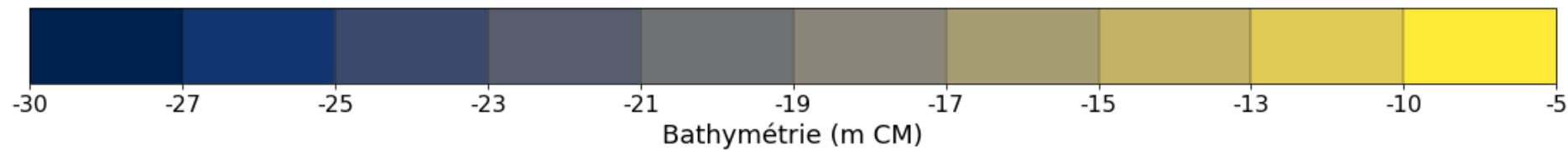
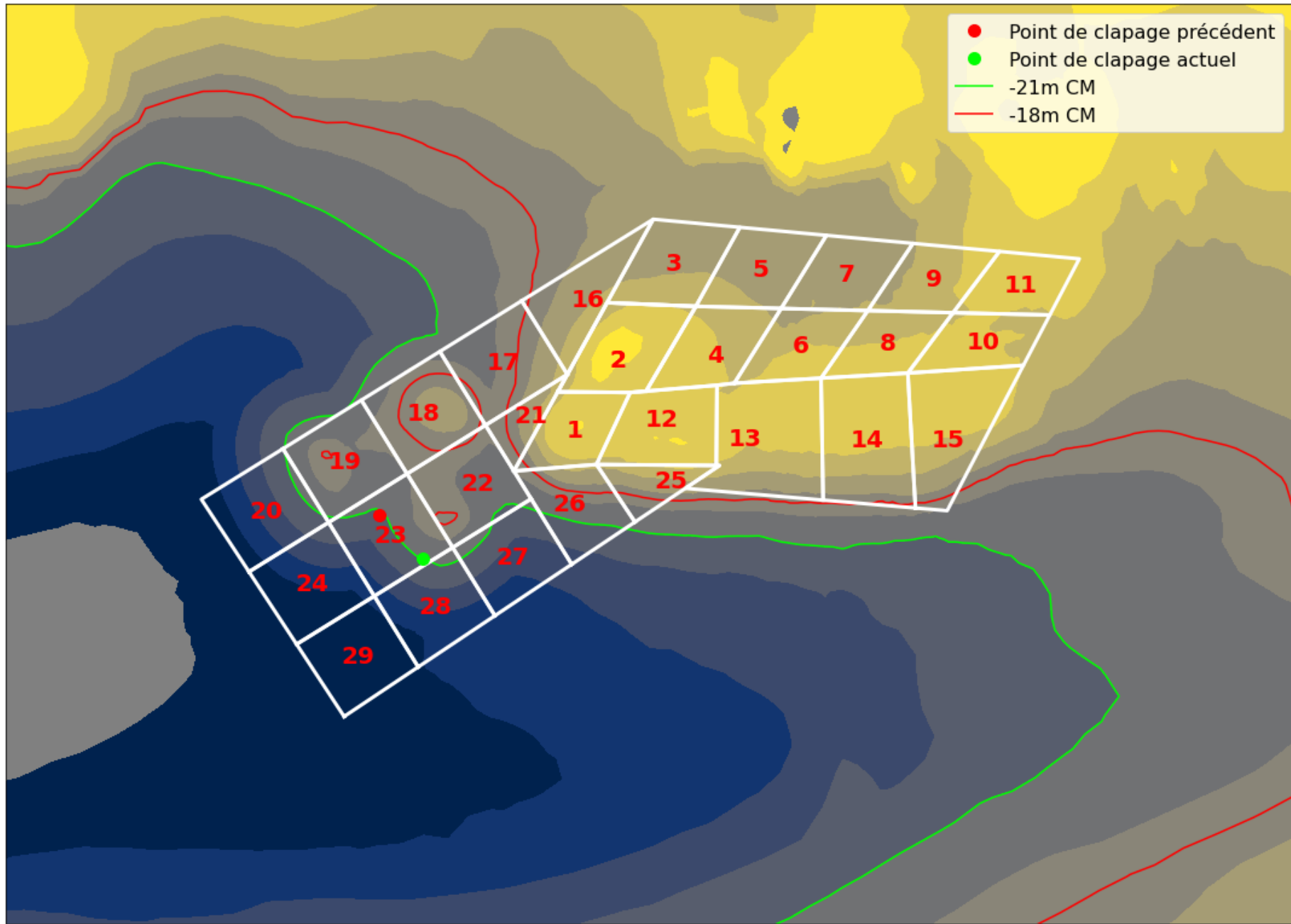




Date de changement de point : 24-02-2028

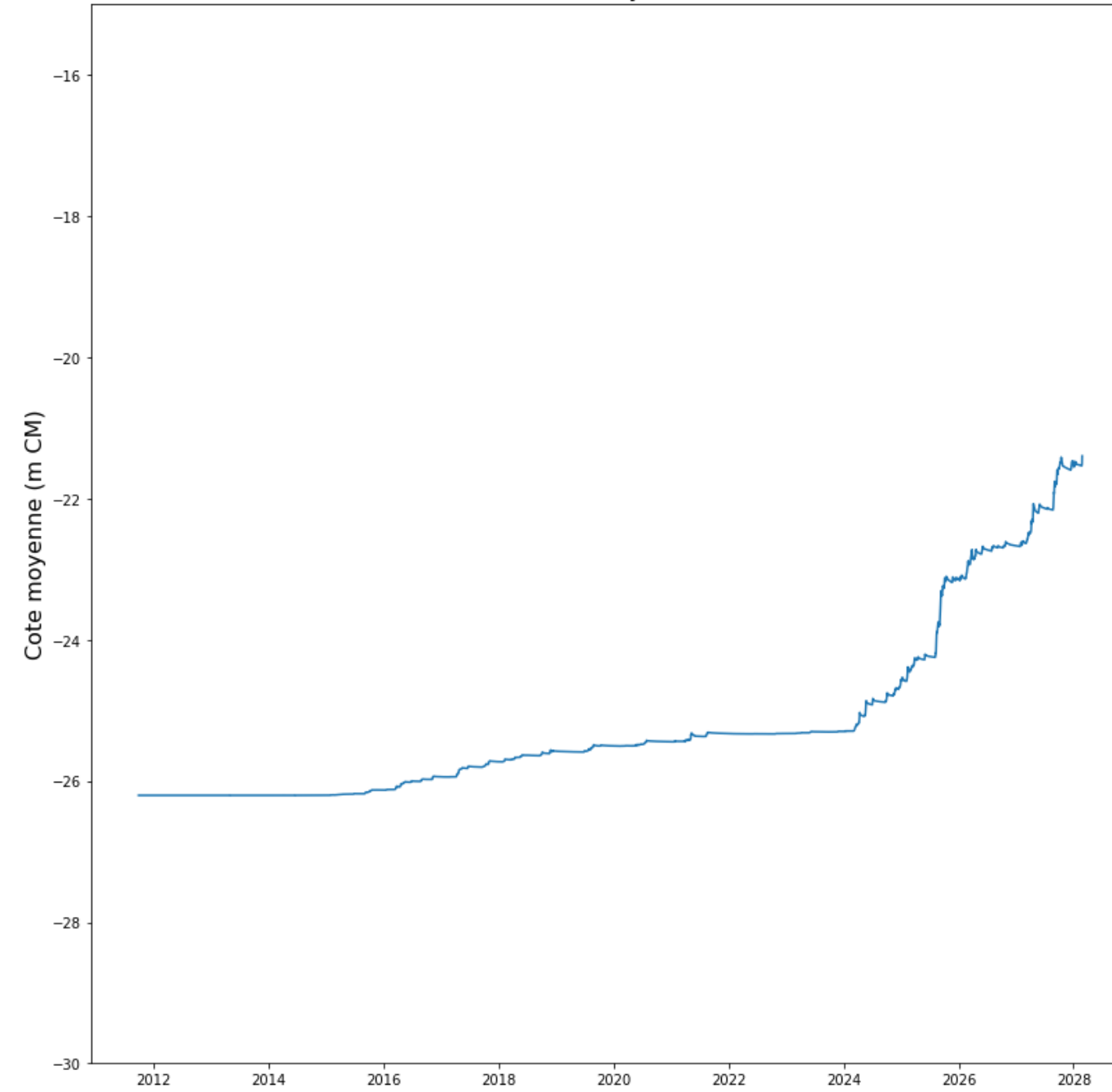
Evolution de la cote moyenne de la zone 23

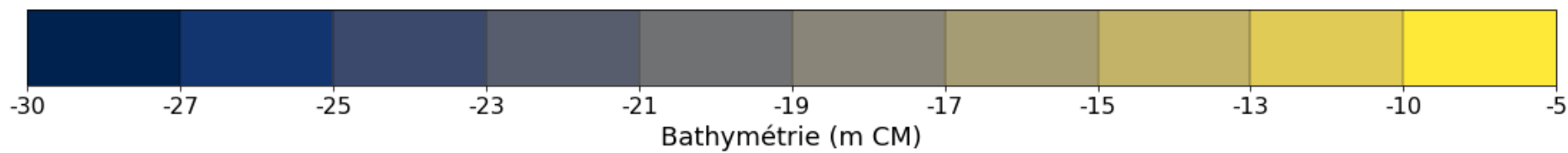
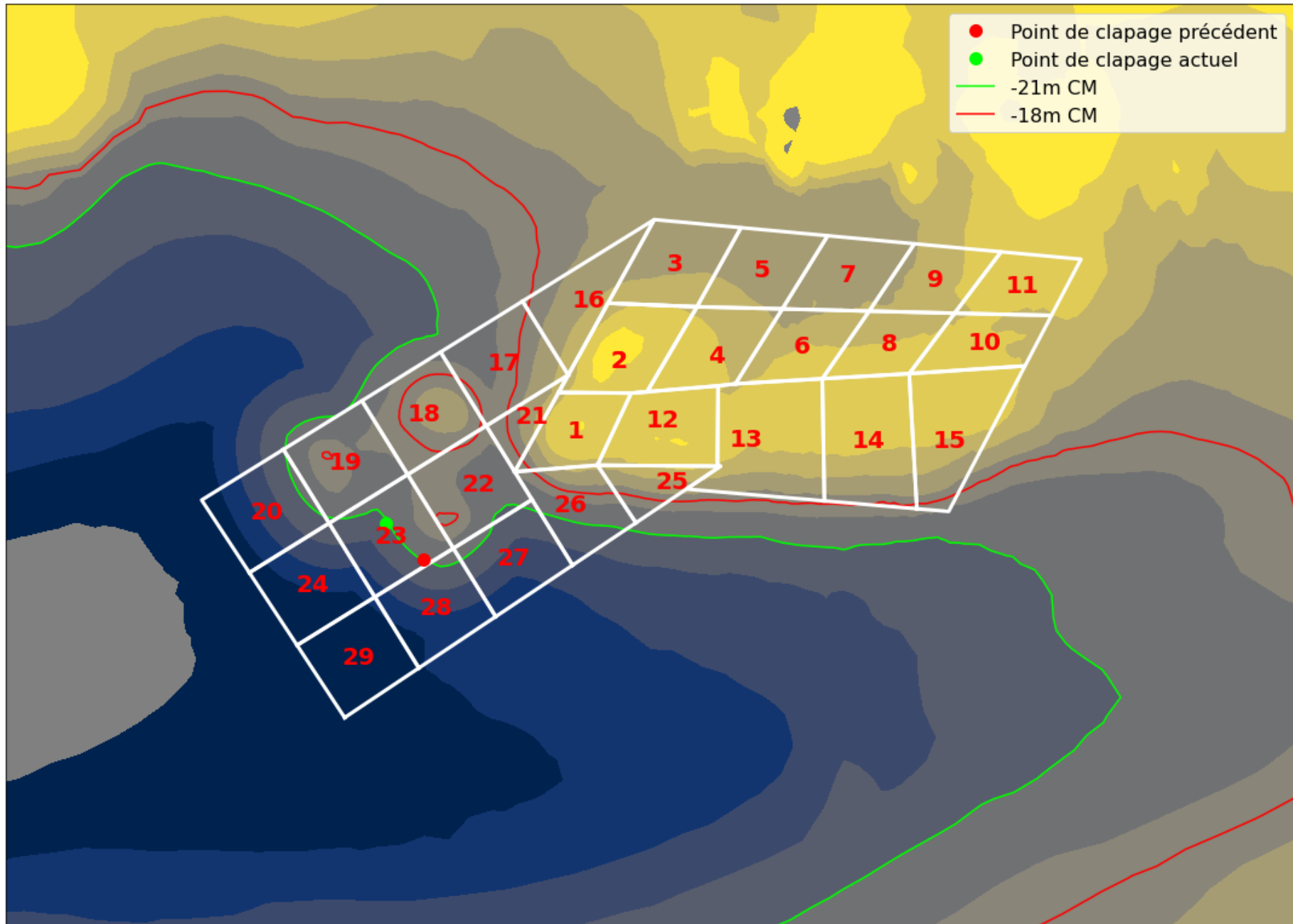




Date de changement de point : 25-02-2028

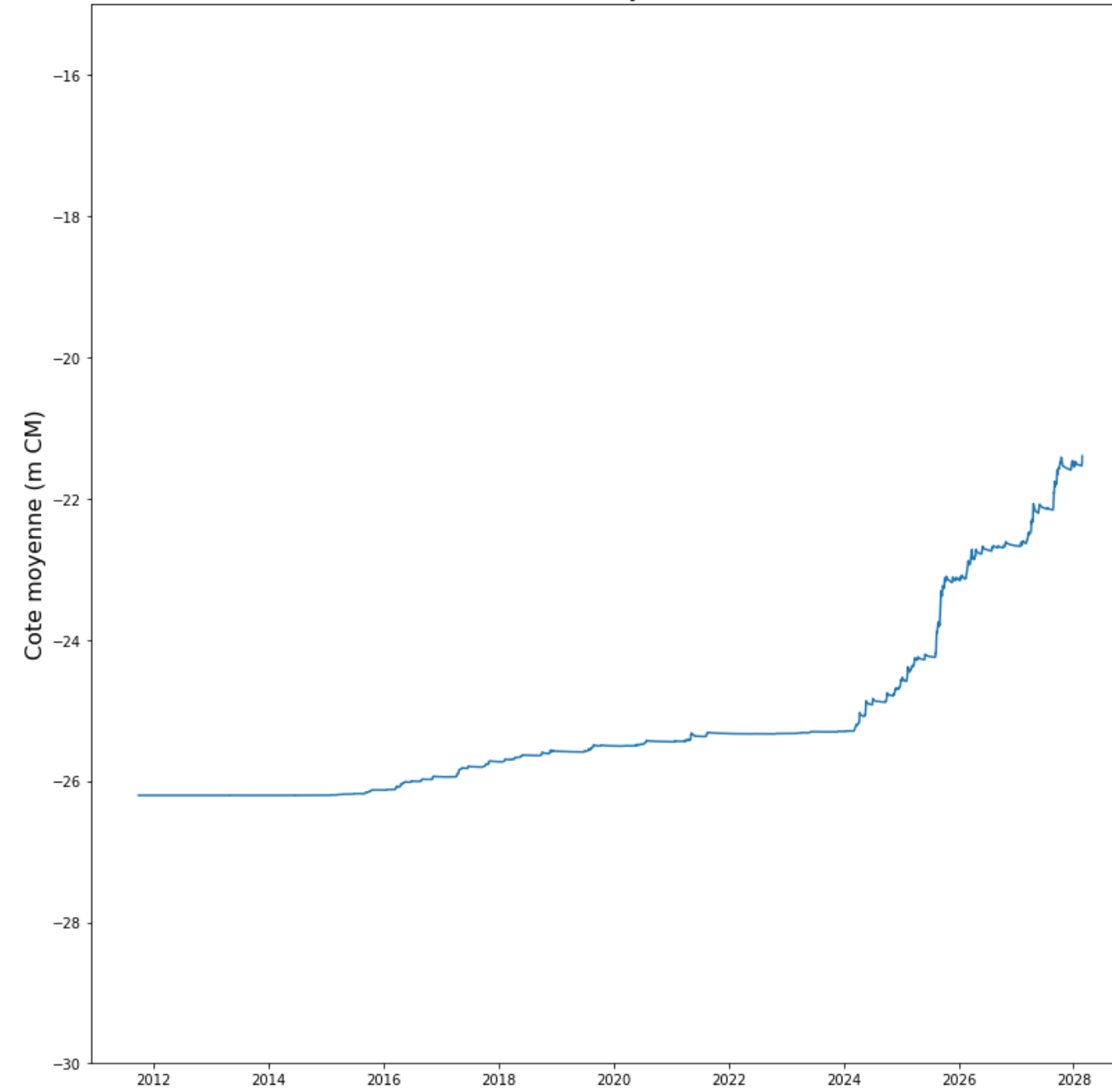
Evolution de la cote moyenne de la zone 23

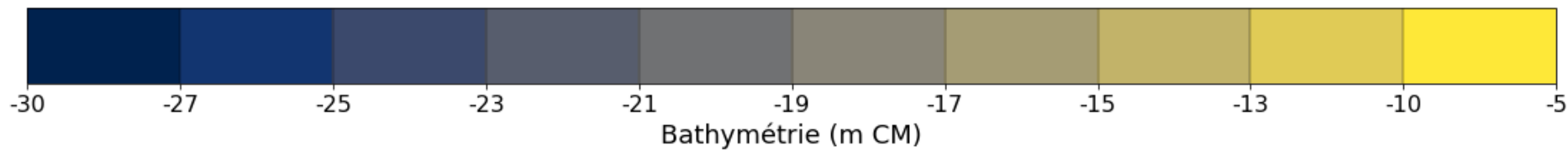
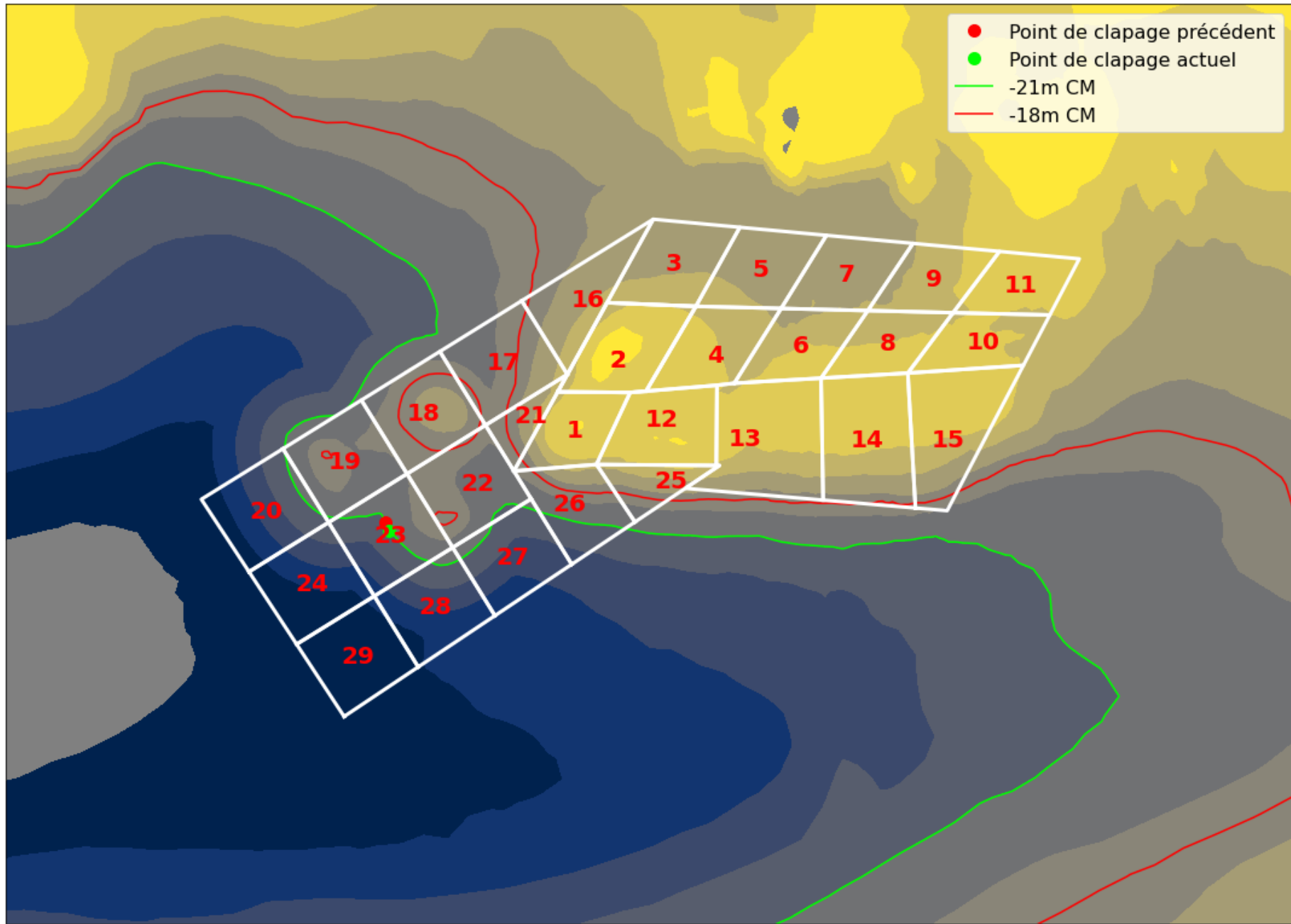




Date de changement de point : 26-02-2028

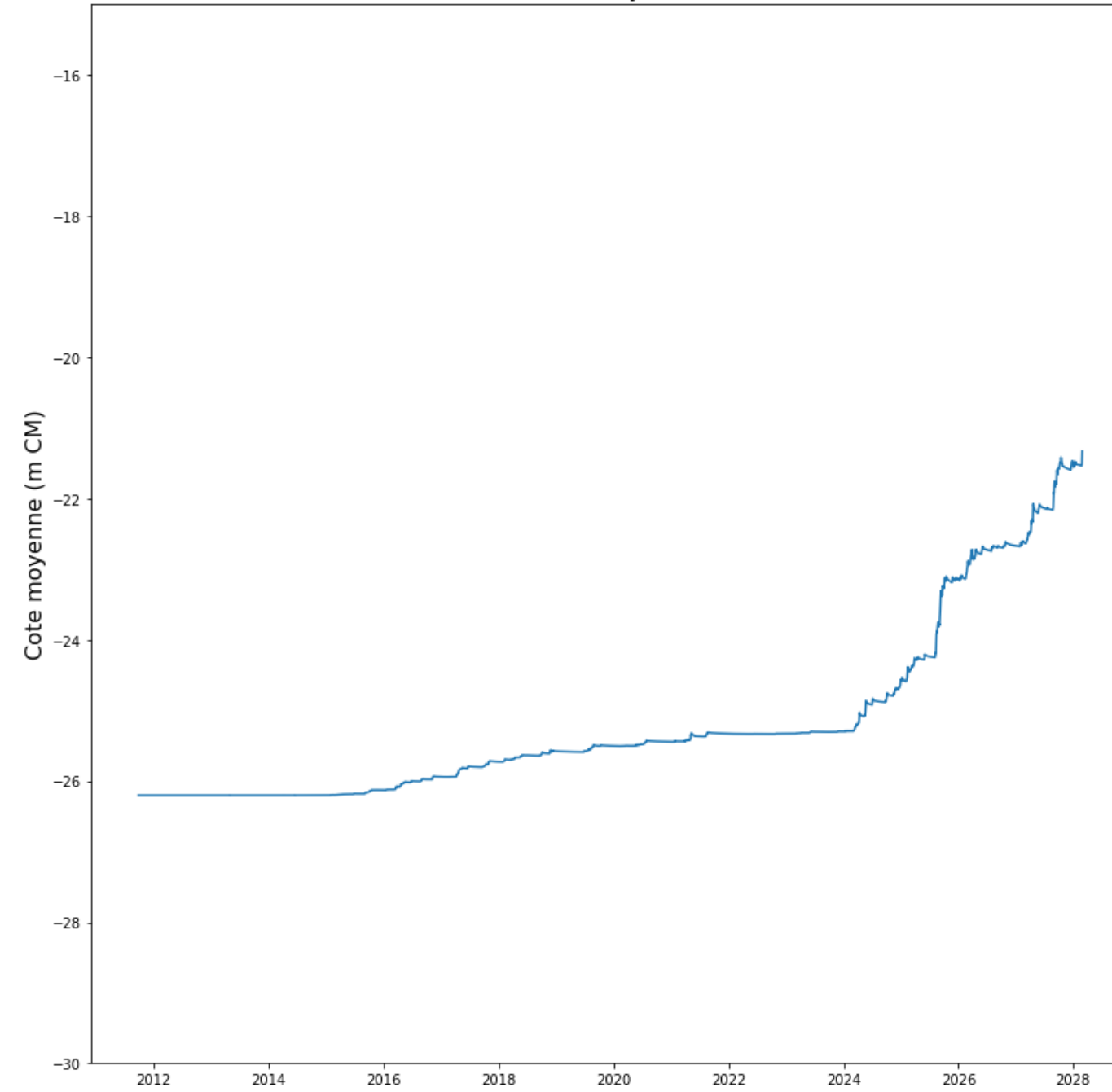
Evolution de la cote moyenne de la zone 23

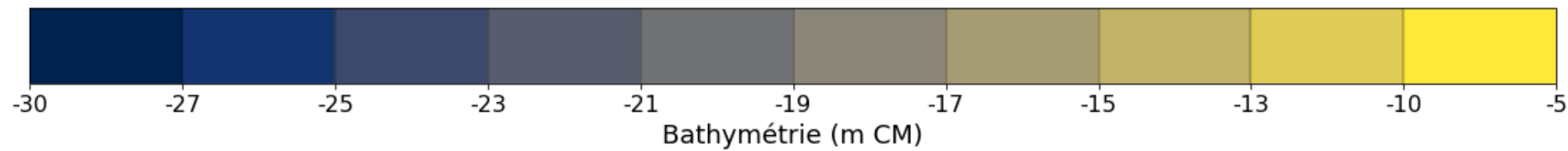
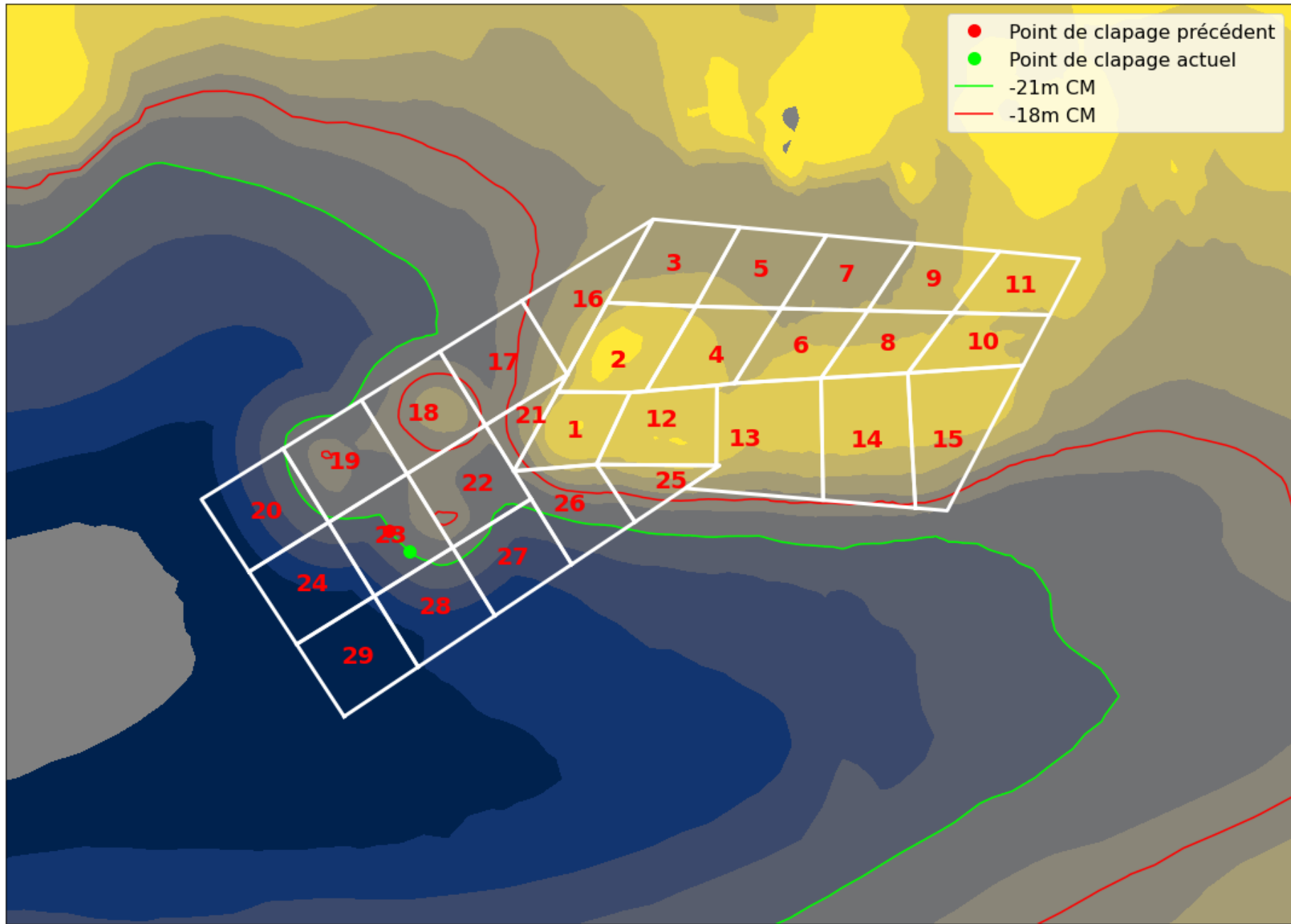




Date de changement de point : 27-02-2028

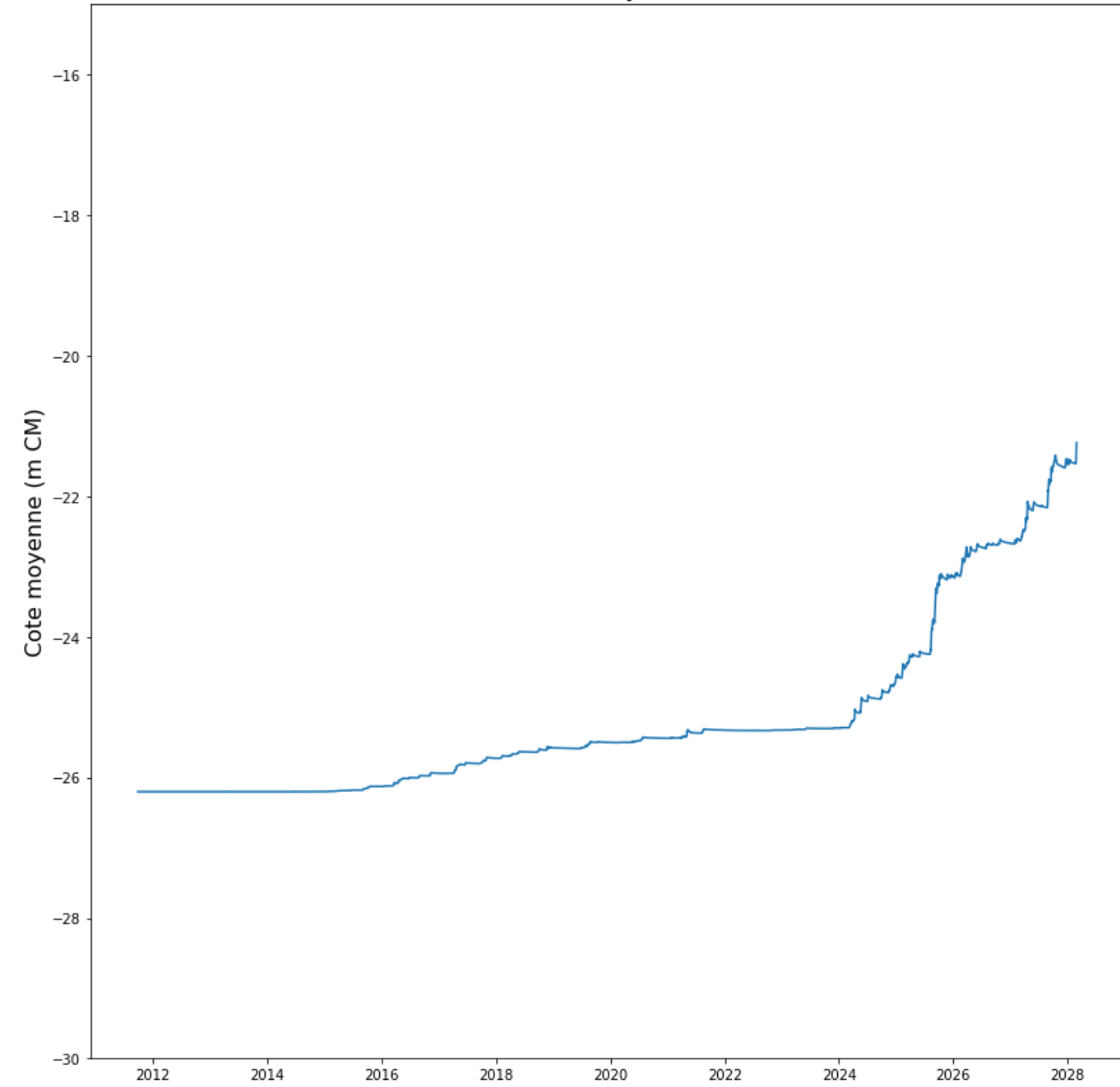
Evolution de la cote moyenne de la zone 23



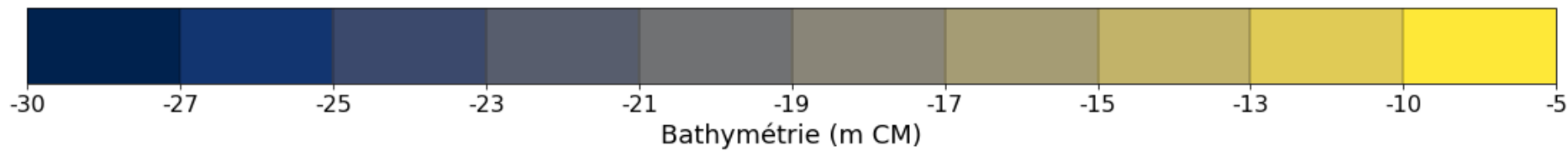
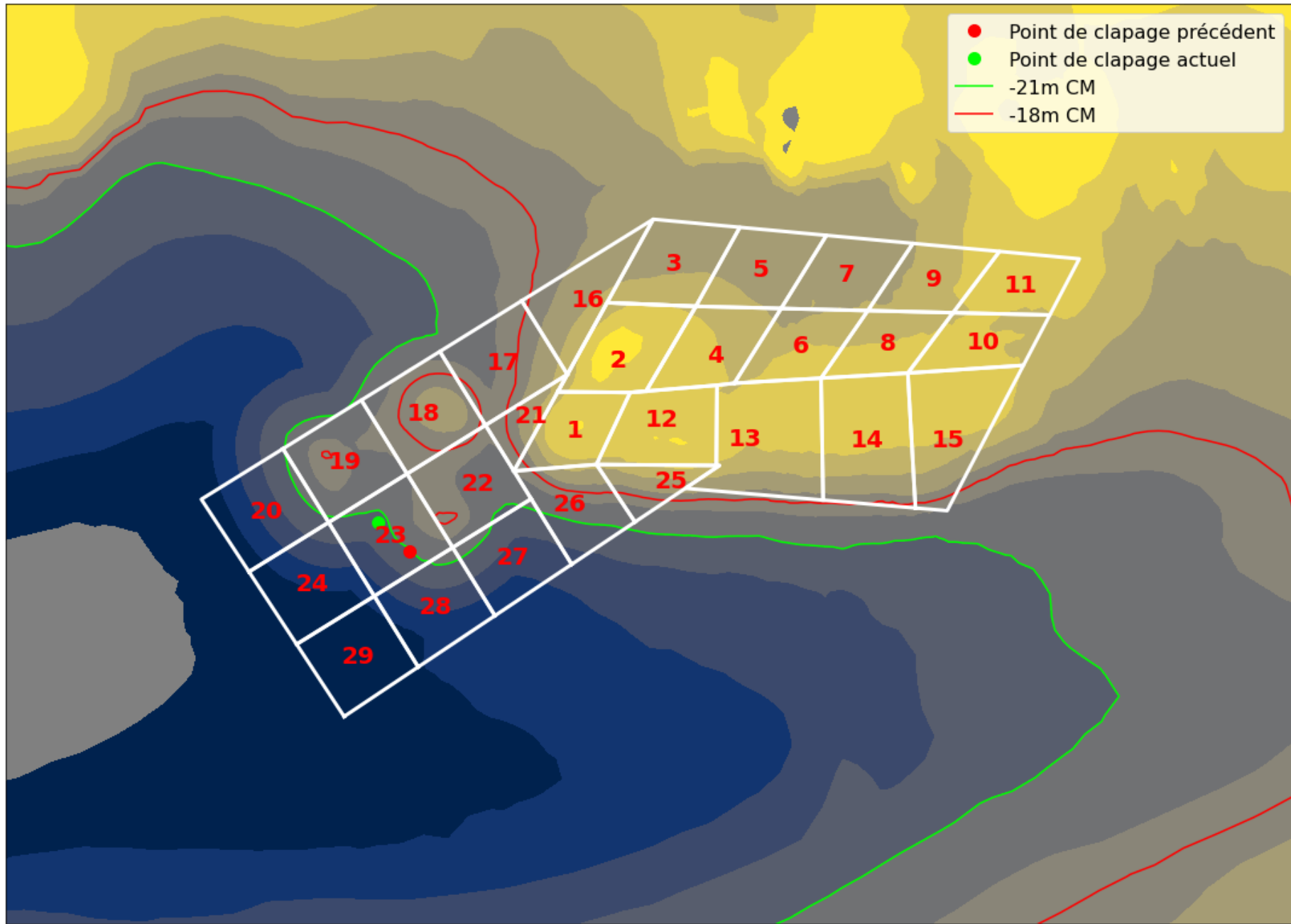


Date de changement de point : 28-02-2028

Evolution de la cote moyenne de la zone 23

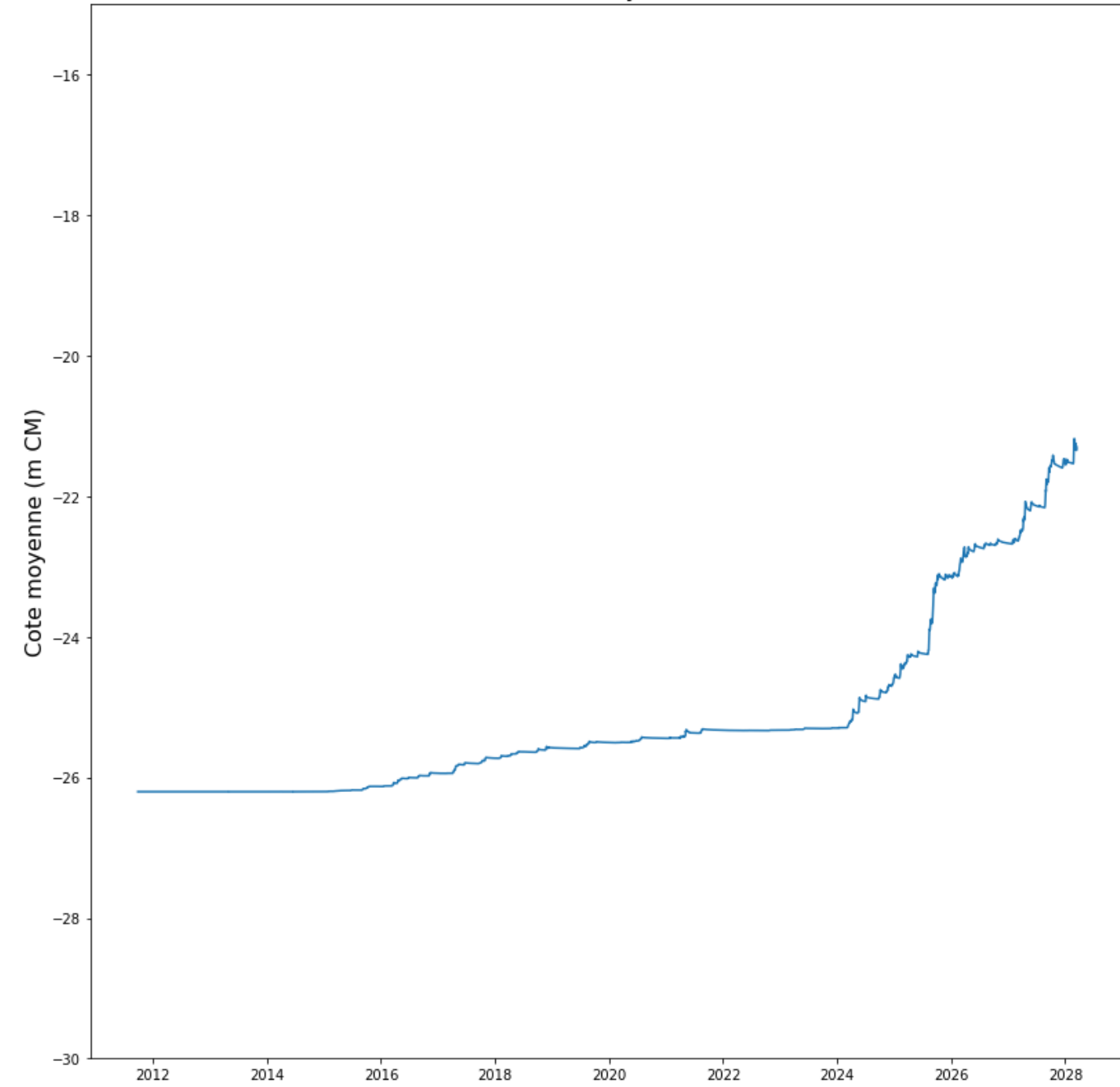




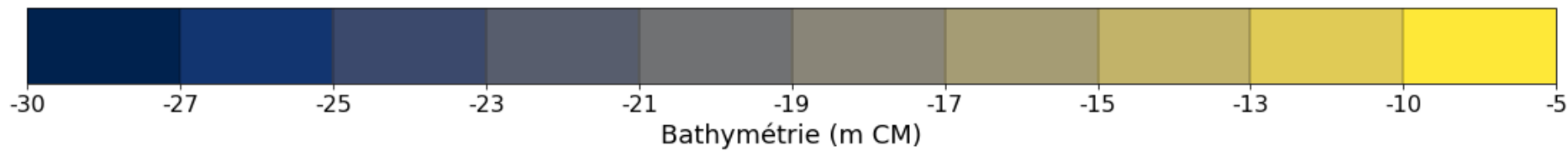
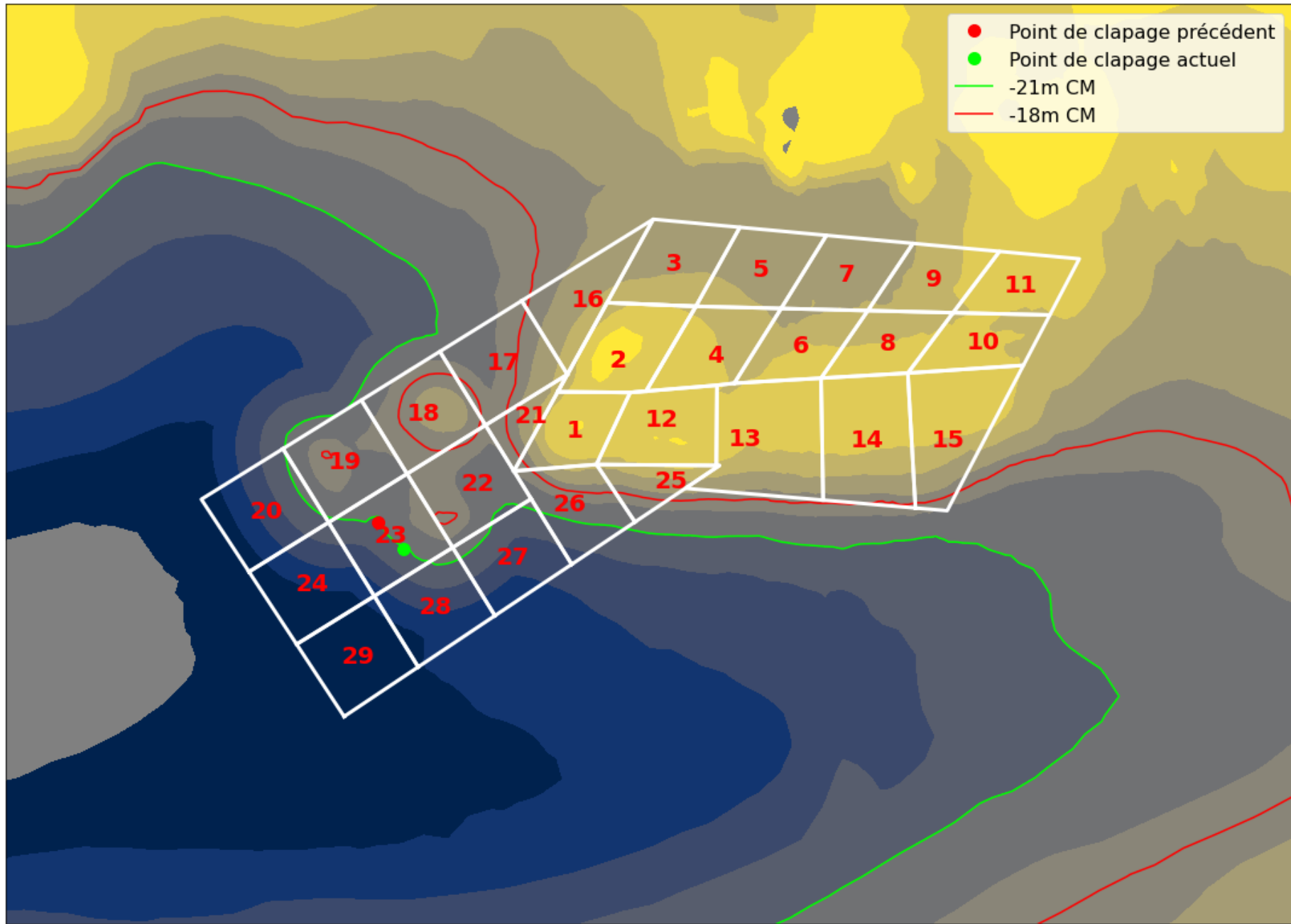


Date de changement de point : 14-03-2028

Evolution de la cote moyenne de la zone 23

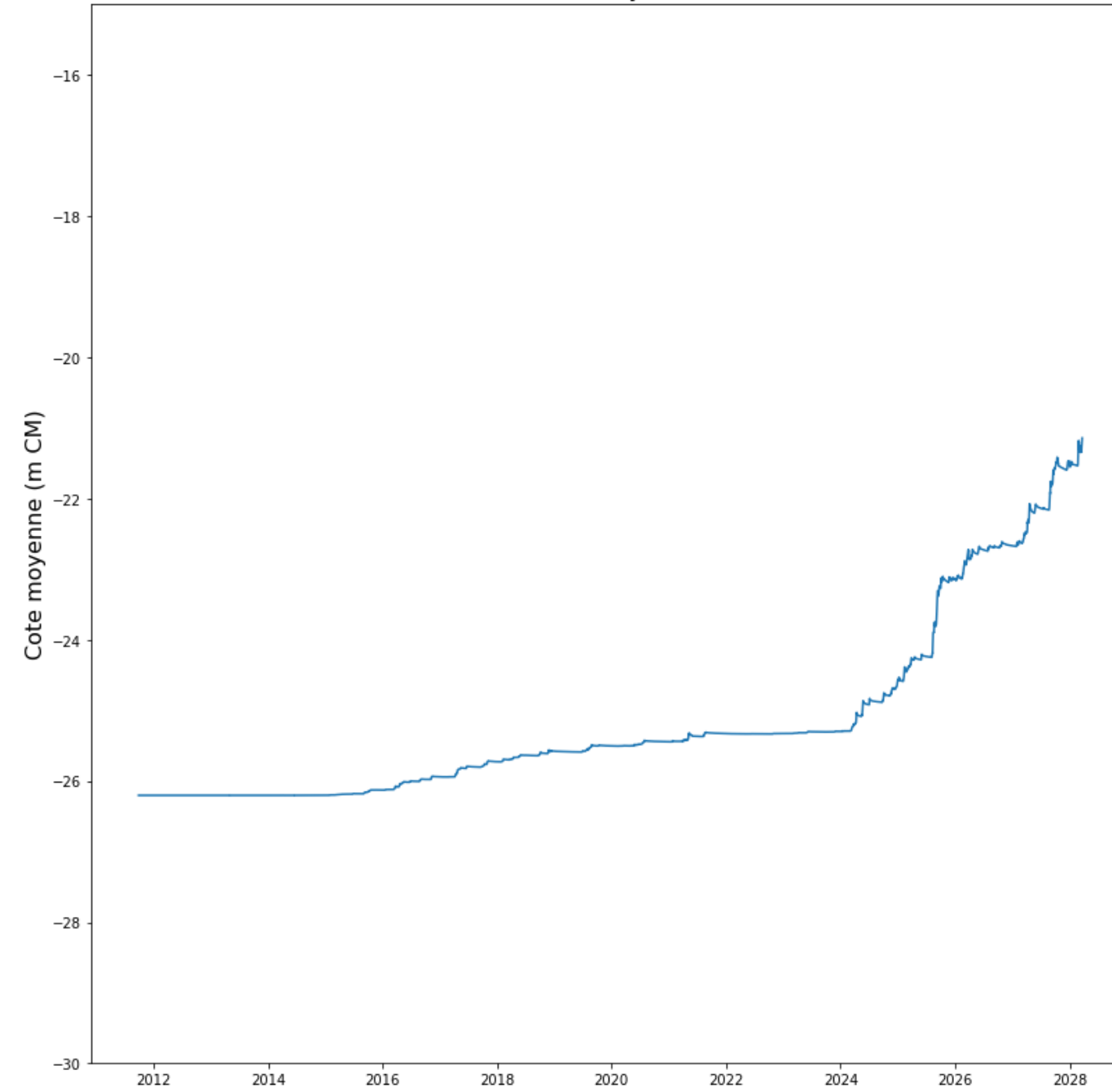


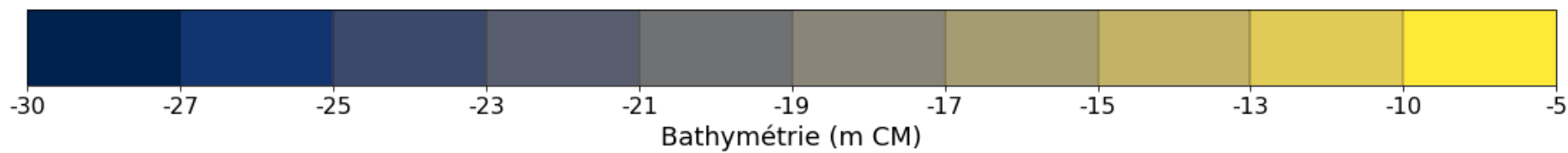
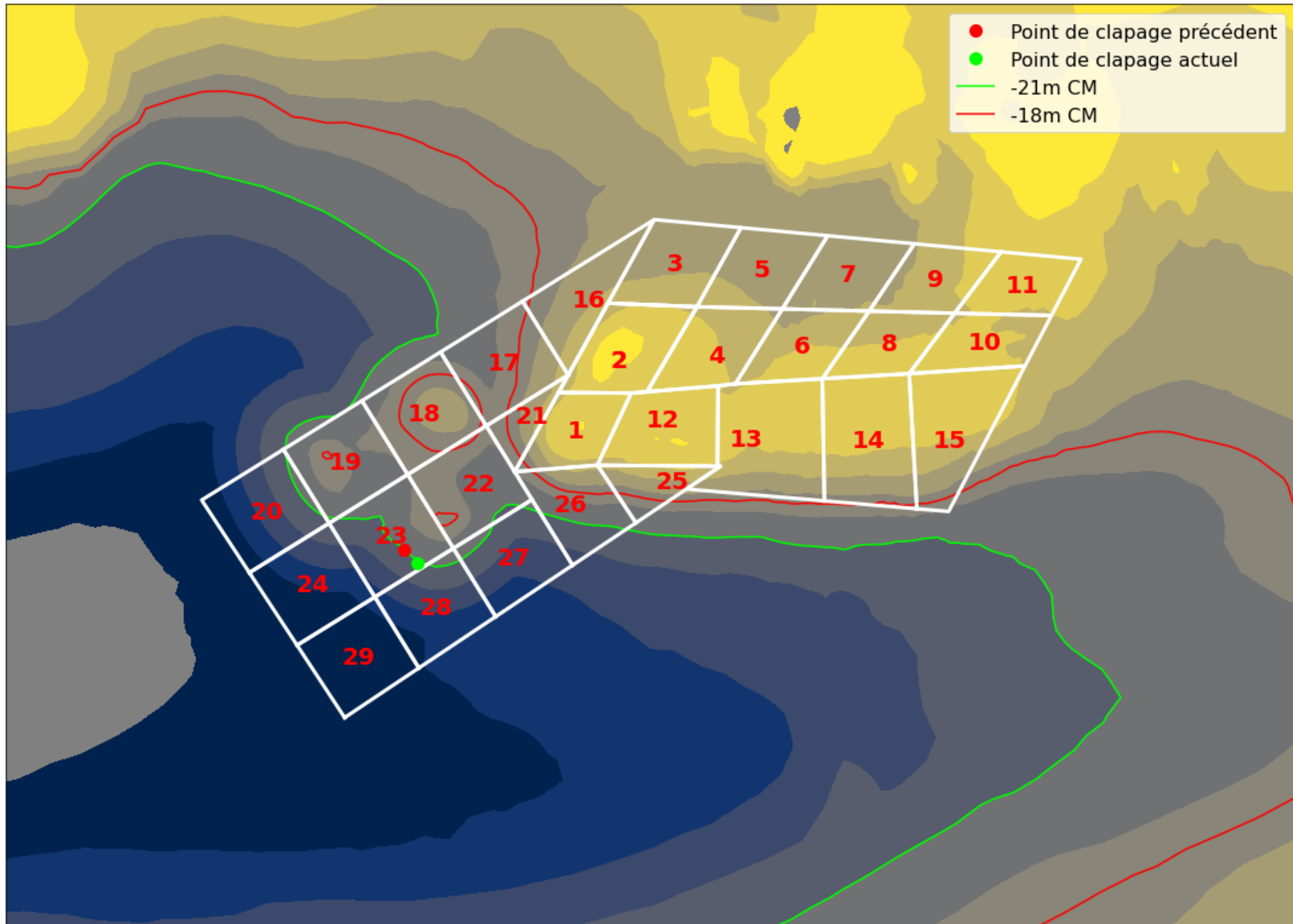




Date de changement de point : 22-03-2028

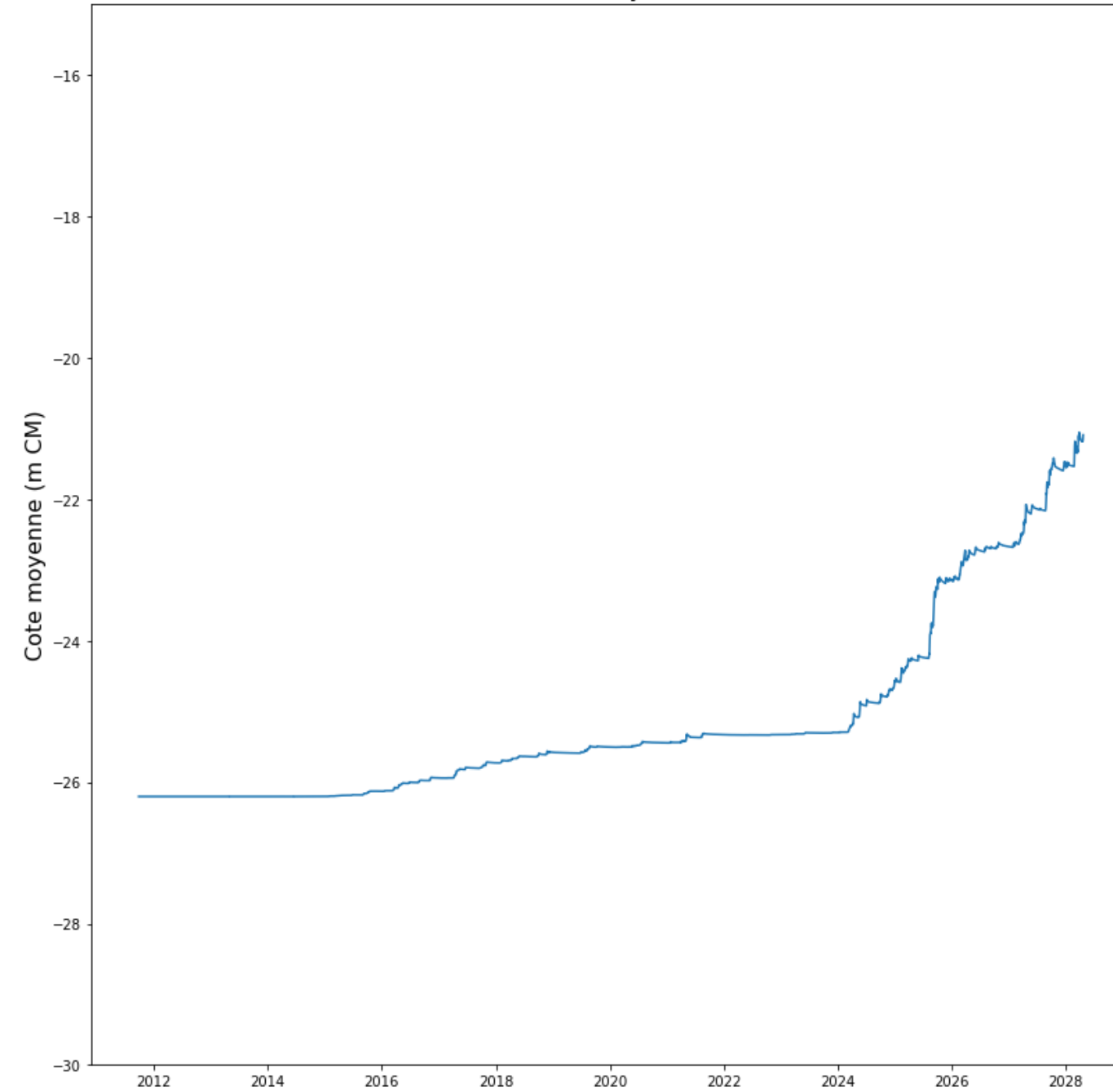
Evolution de la cote moyenne de la zone 23

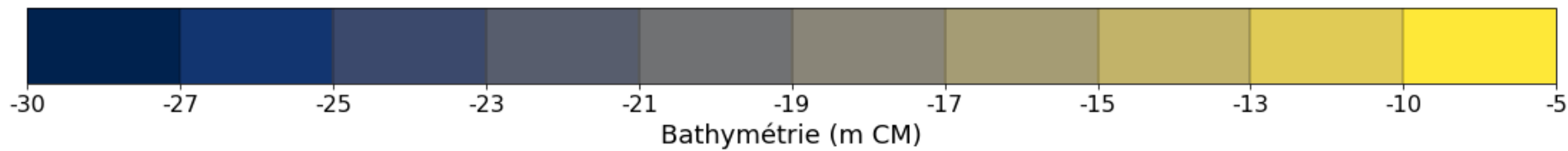
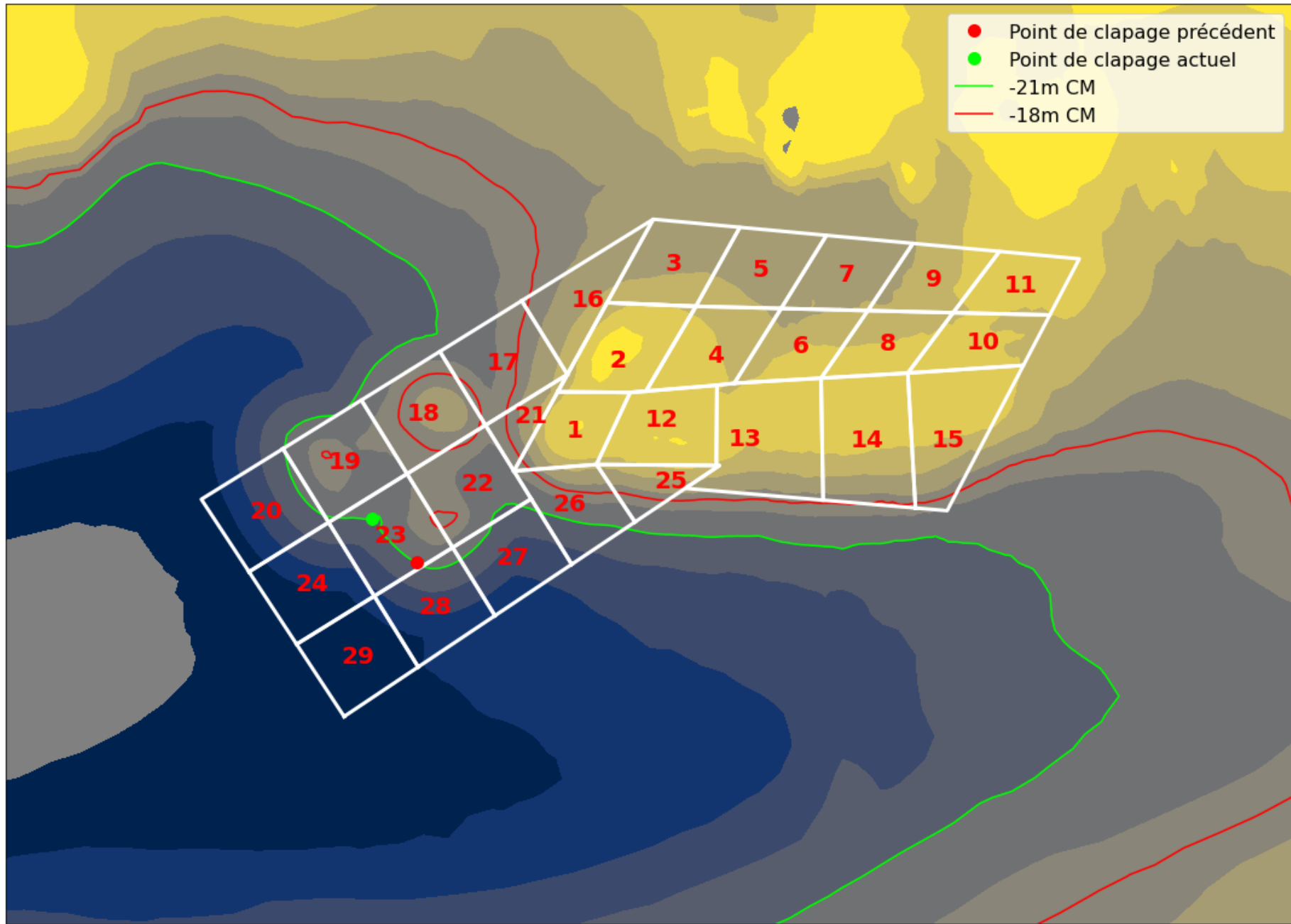




Date de changement de point : 21-04-2028

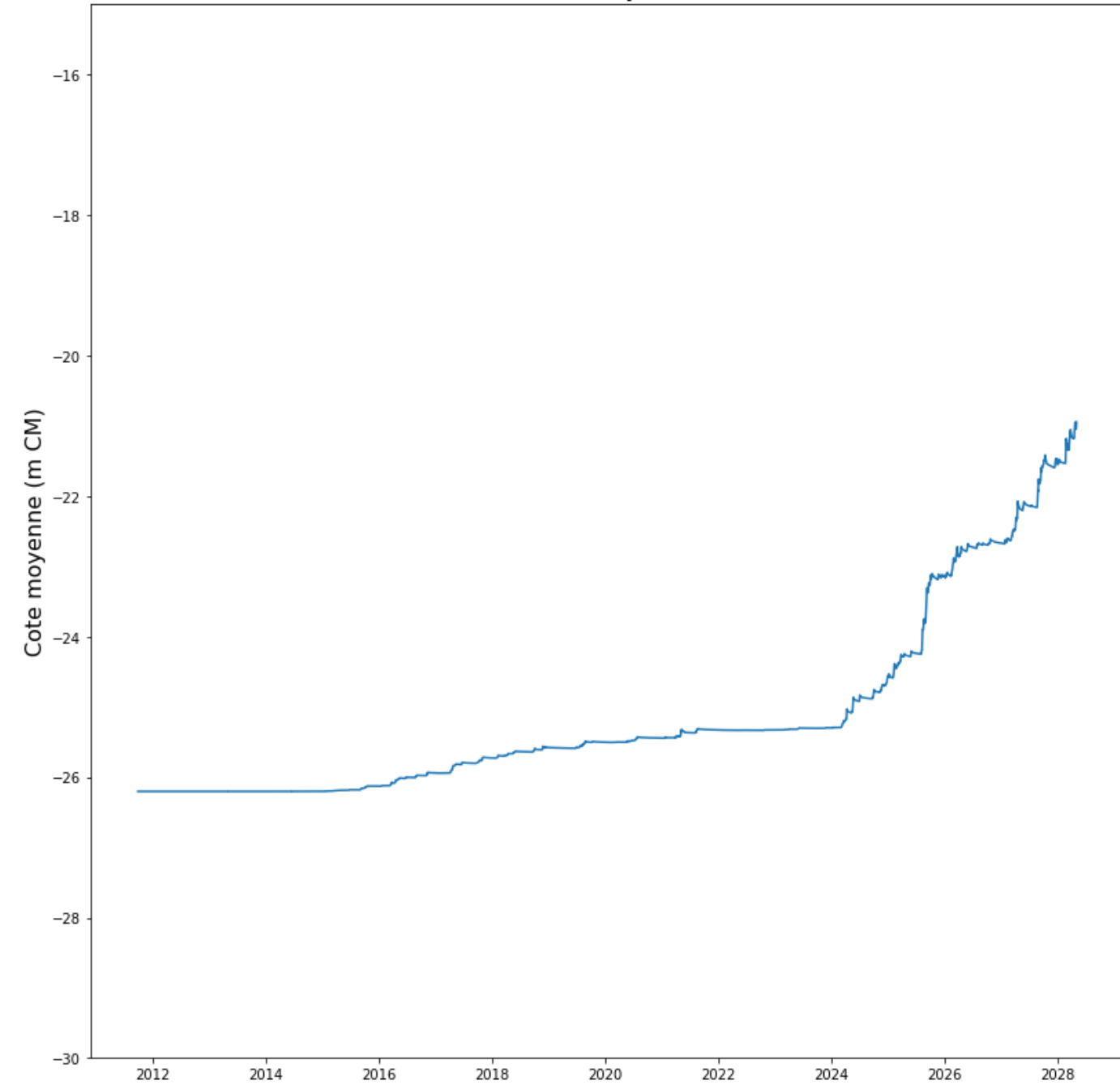
Evolution de la cote moyenne de la zone 23

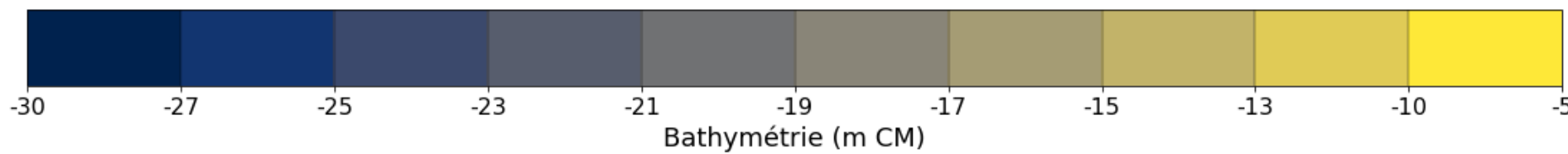
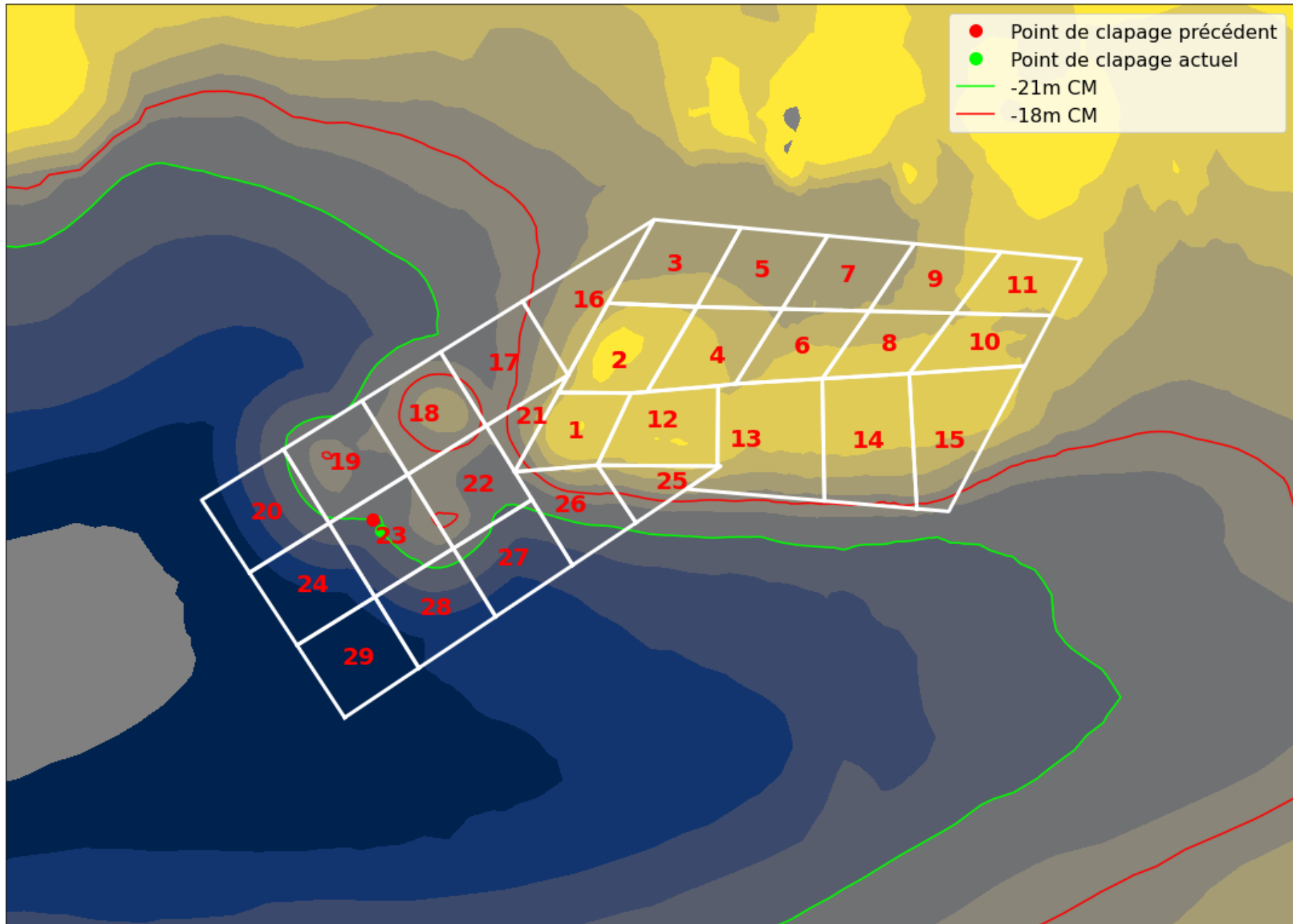




Date de changement de point : 05-05-2028

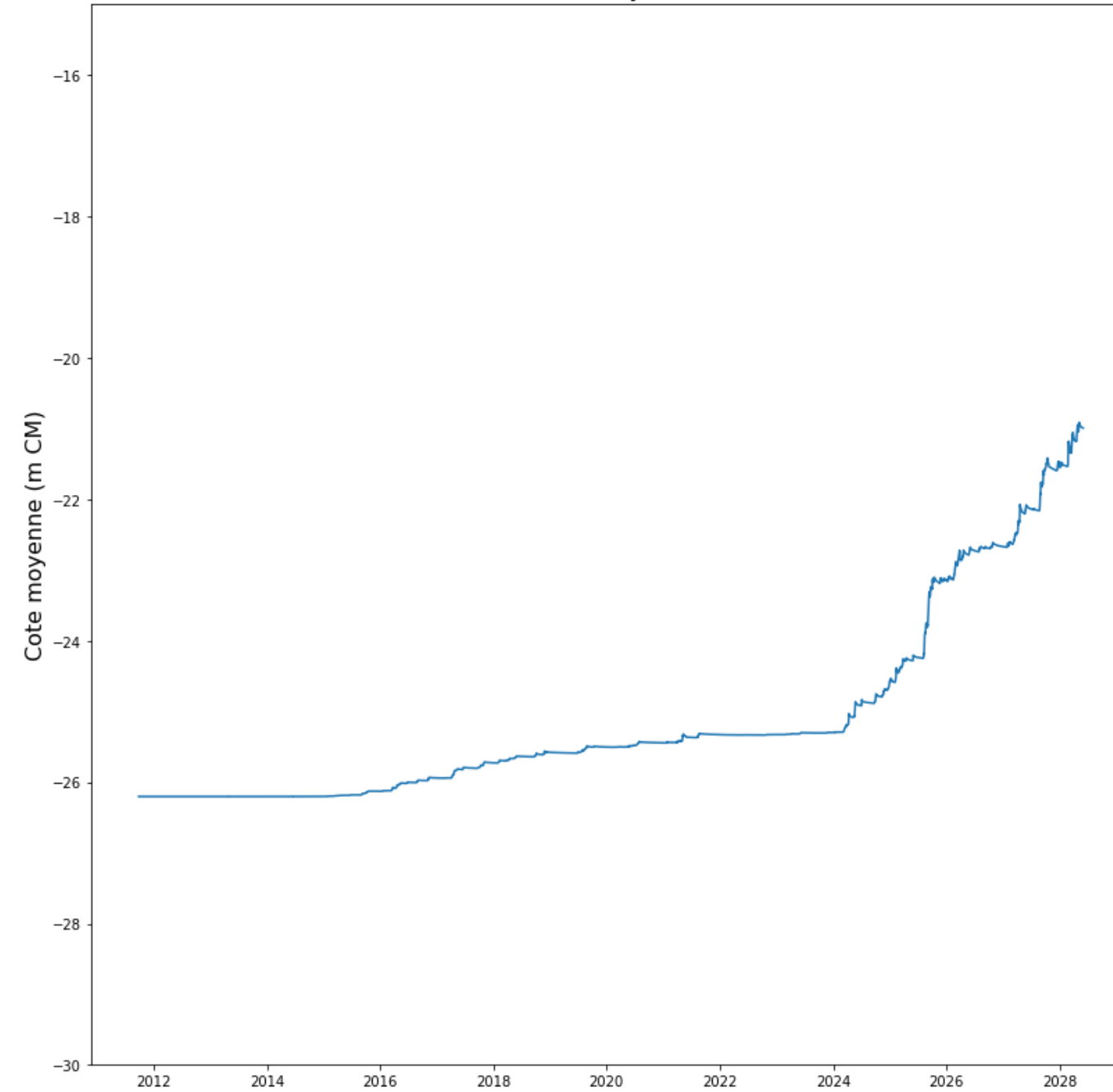
Evolution de la cote moyenne de la zone 23

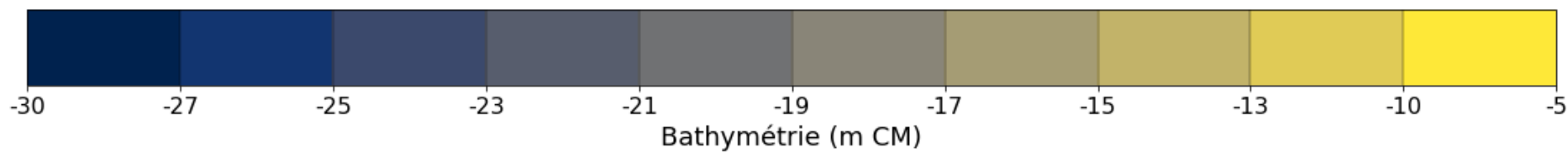
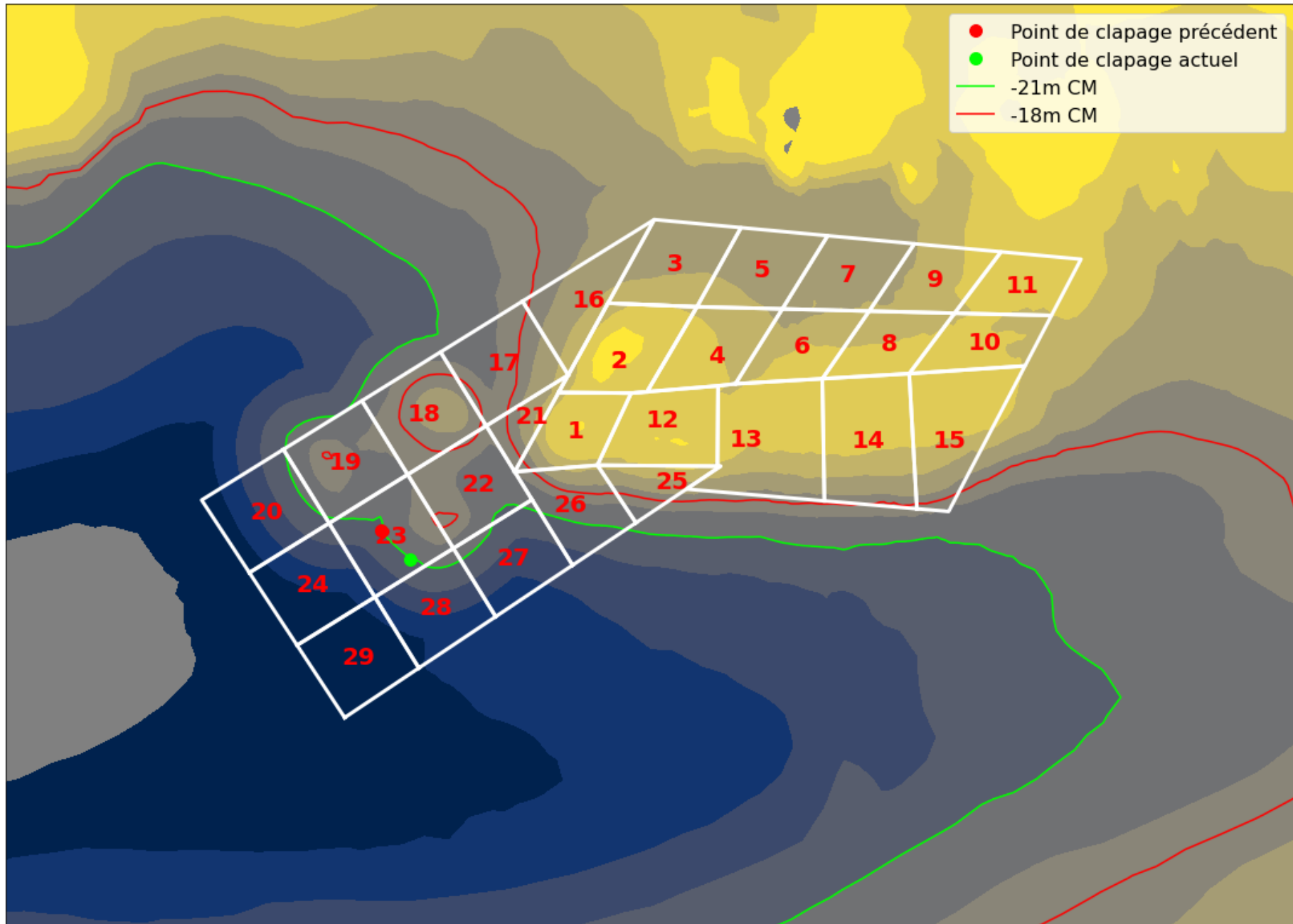




Date de changement de point : 01-06-2028

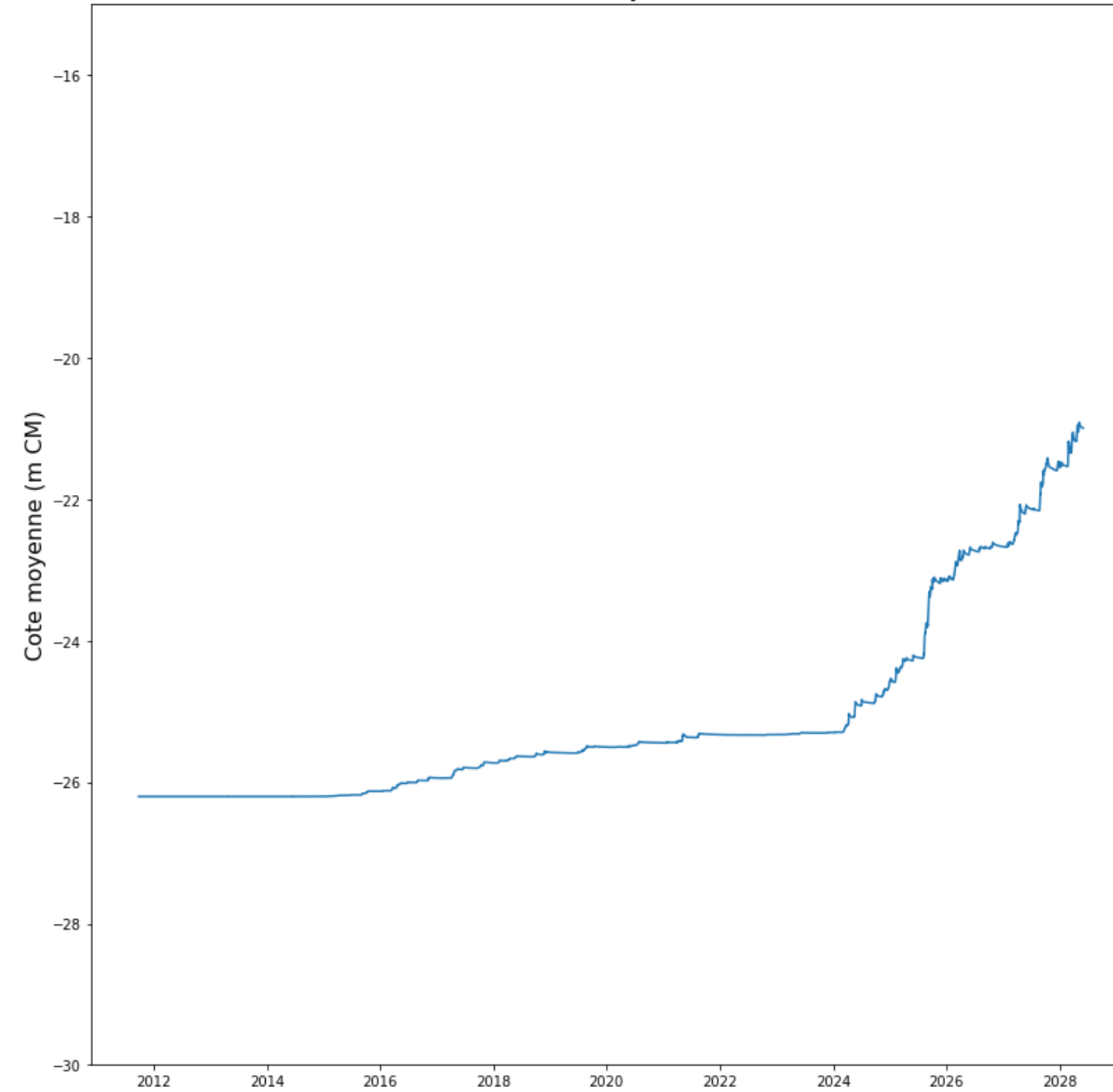
Evolution de la cote moyenne de la zone 23

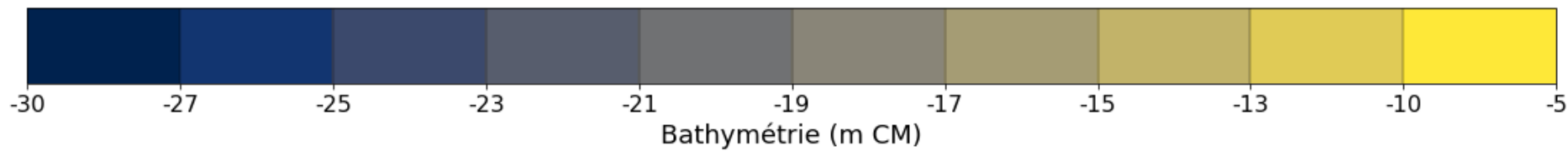
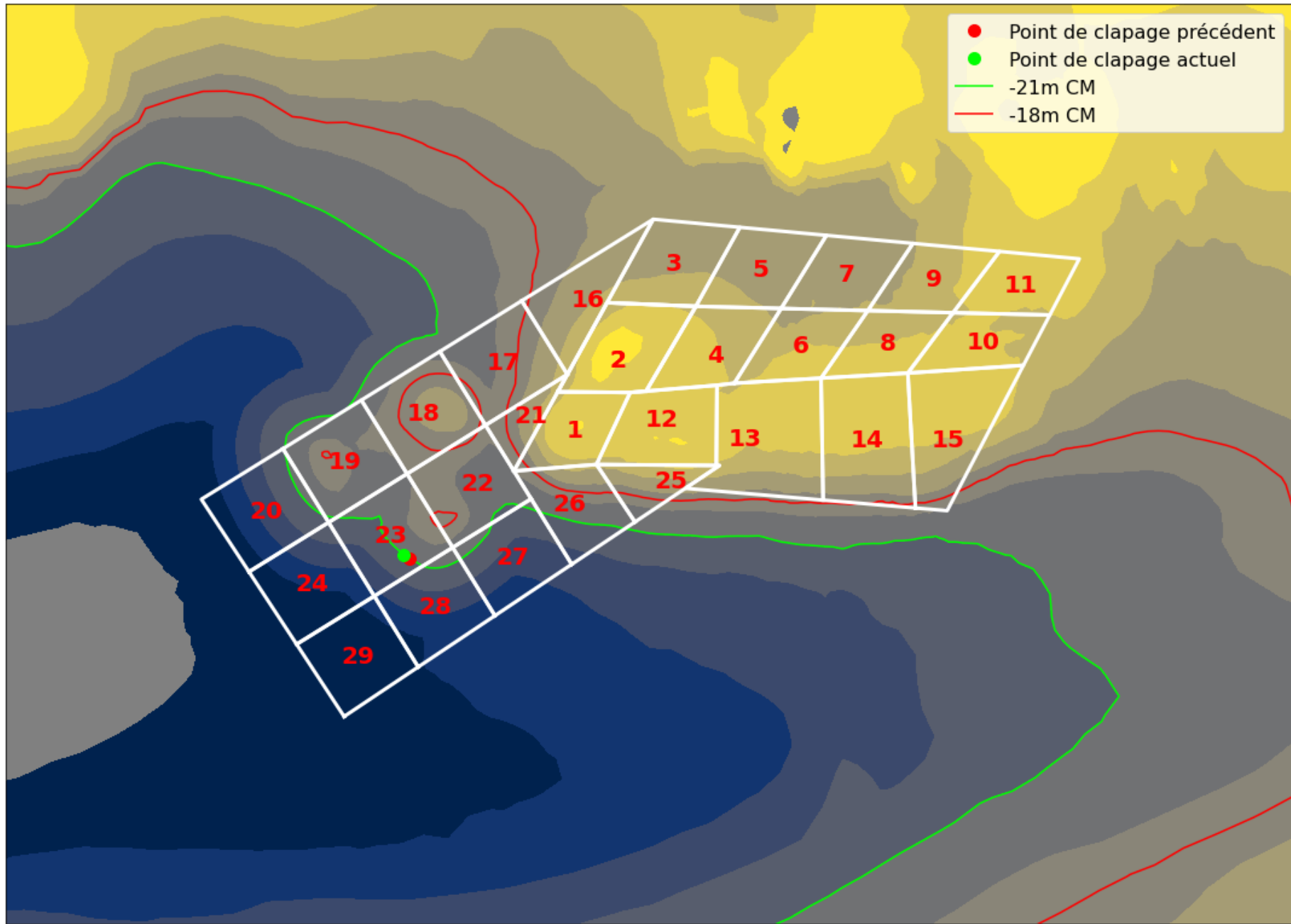




Date de changement de point : 01-06-2028

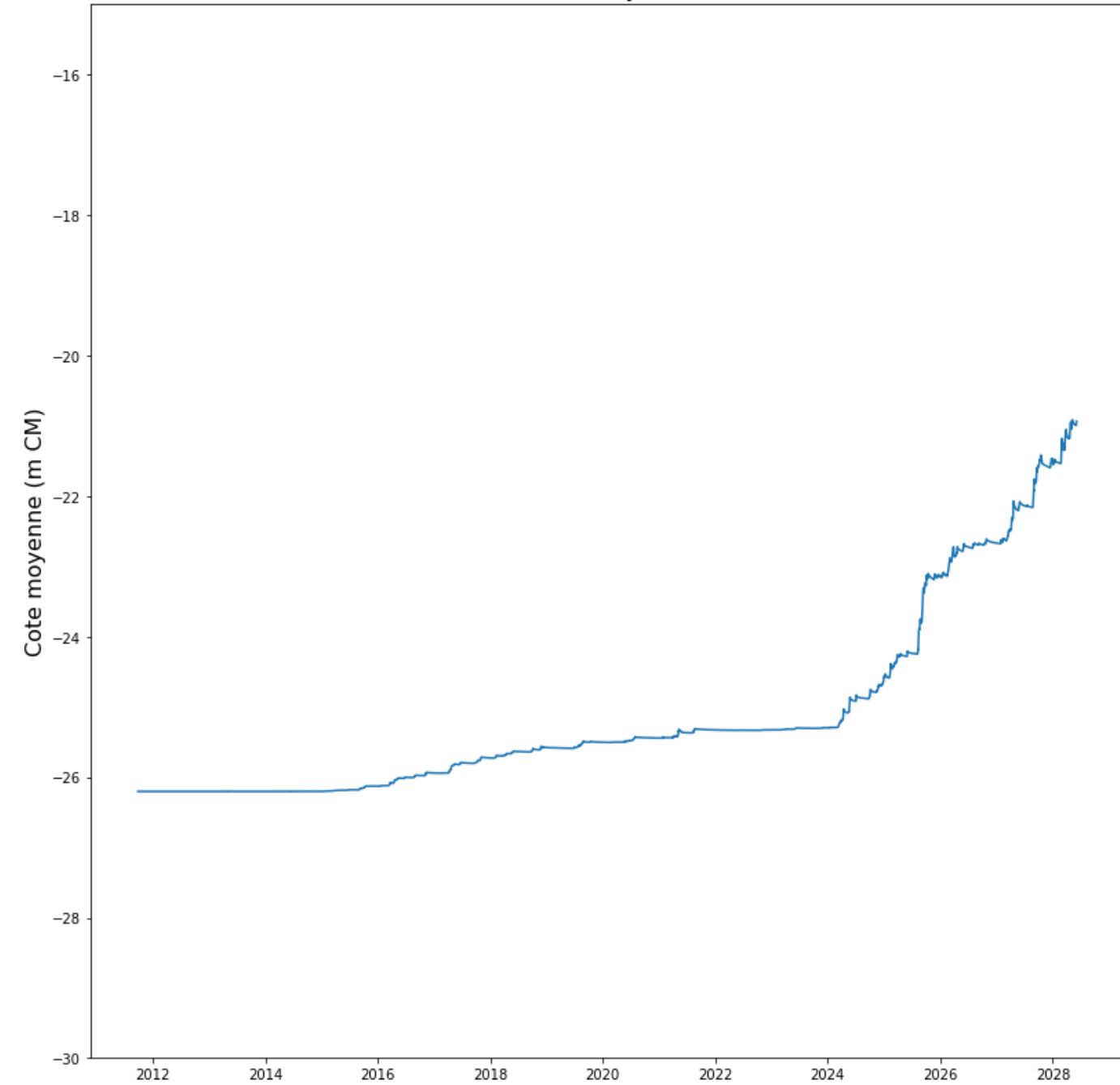
Evolution de la cote moyenne de la zone 23



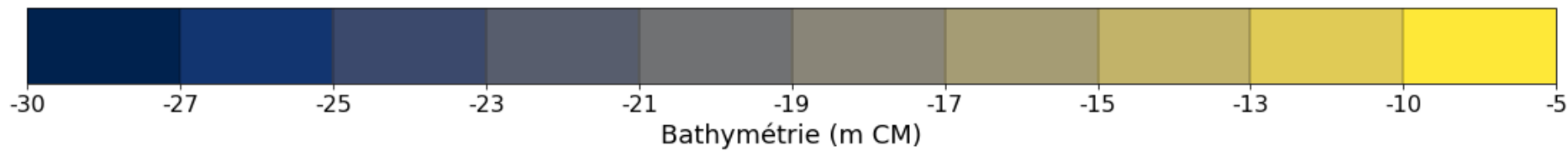
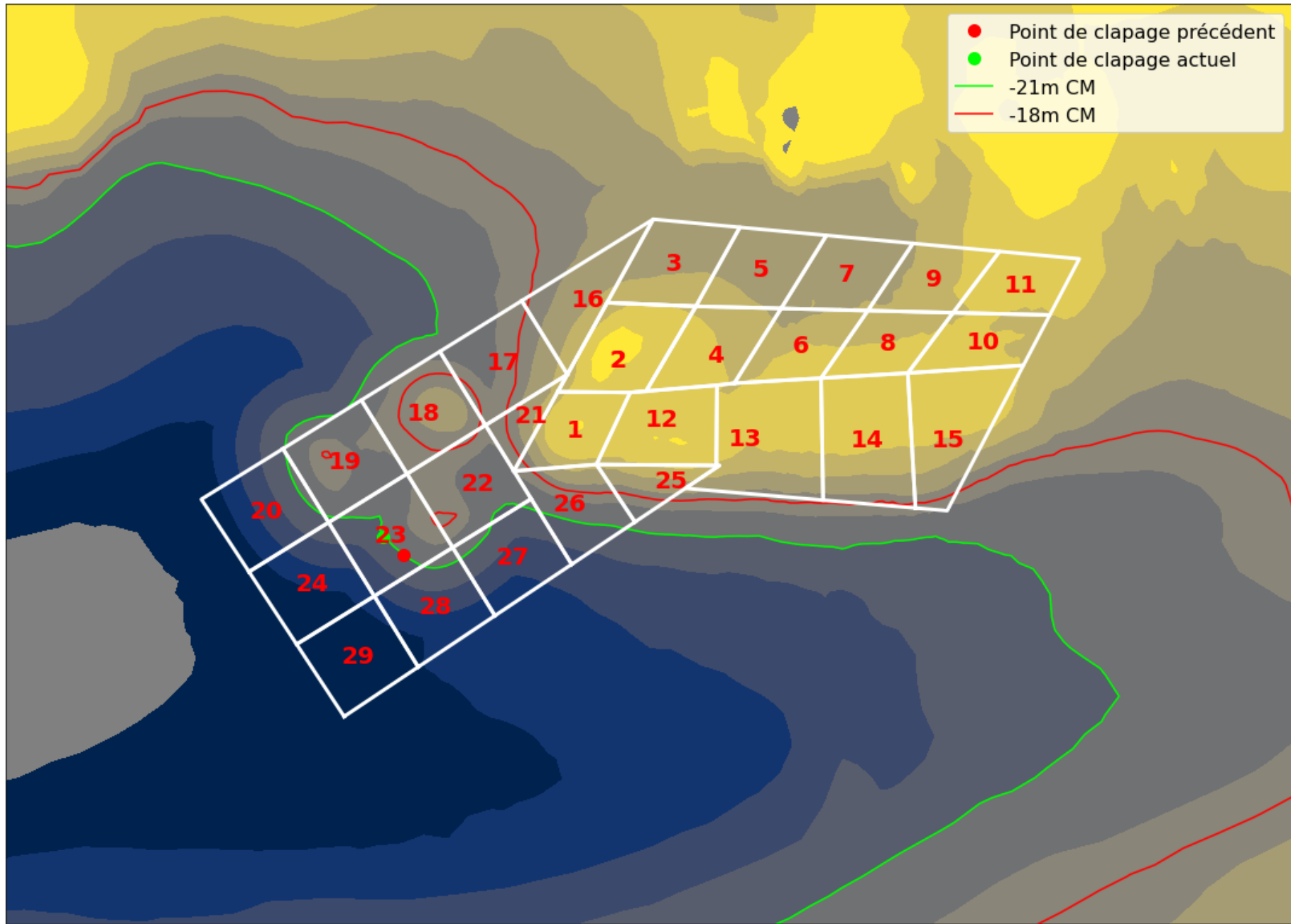


Date de changement de point : 03-06-2028

Evolution de la cote moyenne de la zone 23

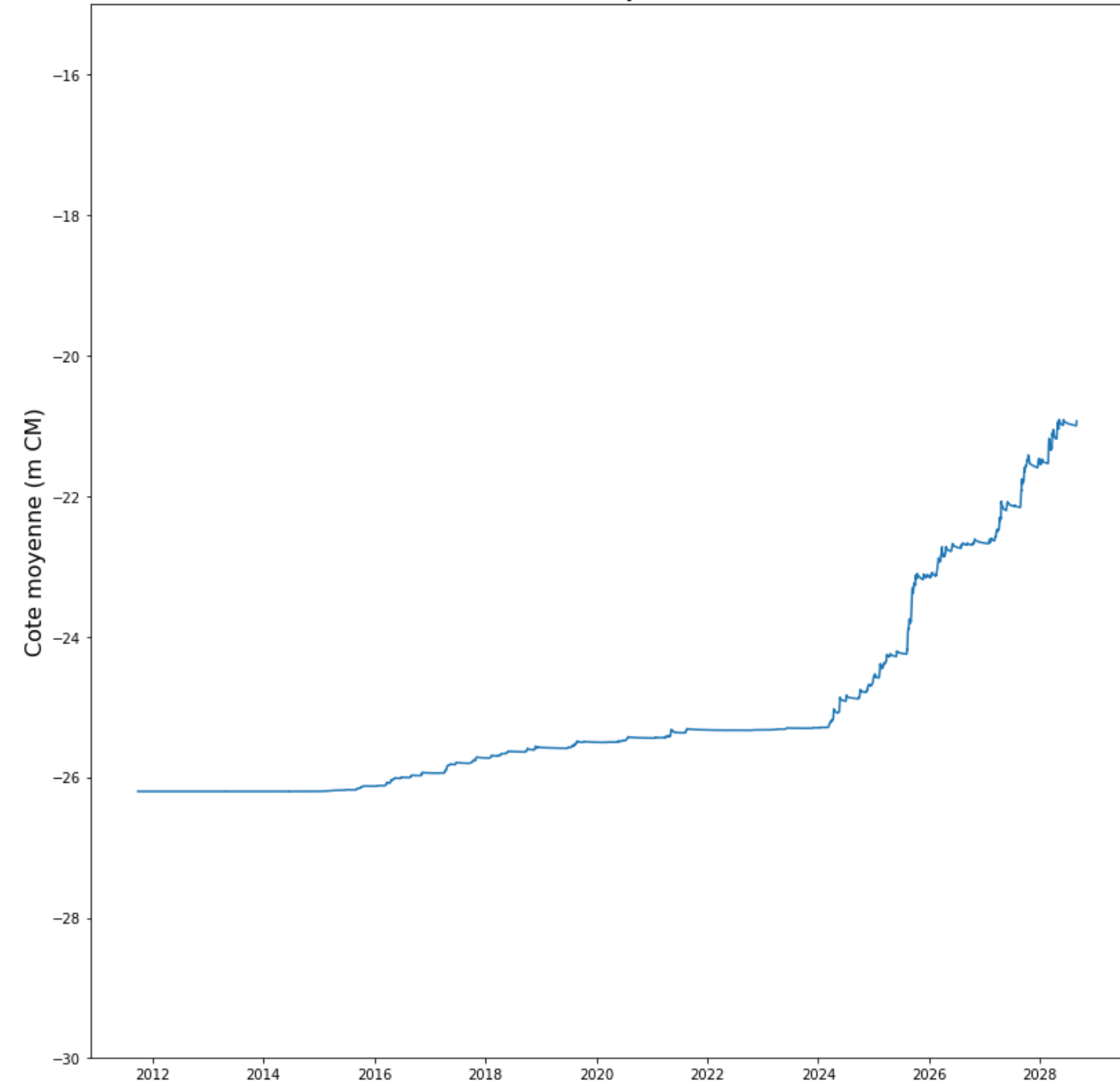


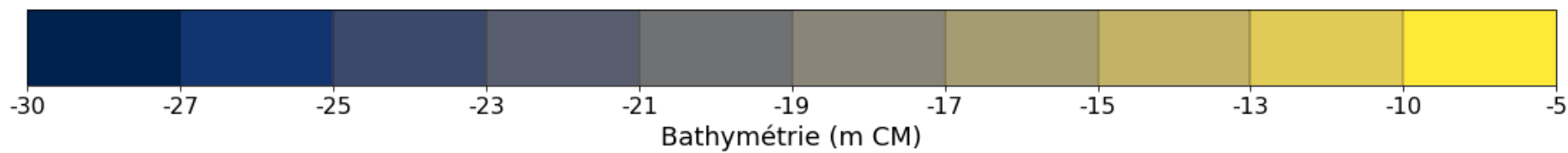
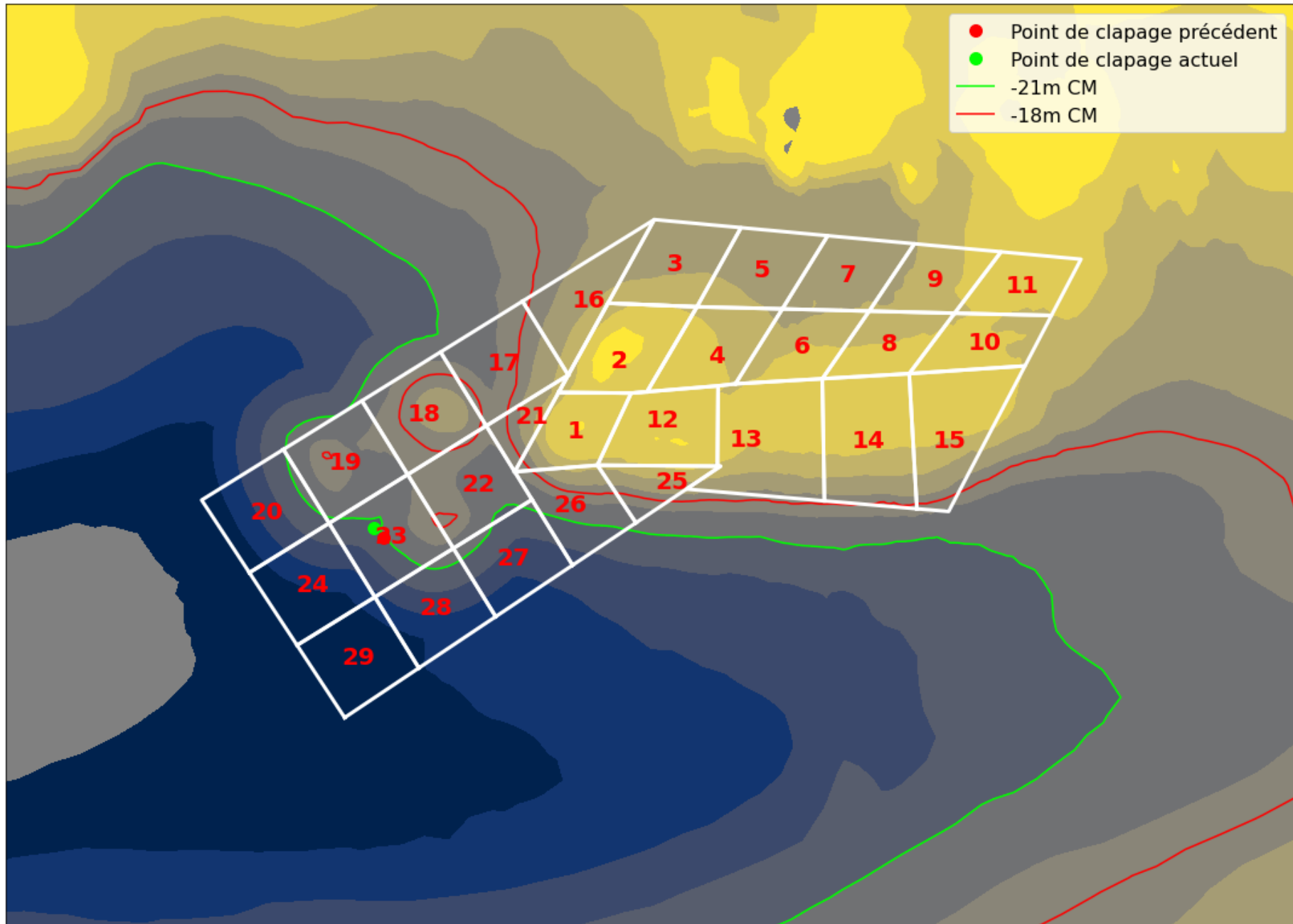




Date de changement de point : 28-08-2028

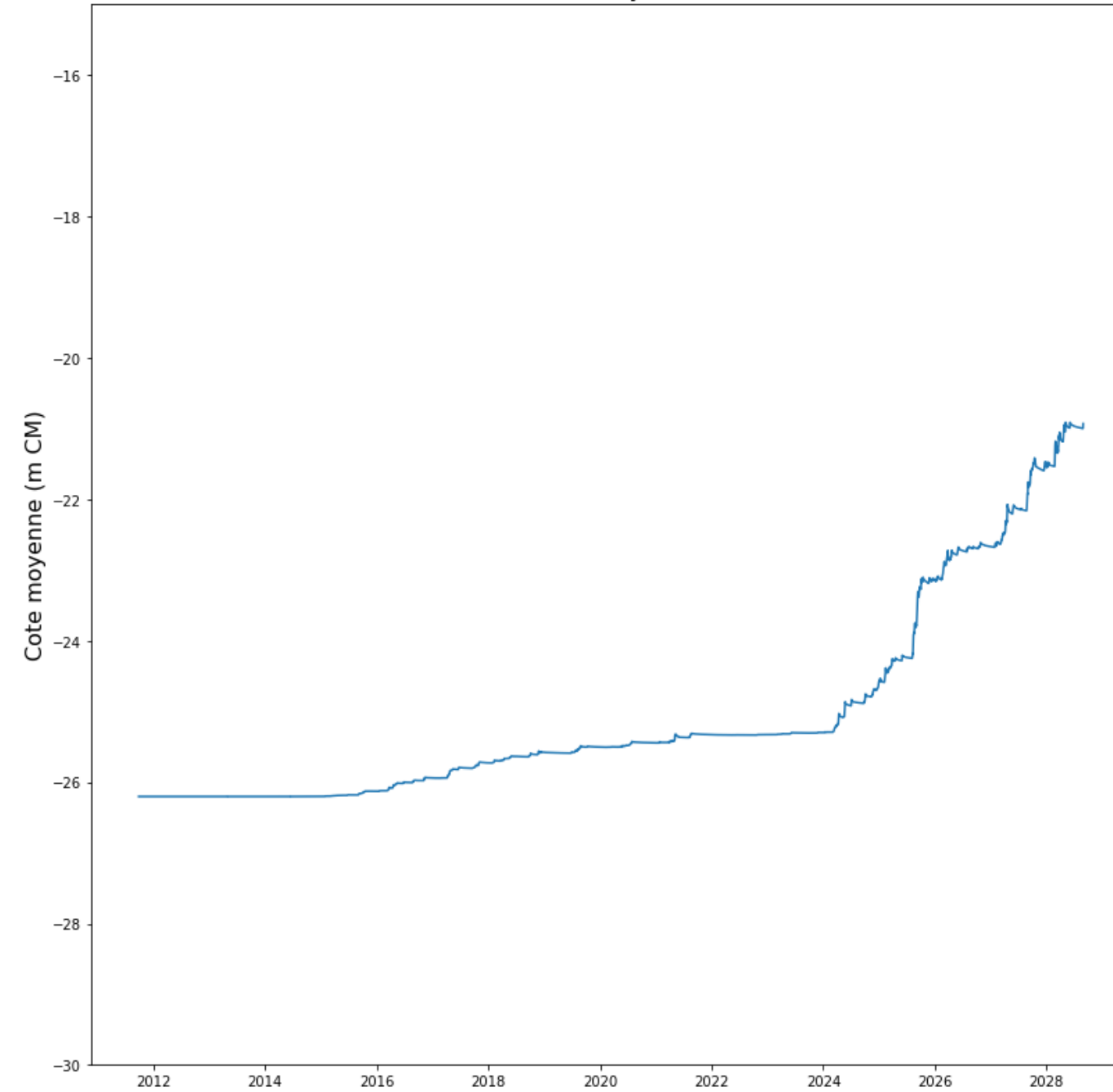
Evolution de la cote moyenne de la zone 23

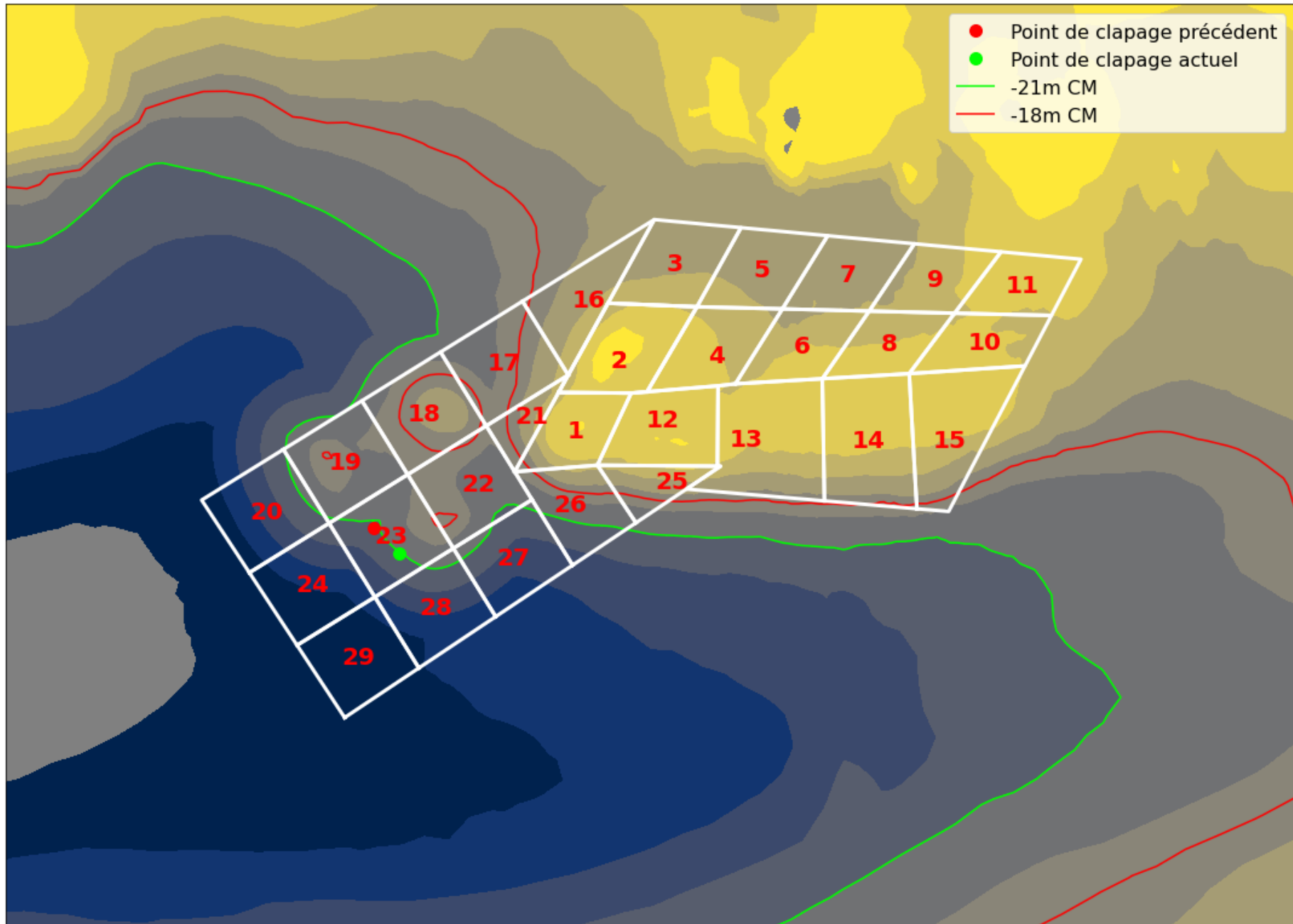




Date de changement de point : 29-08-2028

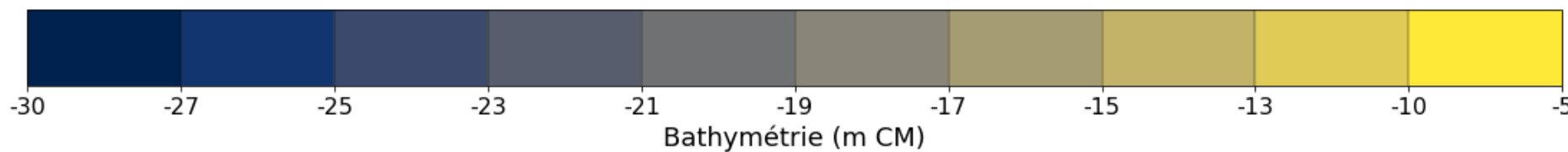
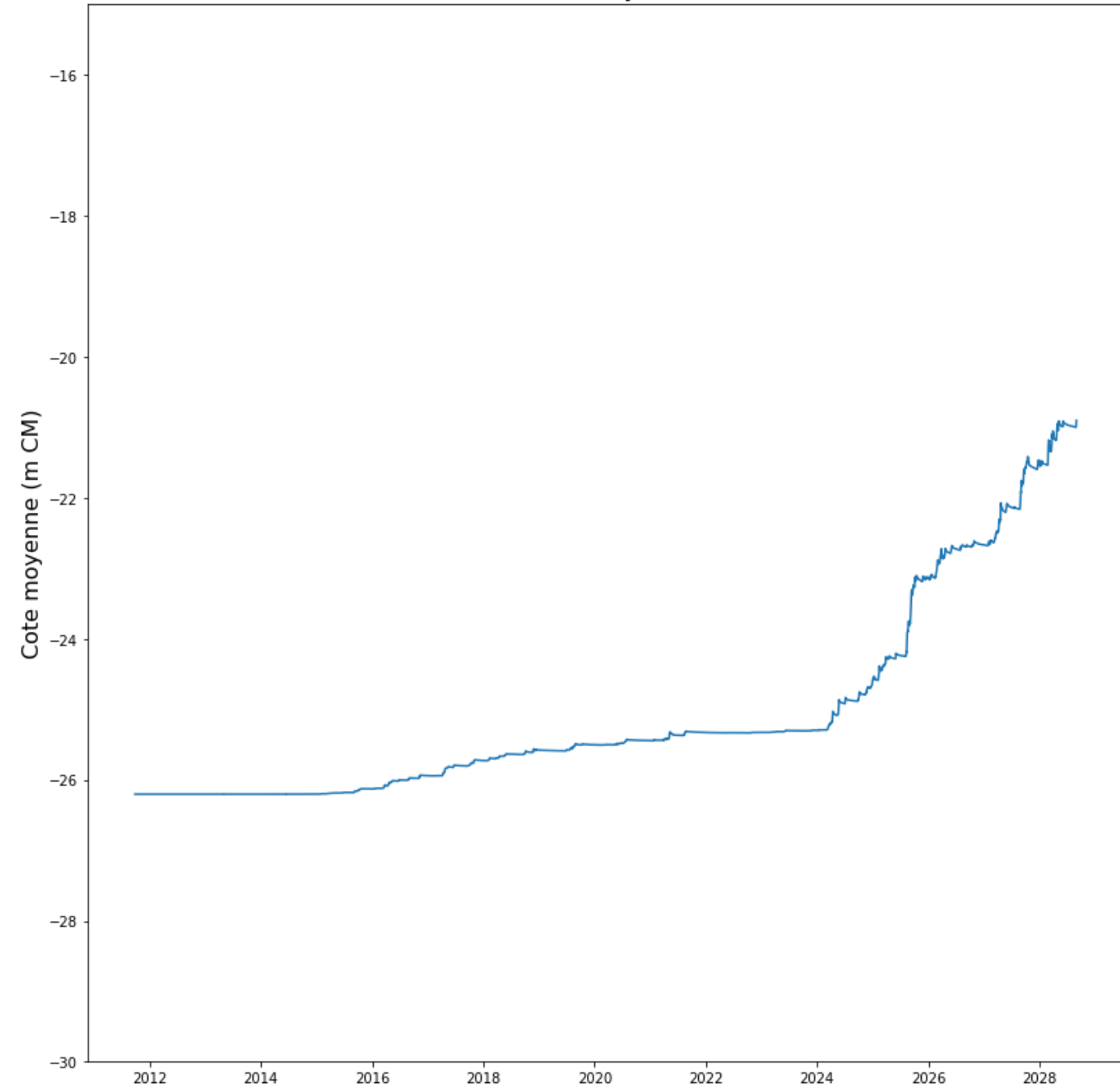
Evolution de la cote moyenne de la zone 23

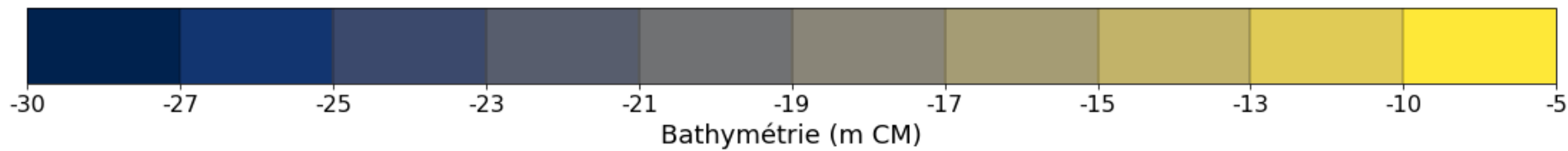
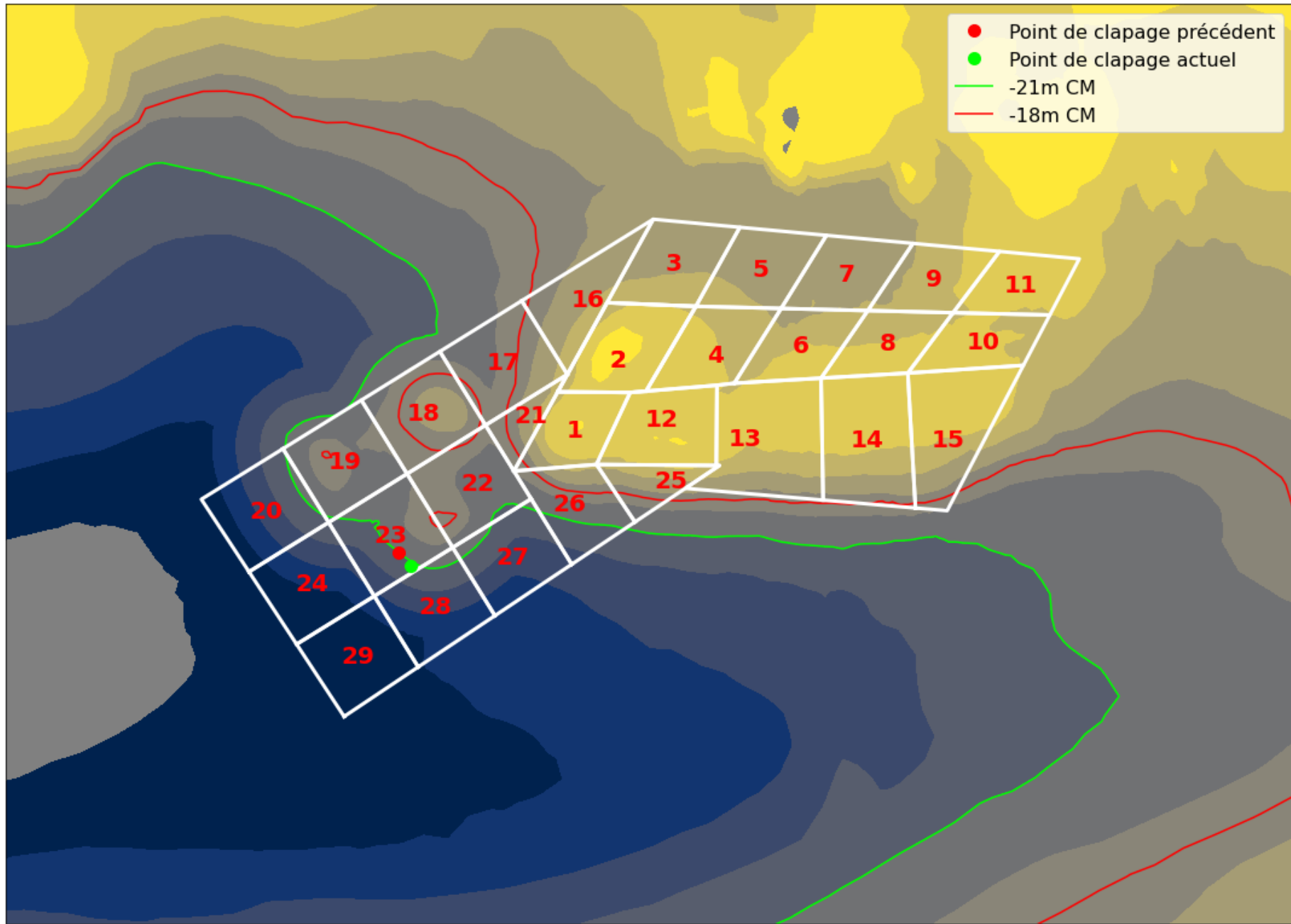




Date de changement de point : 30-08-2028

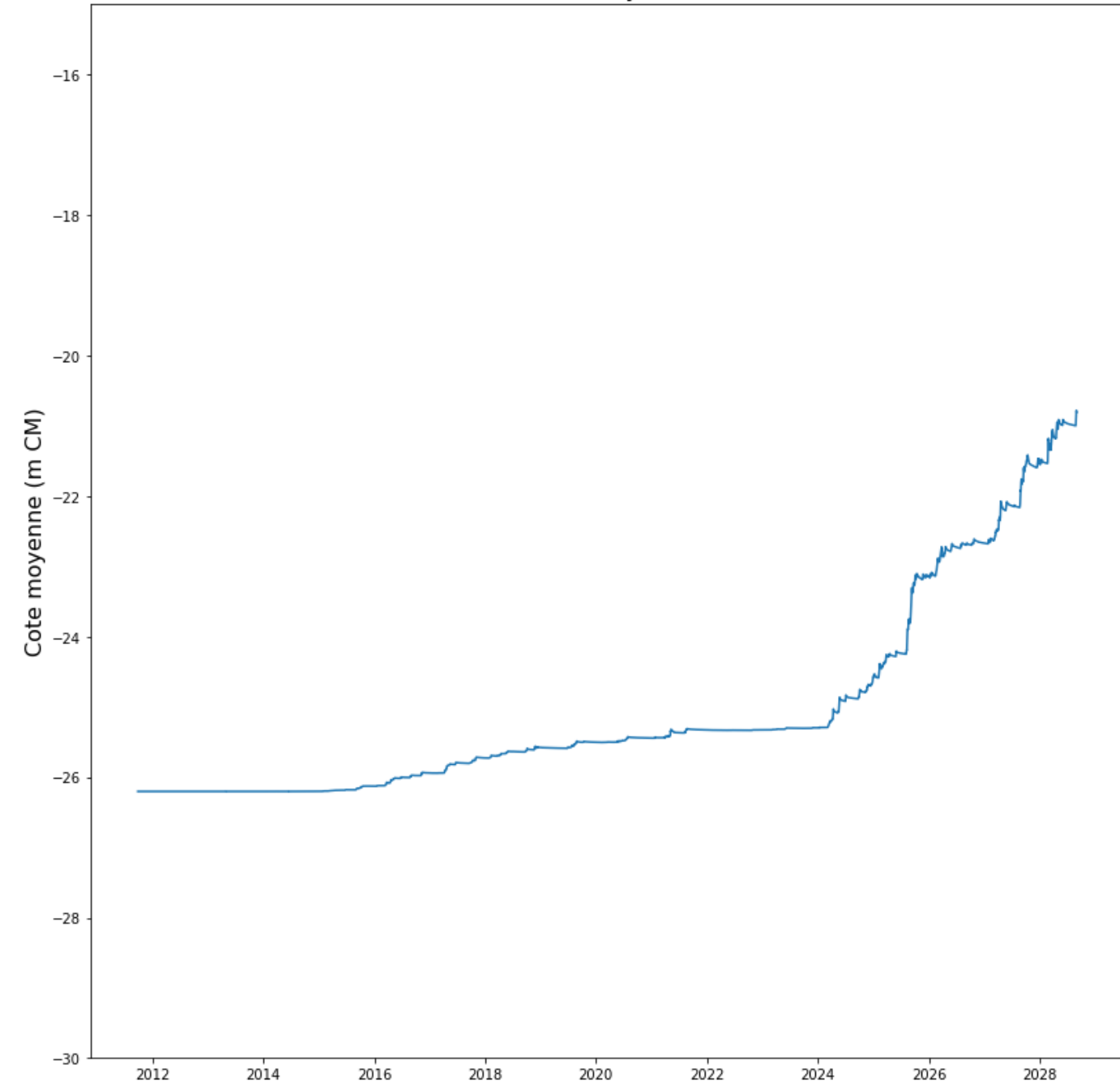
Evolution de la cote moyenne de la zone 23

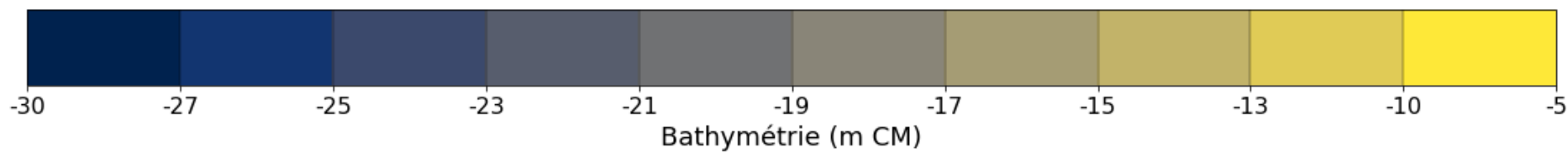
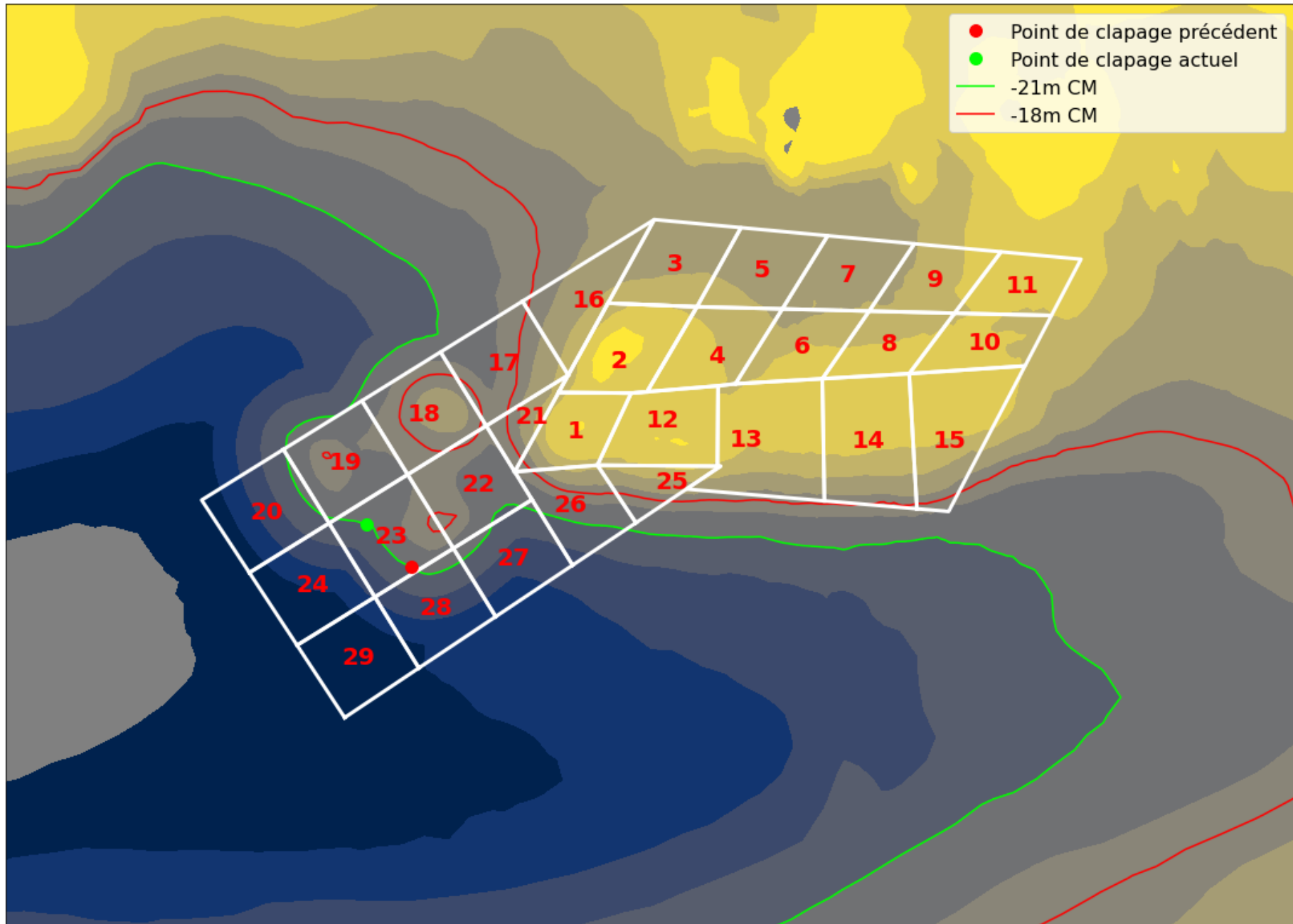




Date de changement de point : 02-09-2028

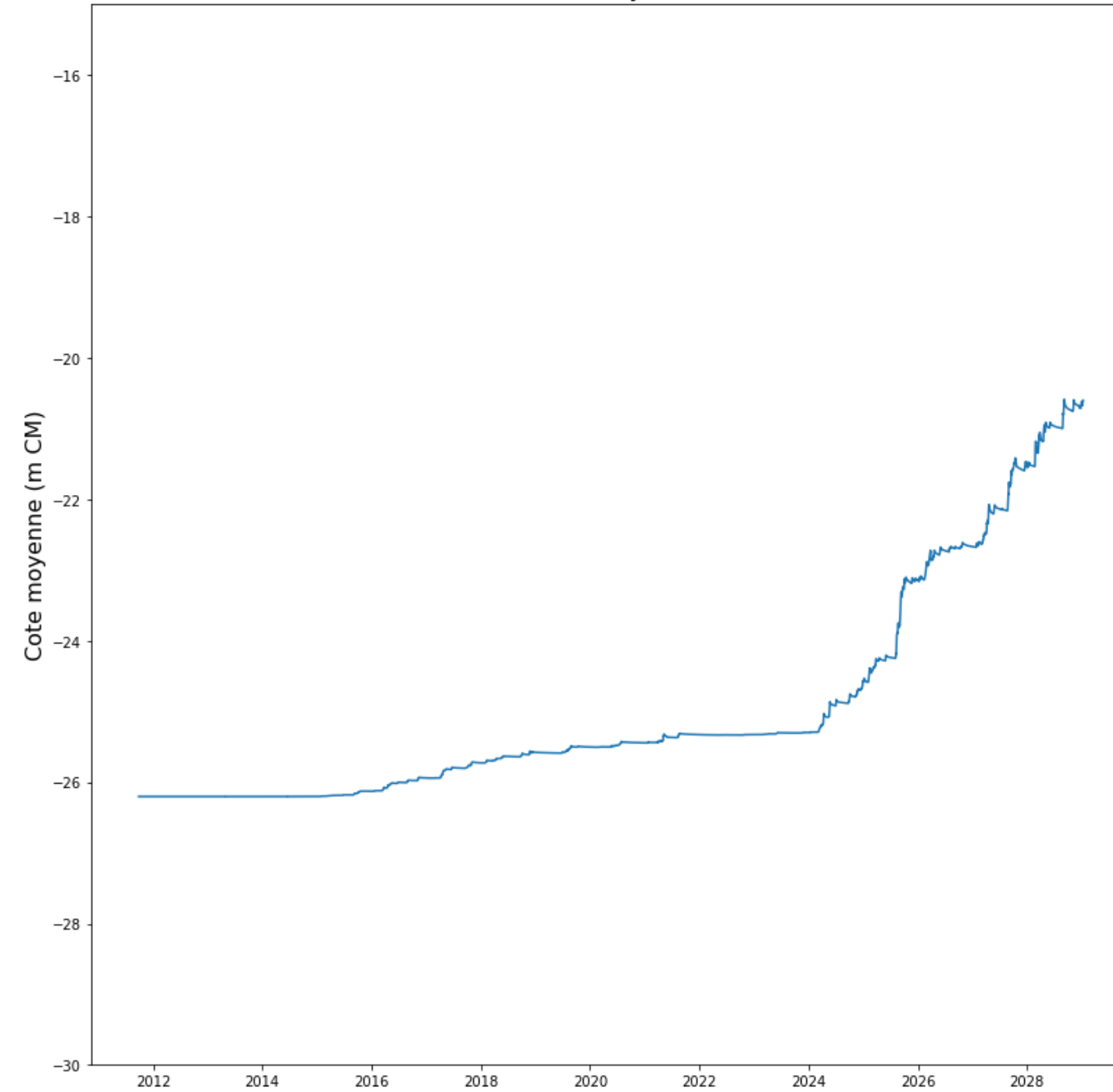
Evolution de la cote moyenne de la zone 23

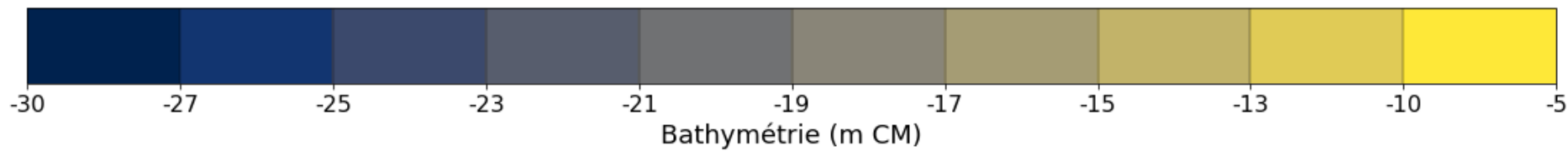
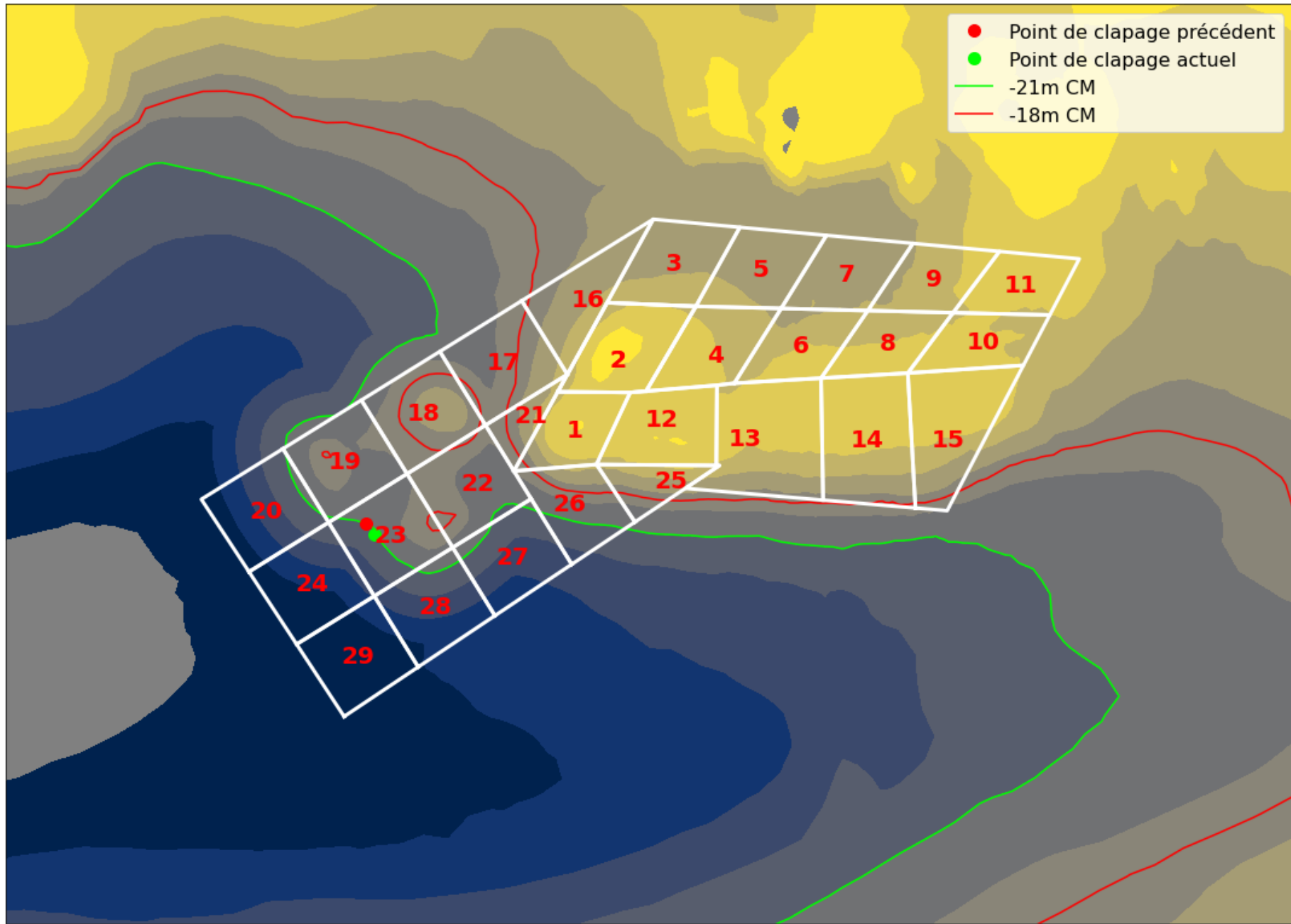




Date de changement de point : 11-01-2029

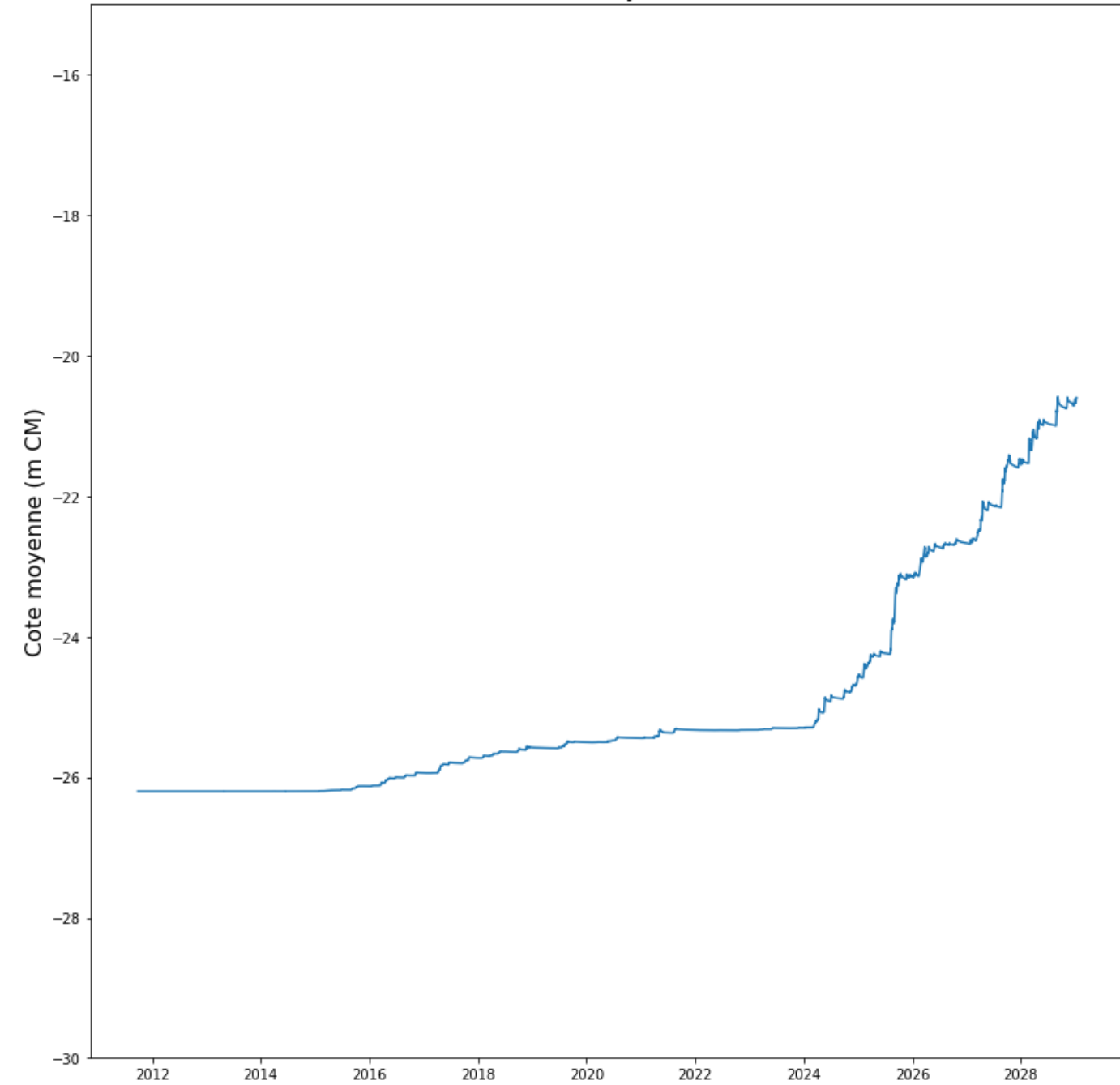
Evolution de la cote moyenne de la zone 23



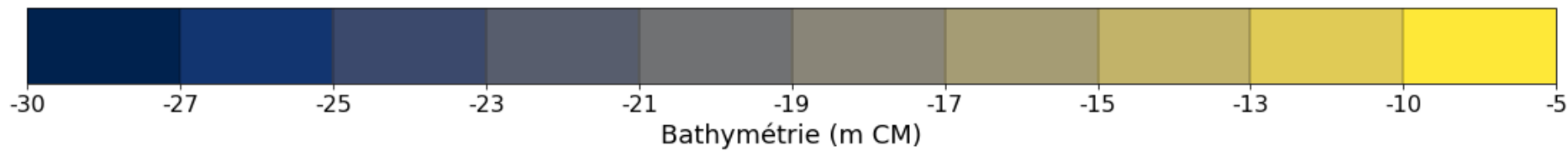
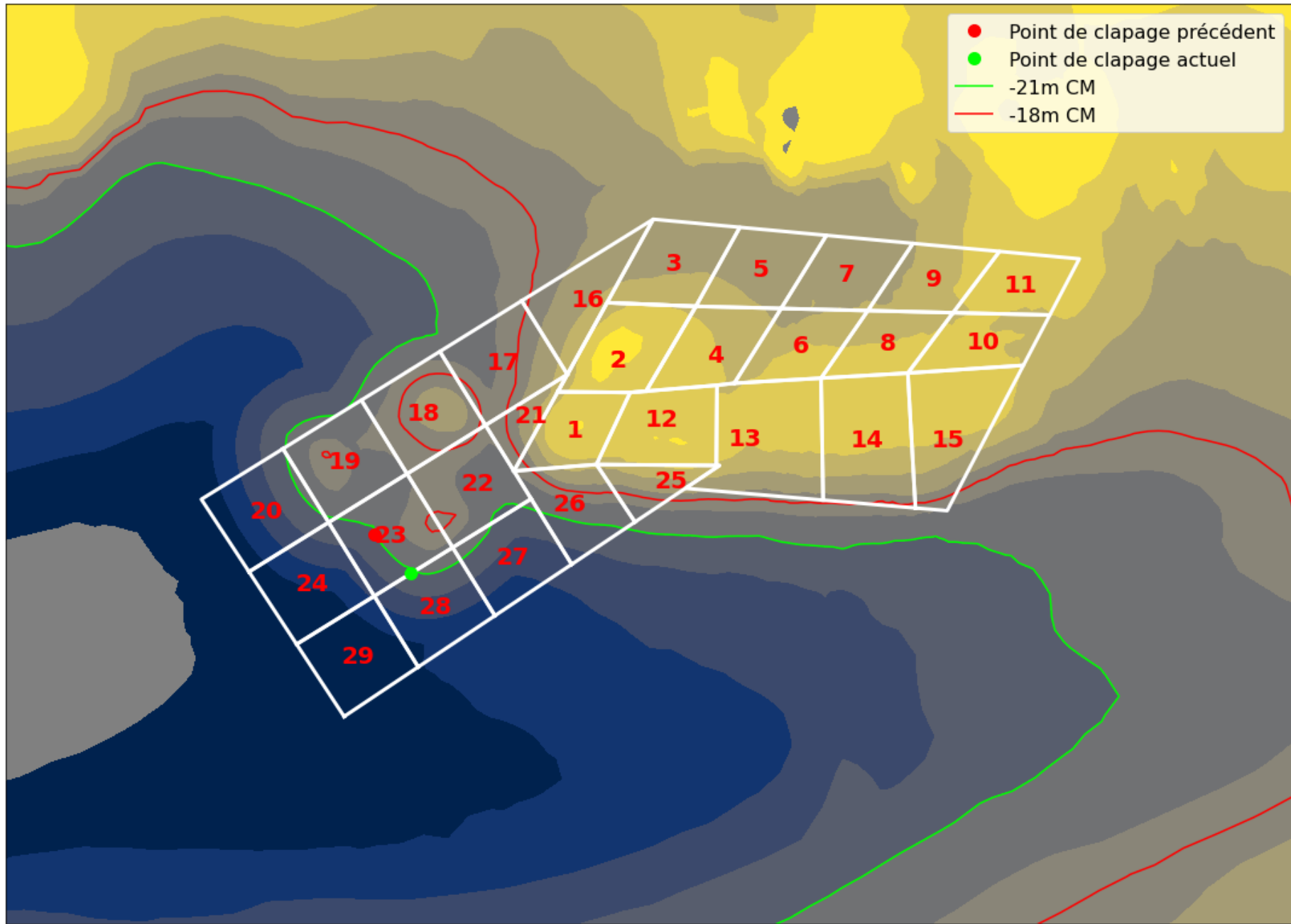


Date de changement de point : 12-01-2029

Evolution de la cote moyenne de la zone 23

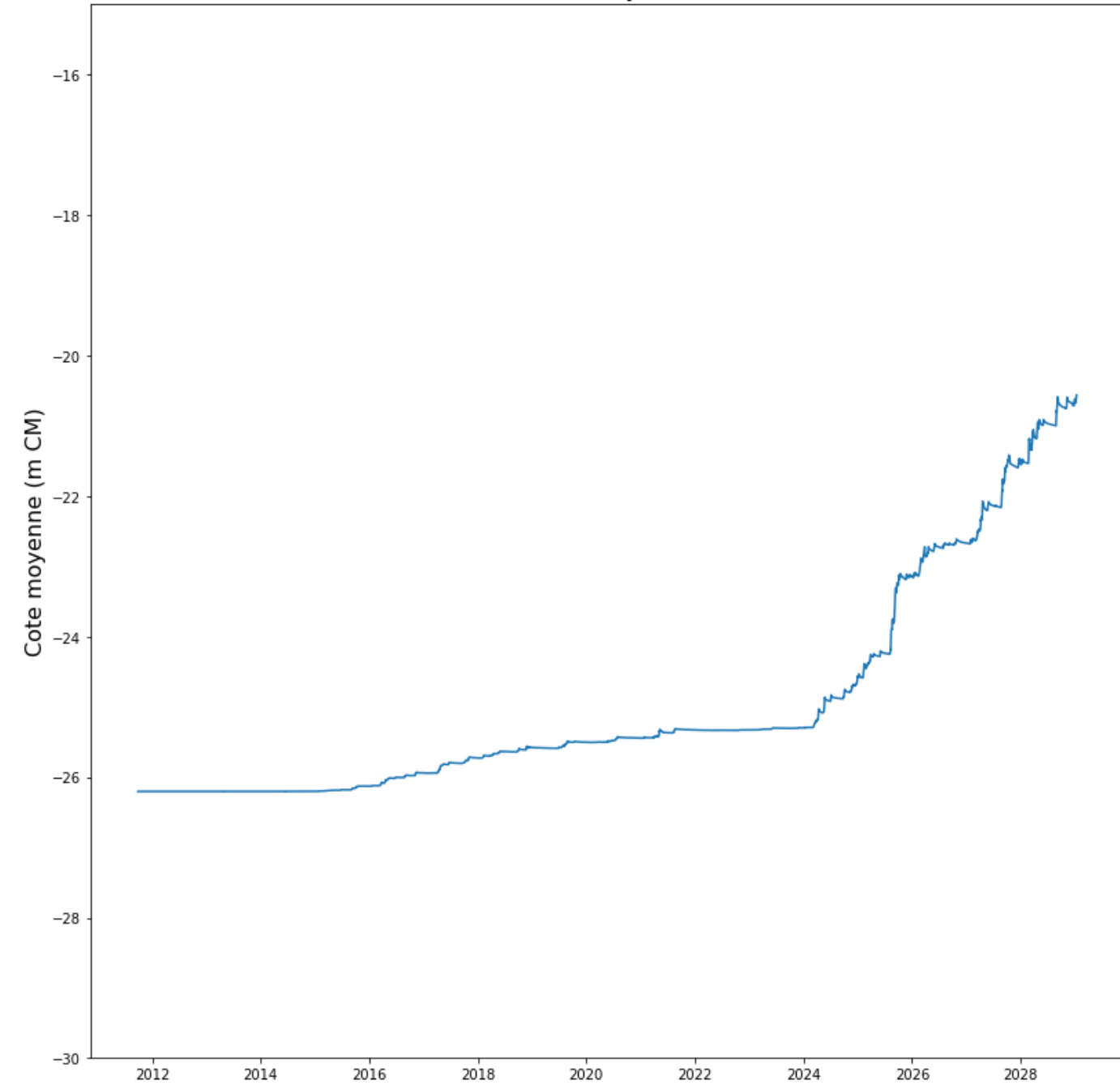


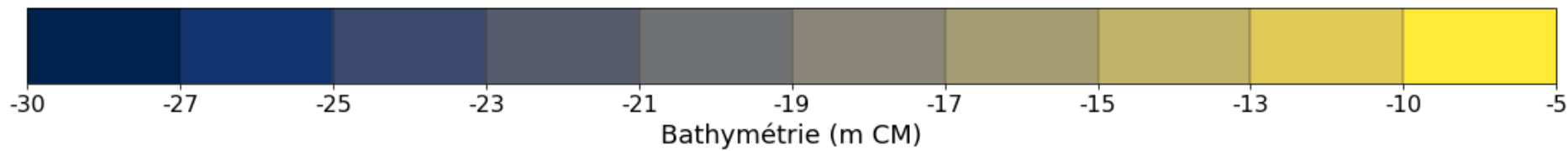
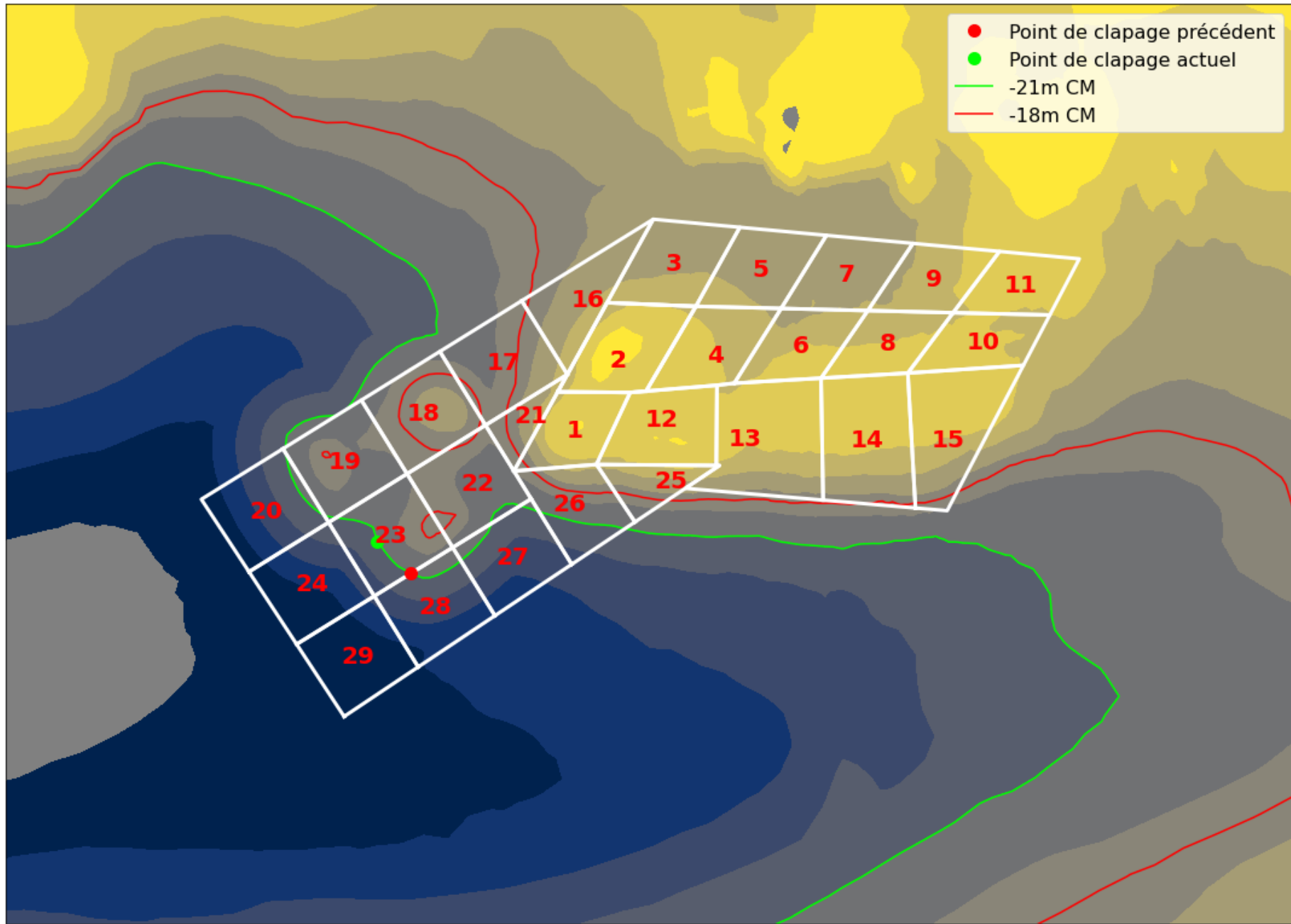




Date de changement de point : 12-01-2029

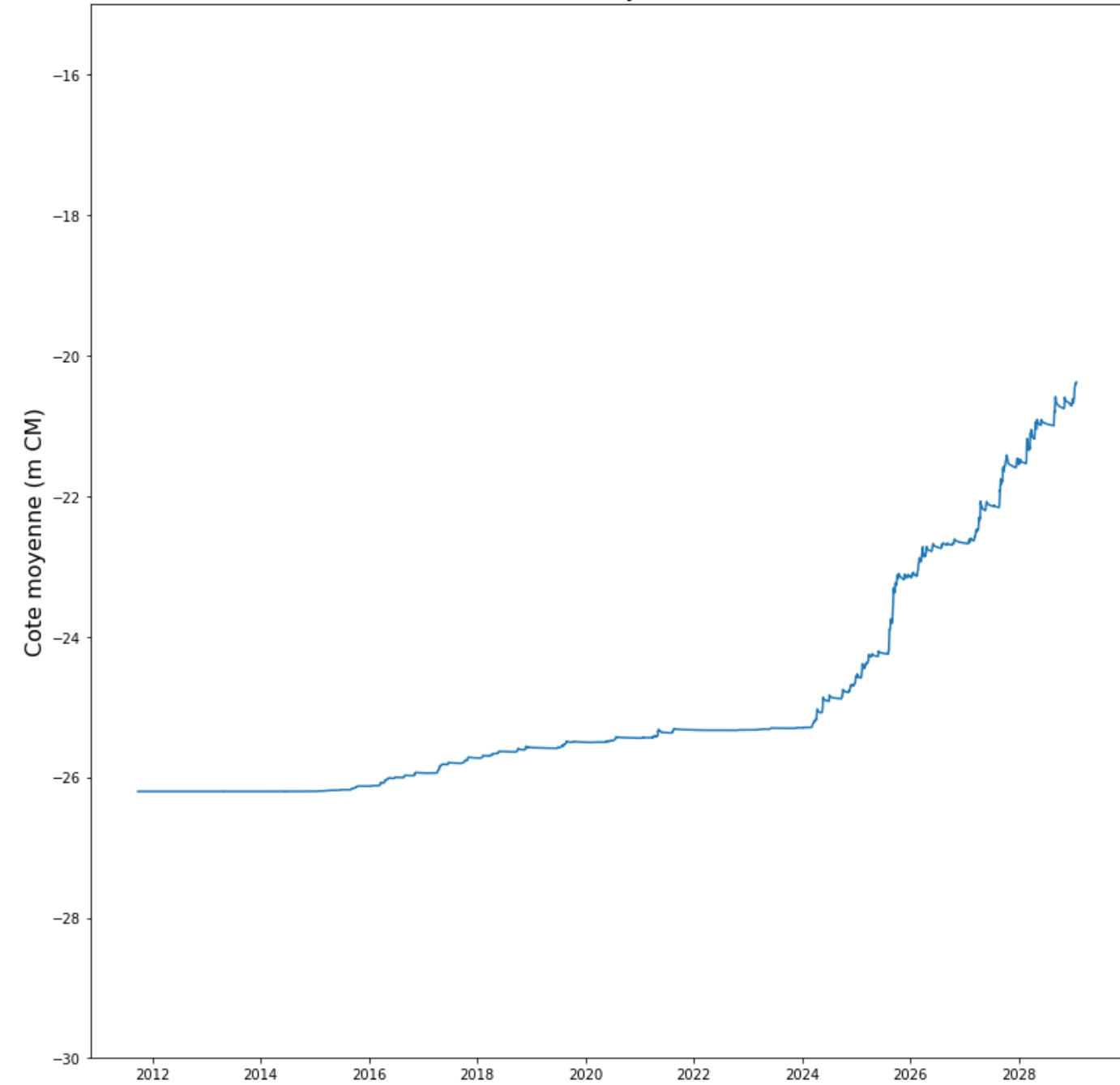
Evolution de la cote moyenne de la zone 23

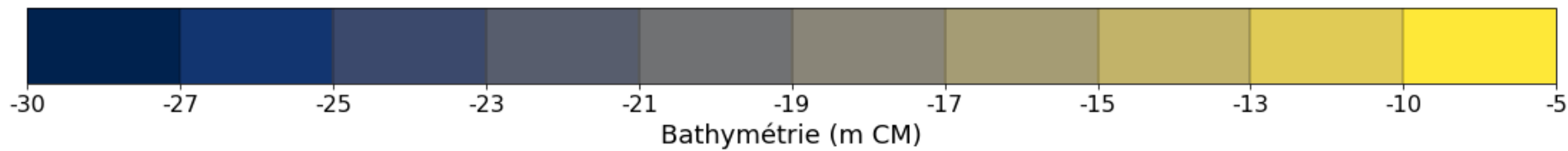
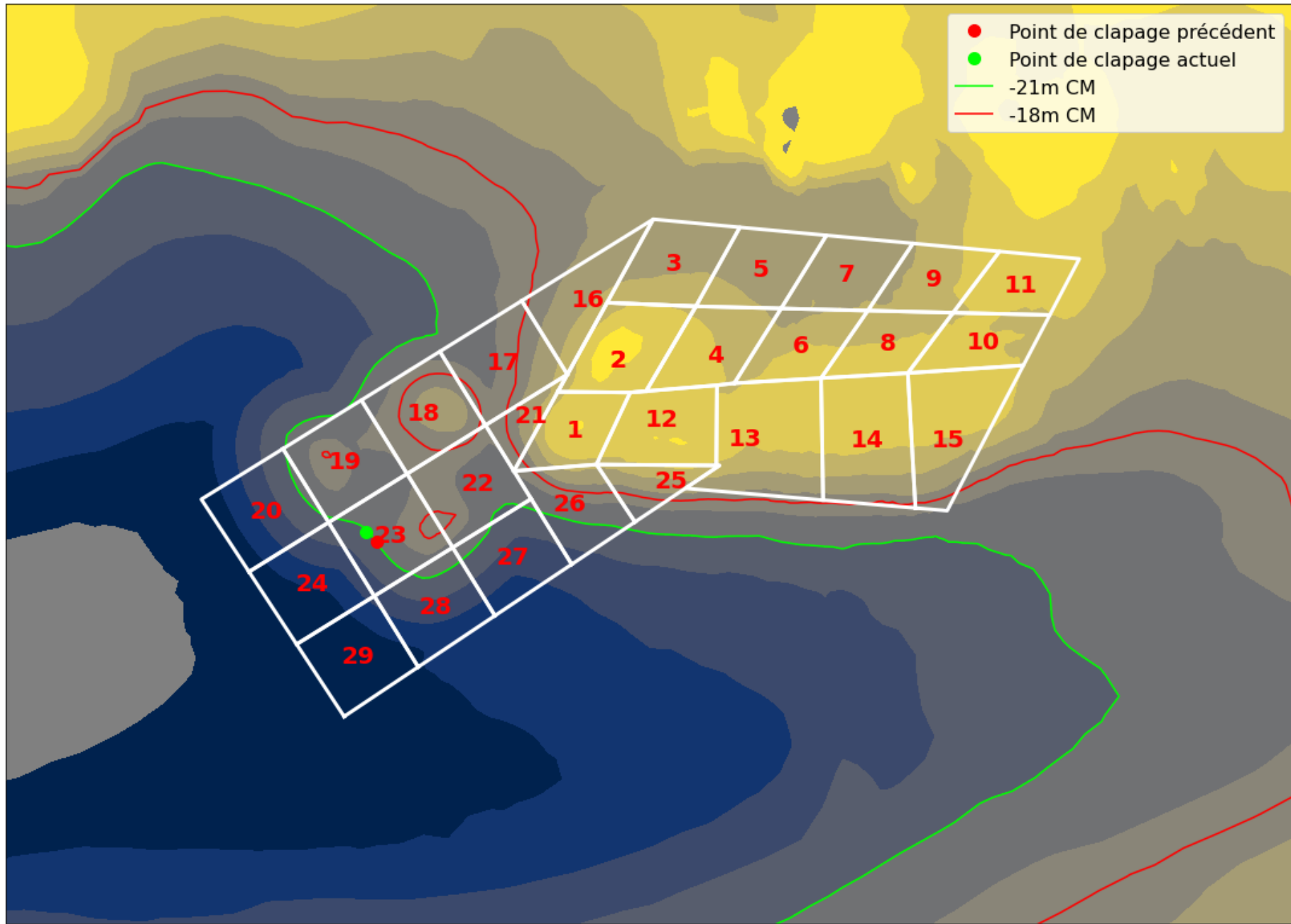




Date de changement de point : 28-01-2029

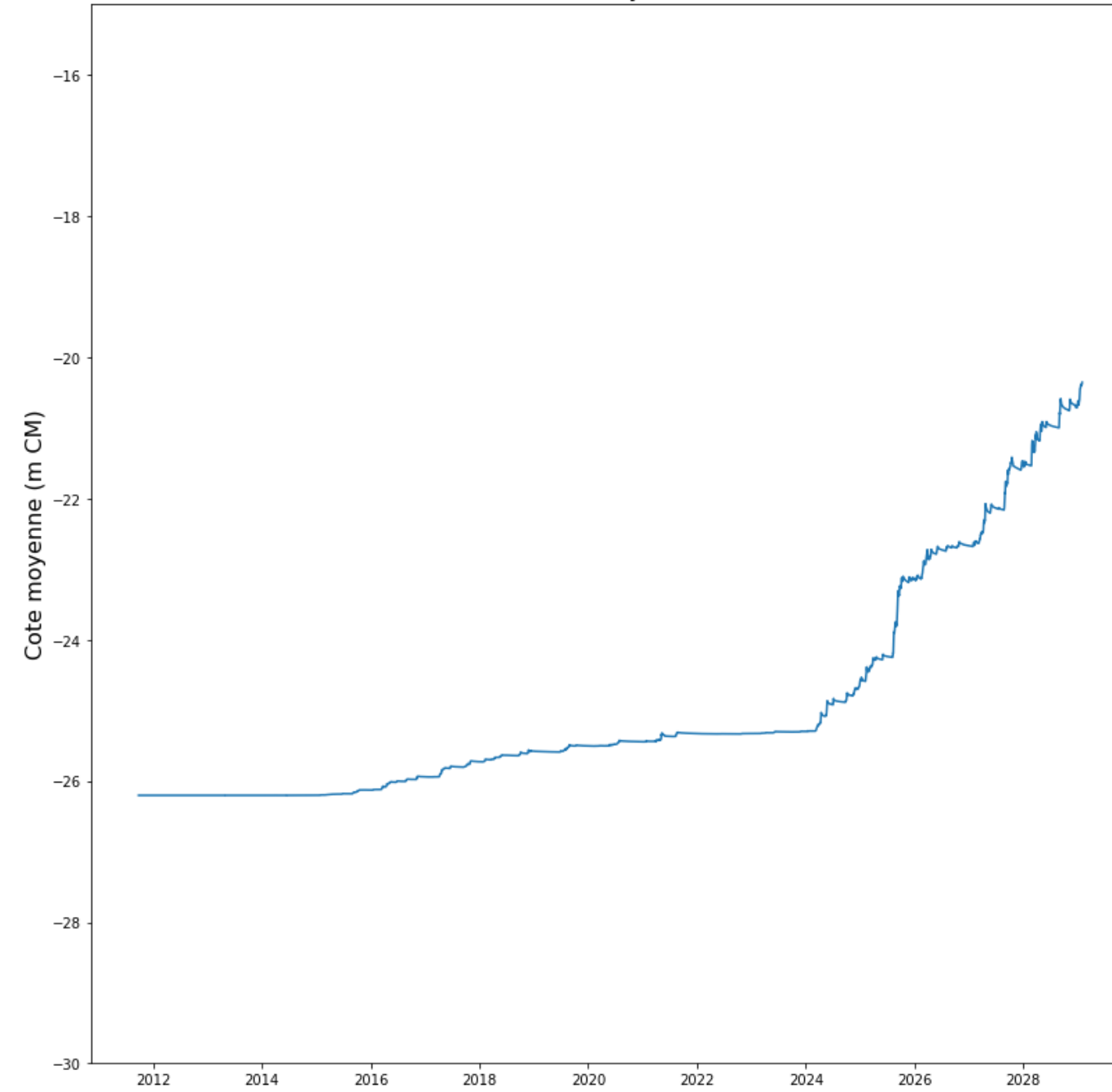
Evolution de la cote moyenne de la zone 23

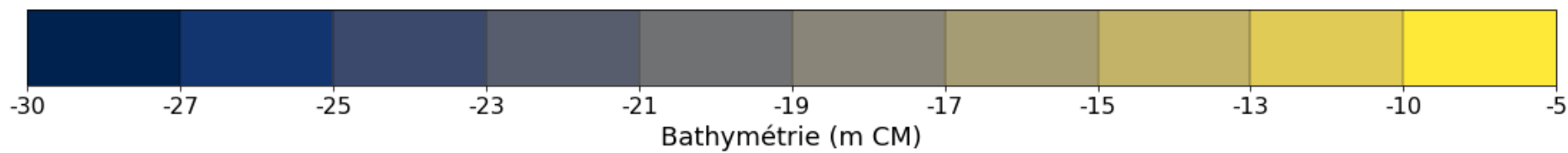
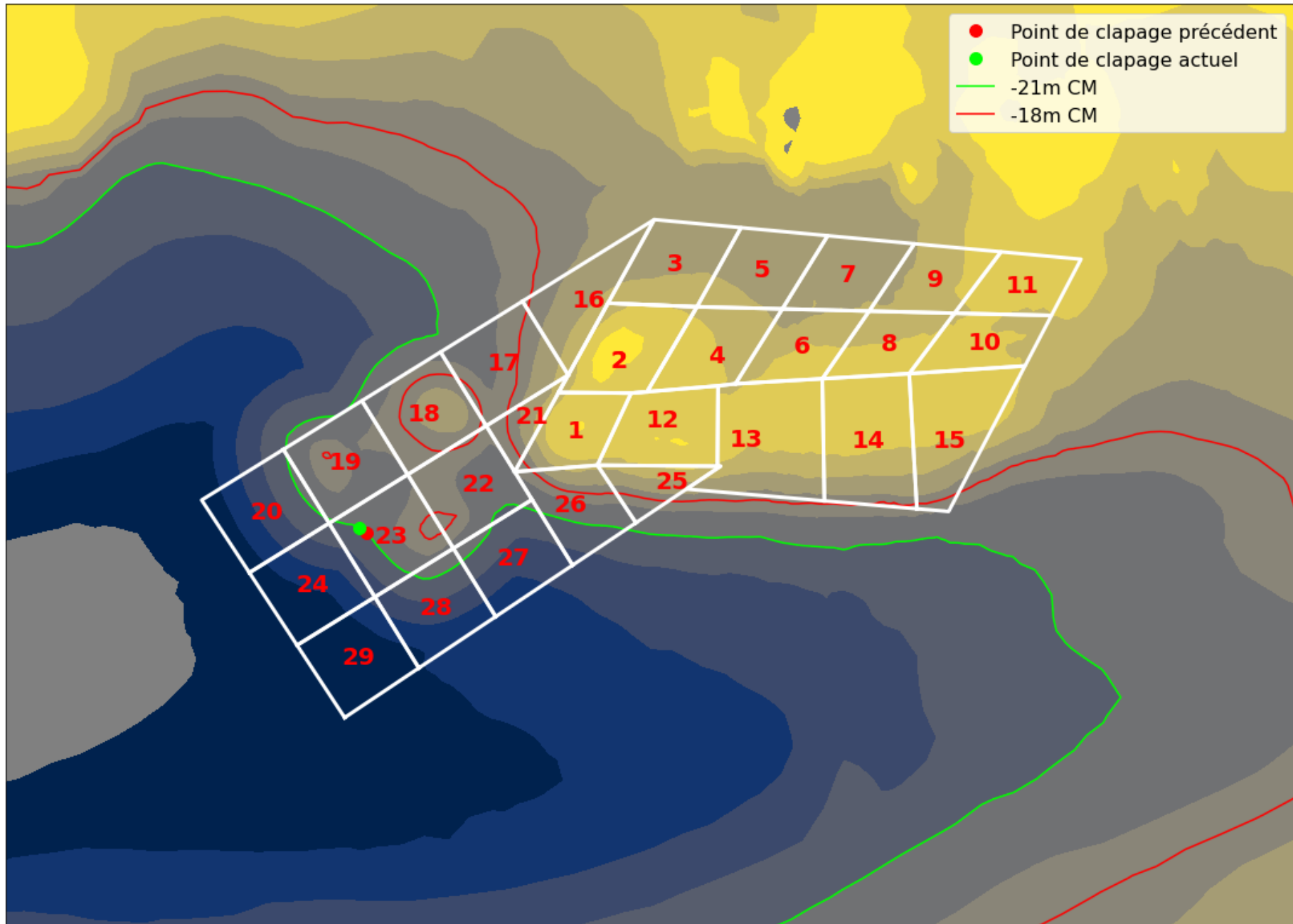




Date de changement de point : 29-01-2029

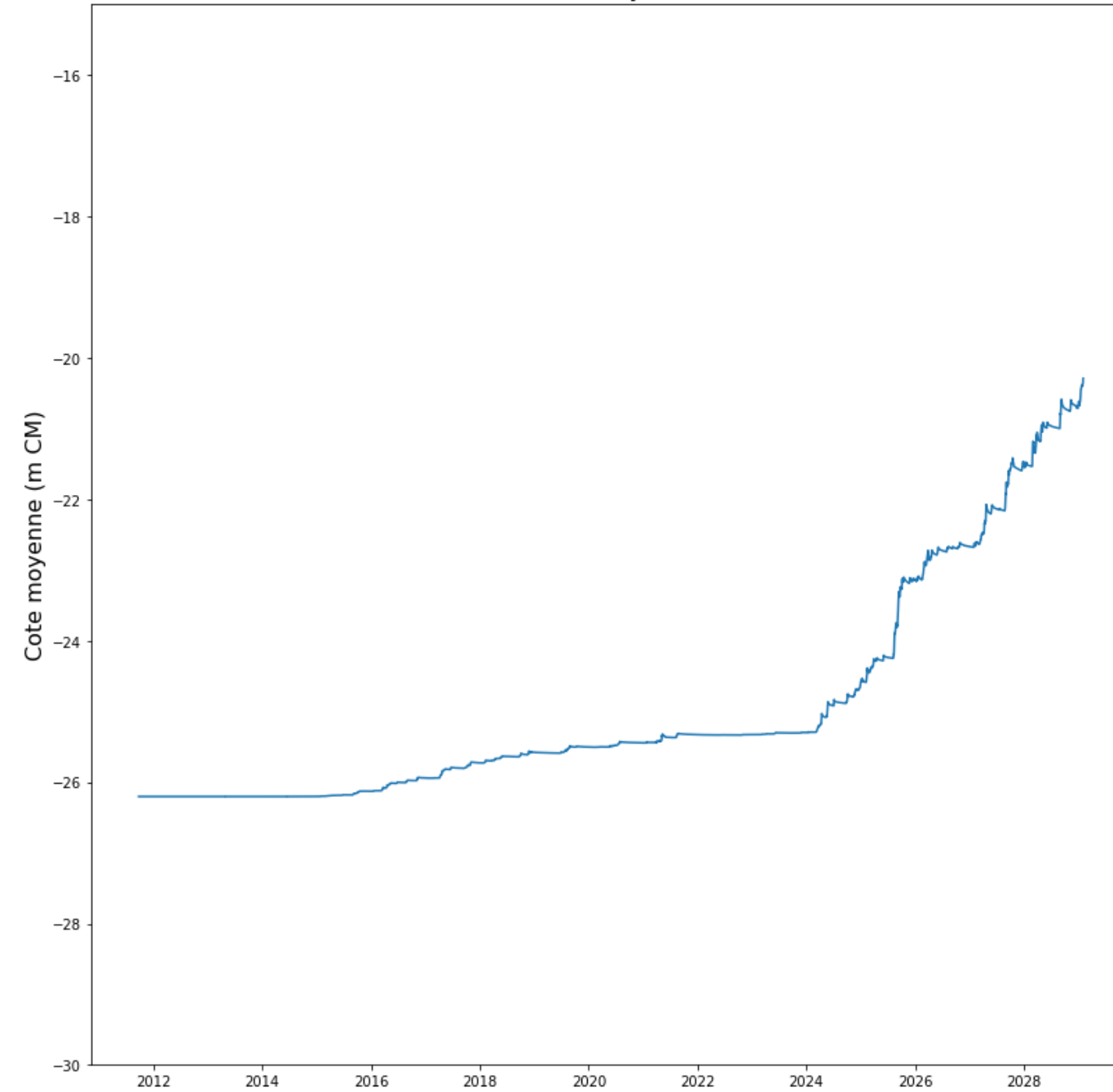
Evolution de la cote moyenne de la zone 23

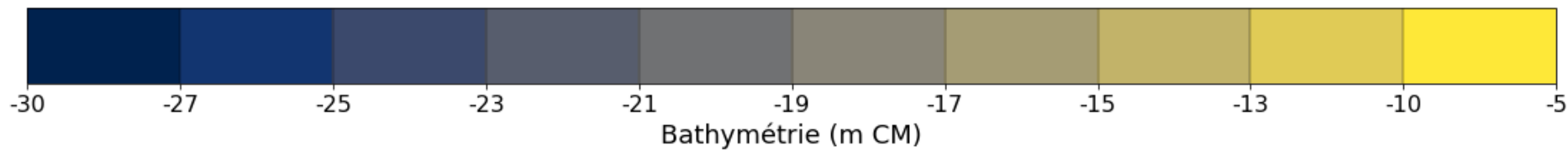
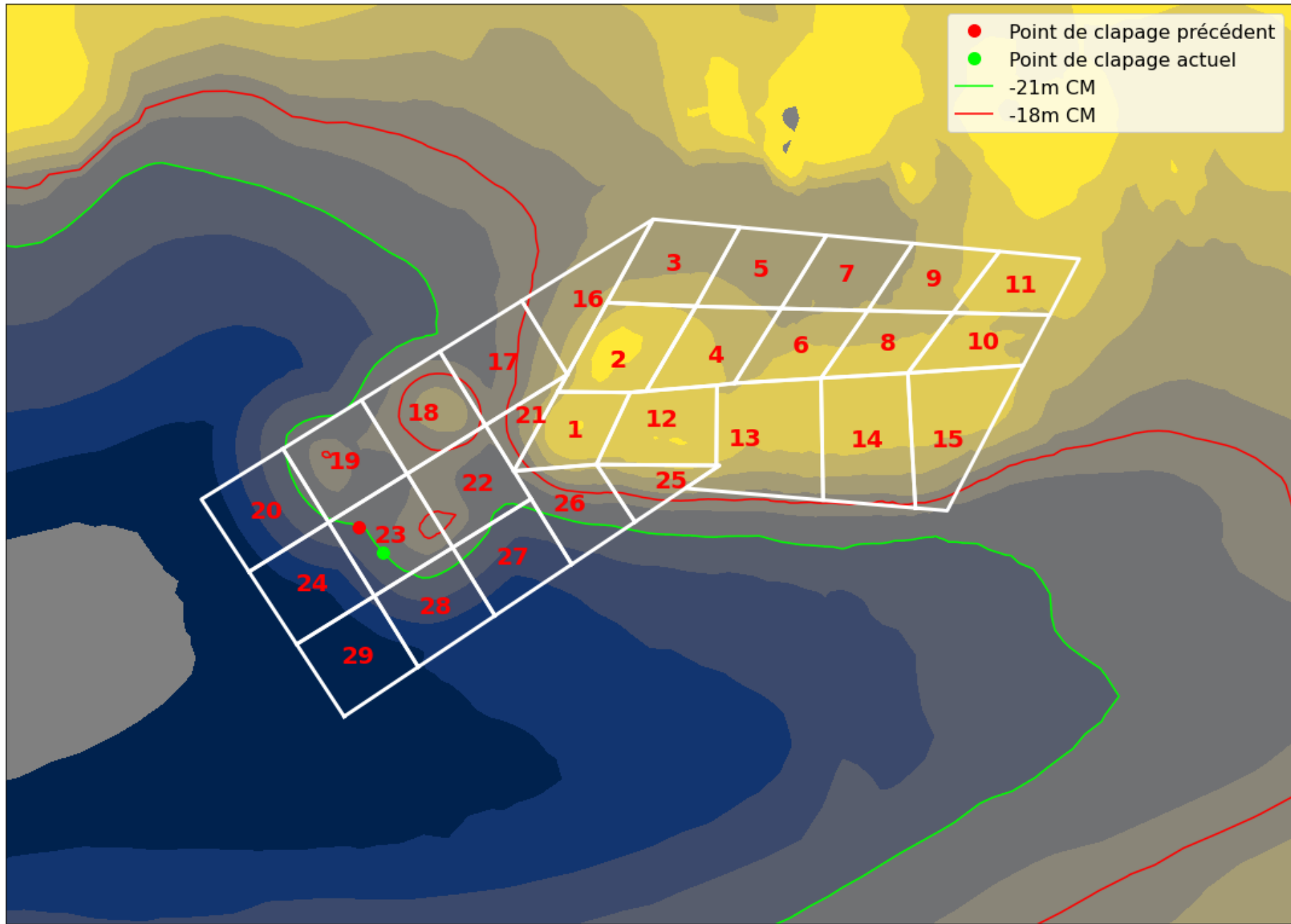




Date de changement de point : 30-01-2029

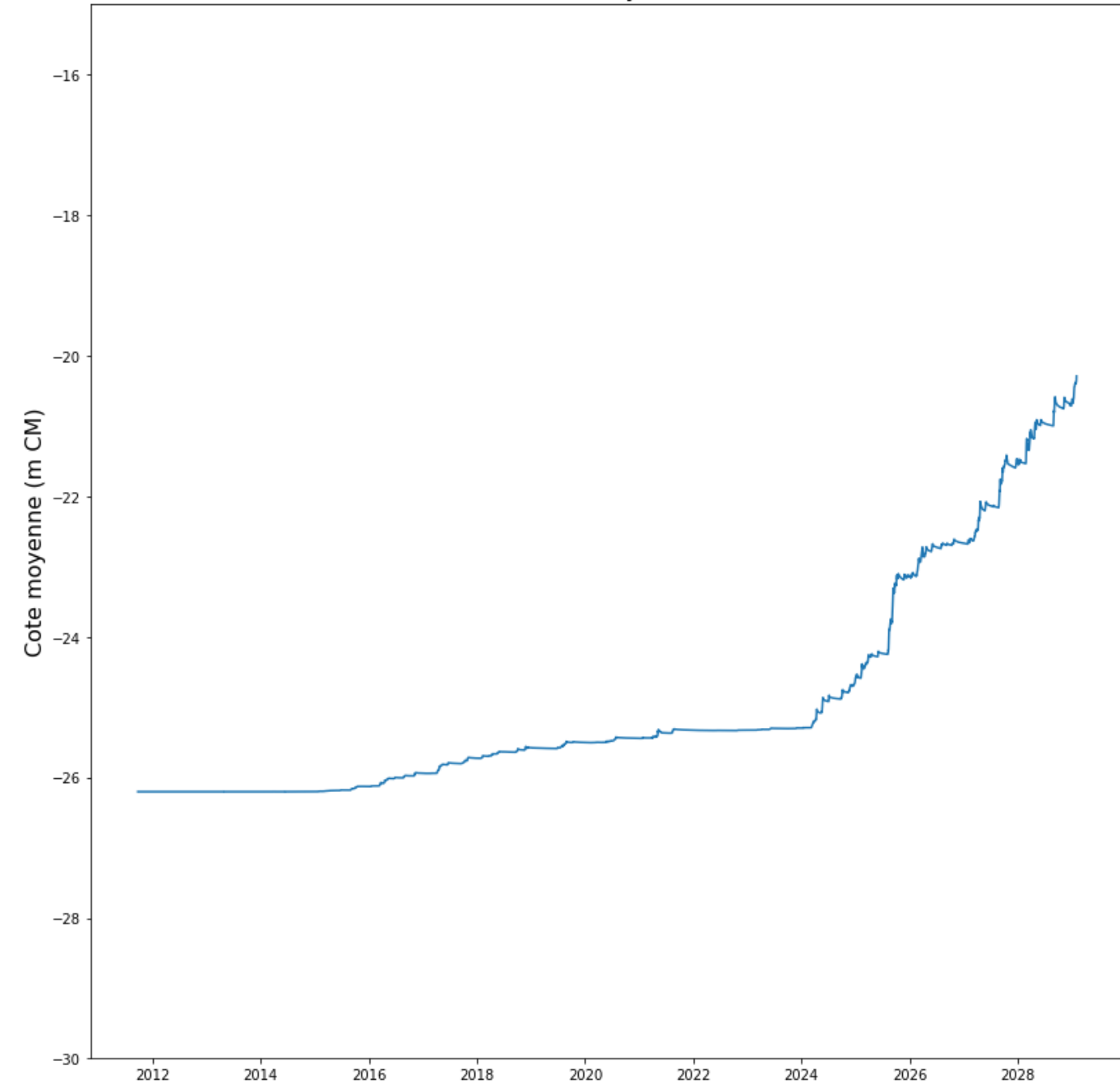
Evolution de la cote moyenne de la zone 23

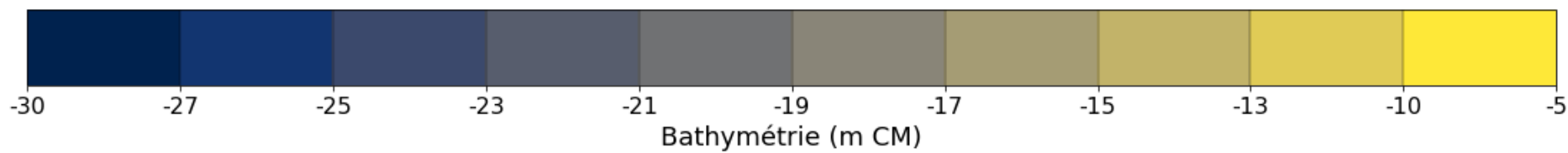
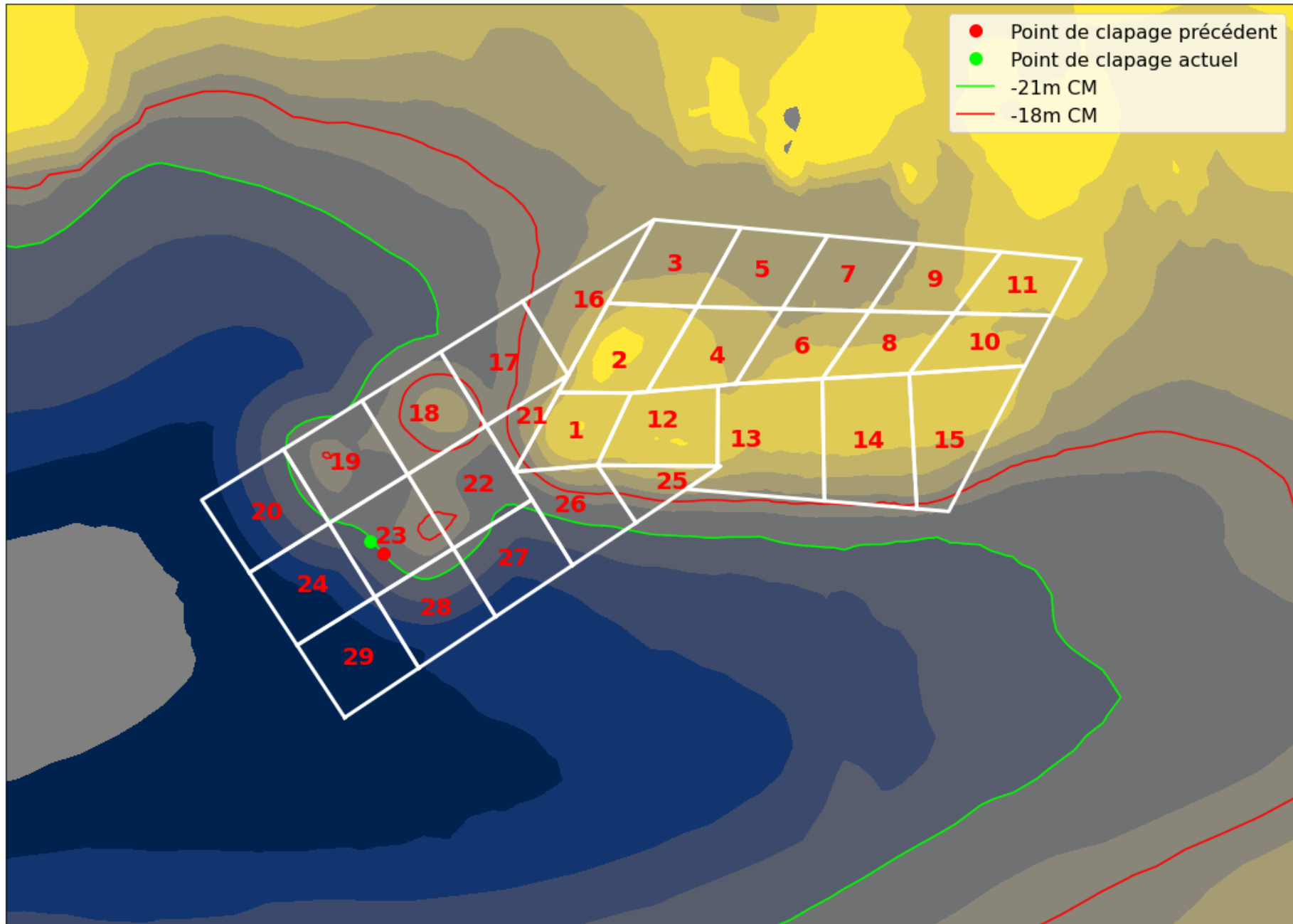




Date de changement de point : 31-01-2029

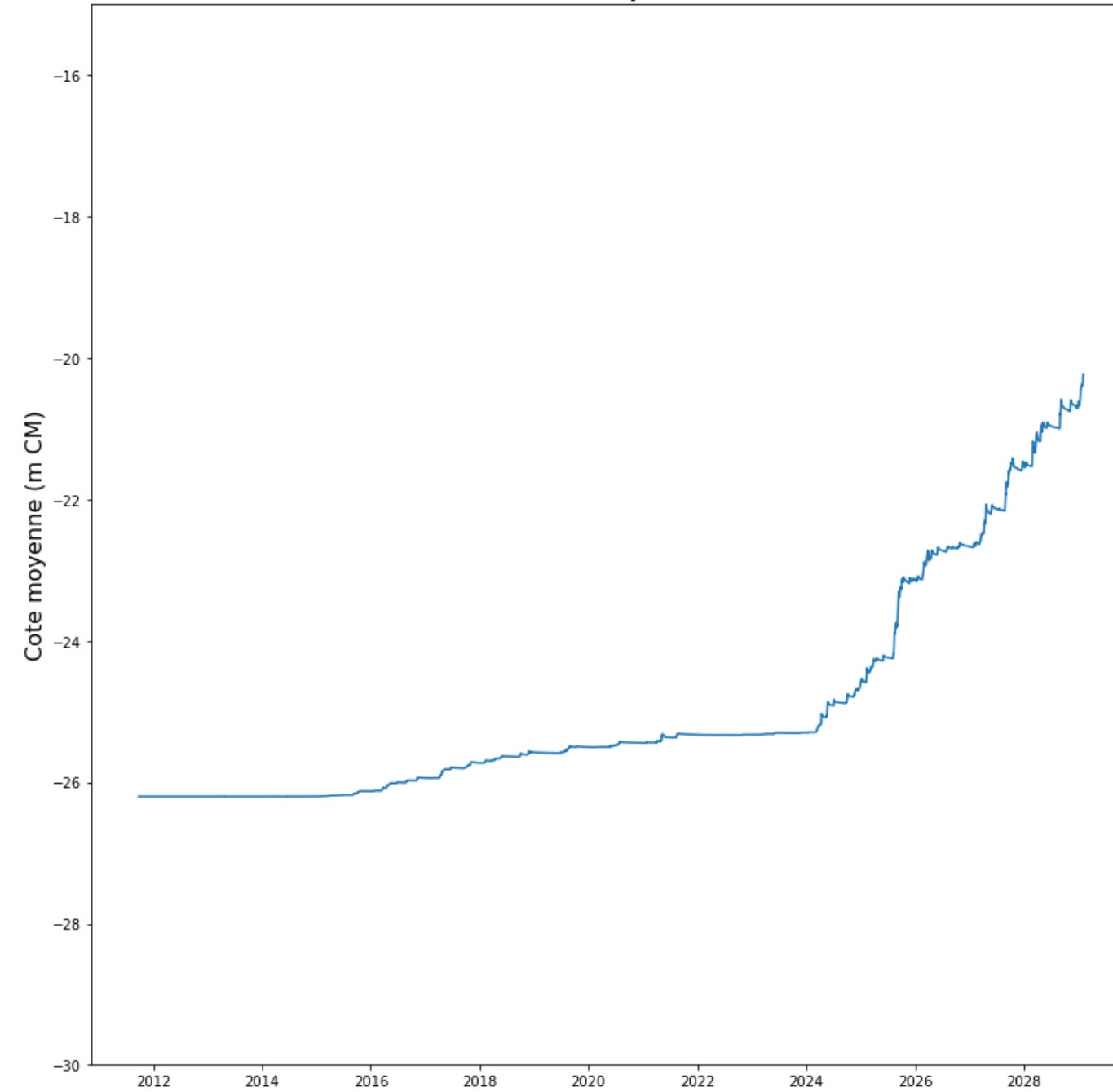
Evolution de la cote moyenne de la zone 23



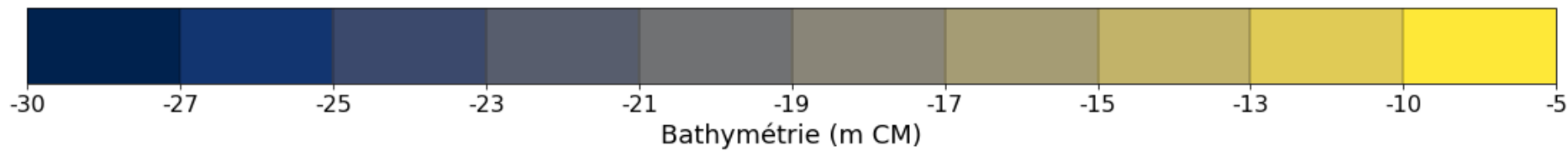
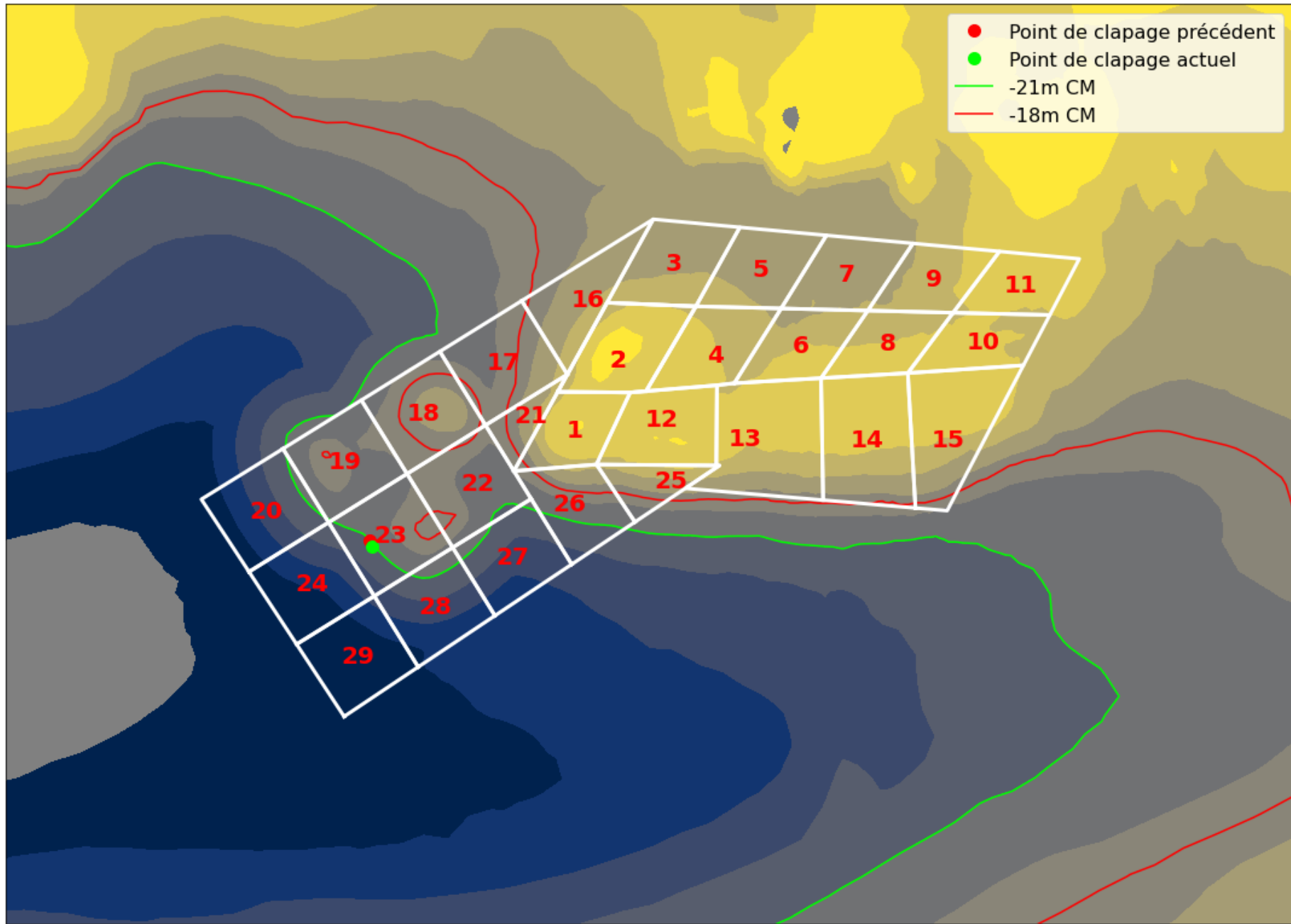


Date de changement de point : 01-02-2029

Evolution de la cote moyenne de la zone 23

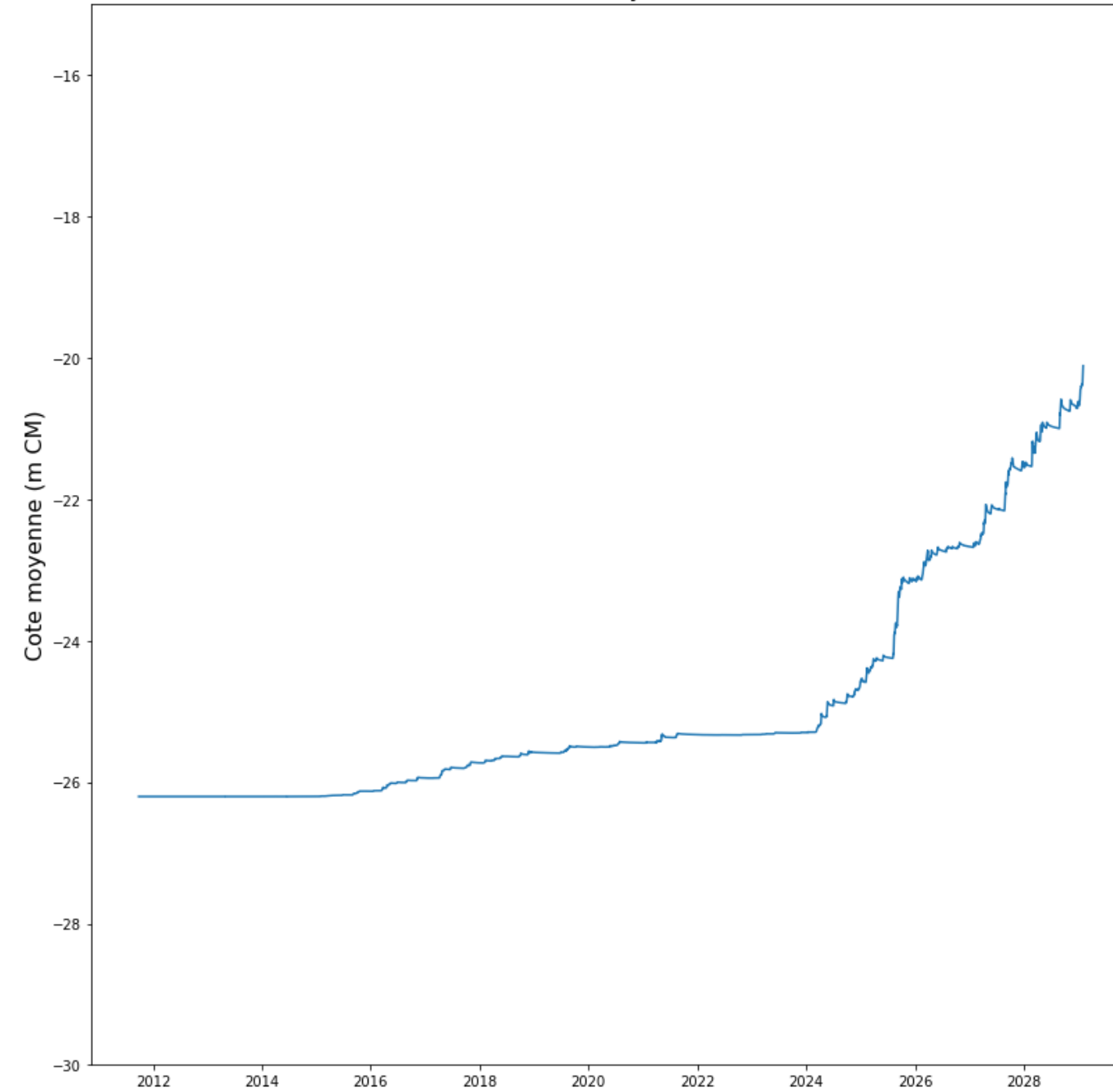


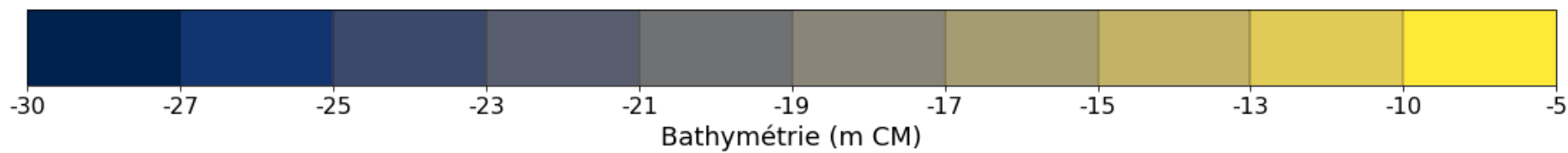
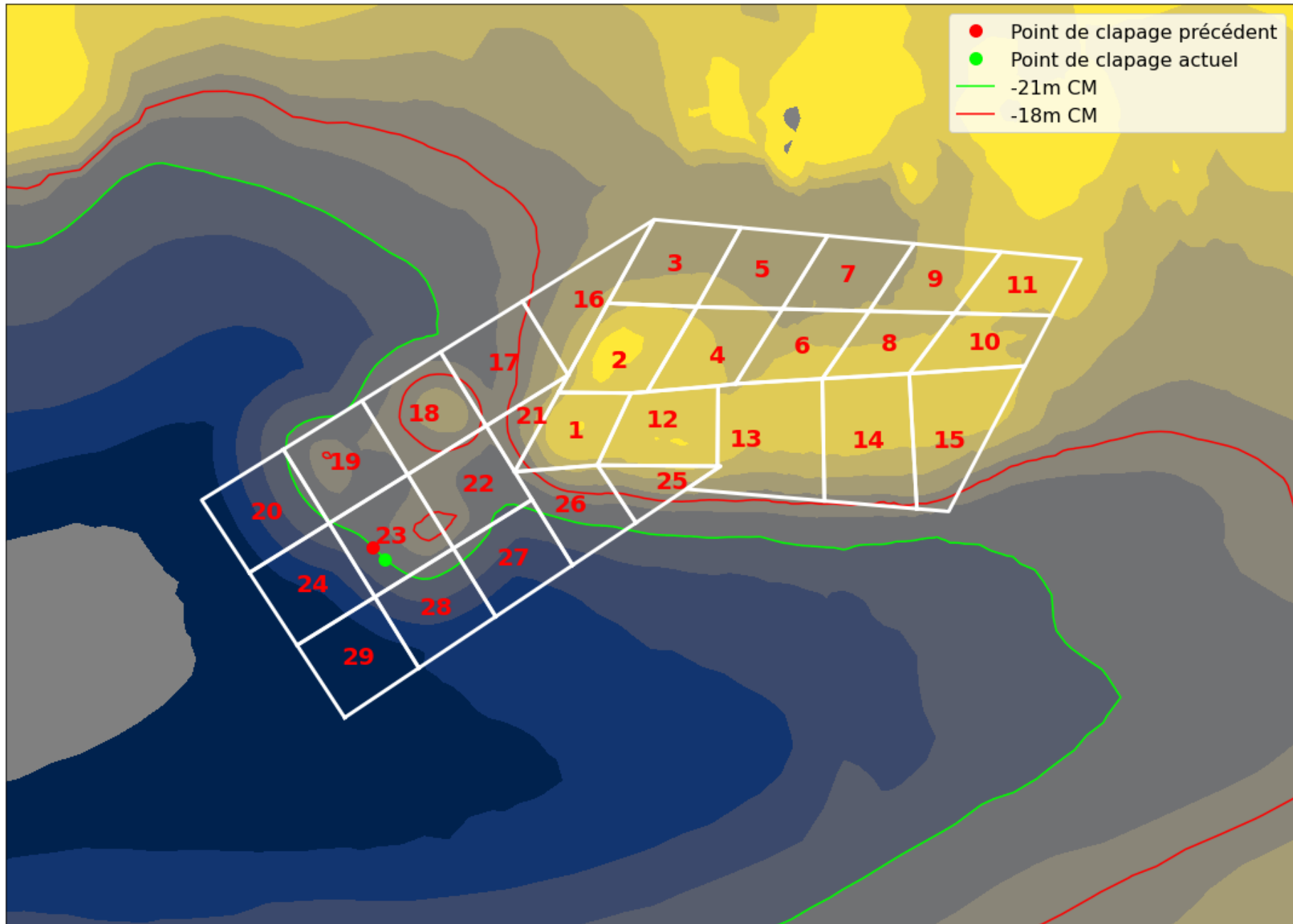




Date de changement de point : 03-02-2029

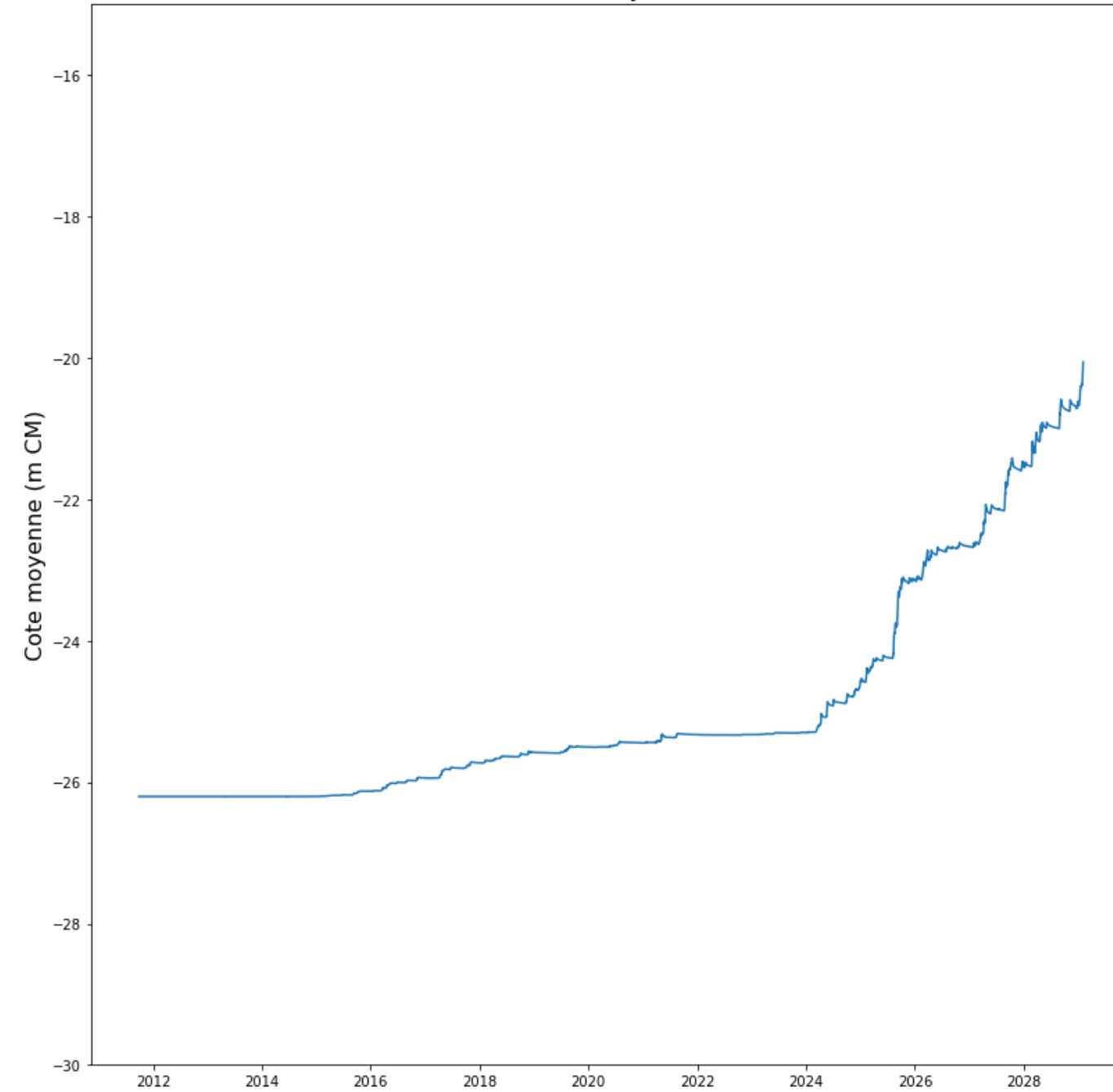
Evolution de la cote moyenne de la zone 23

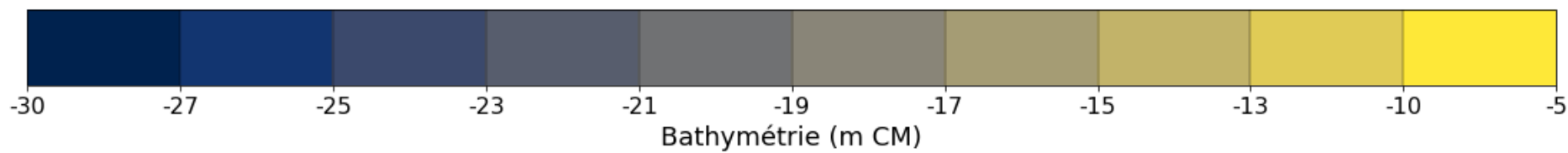
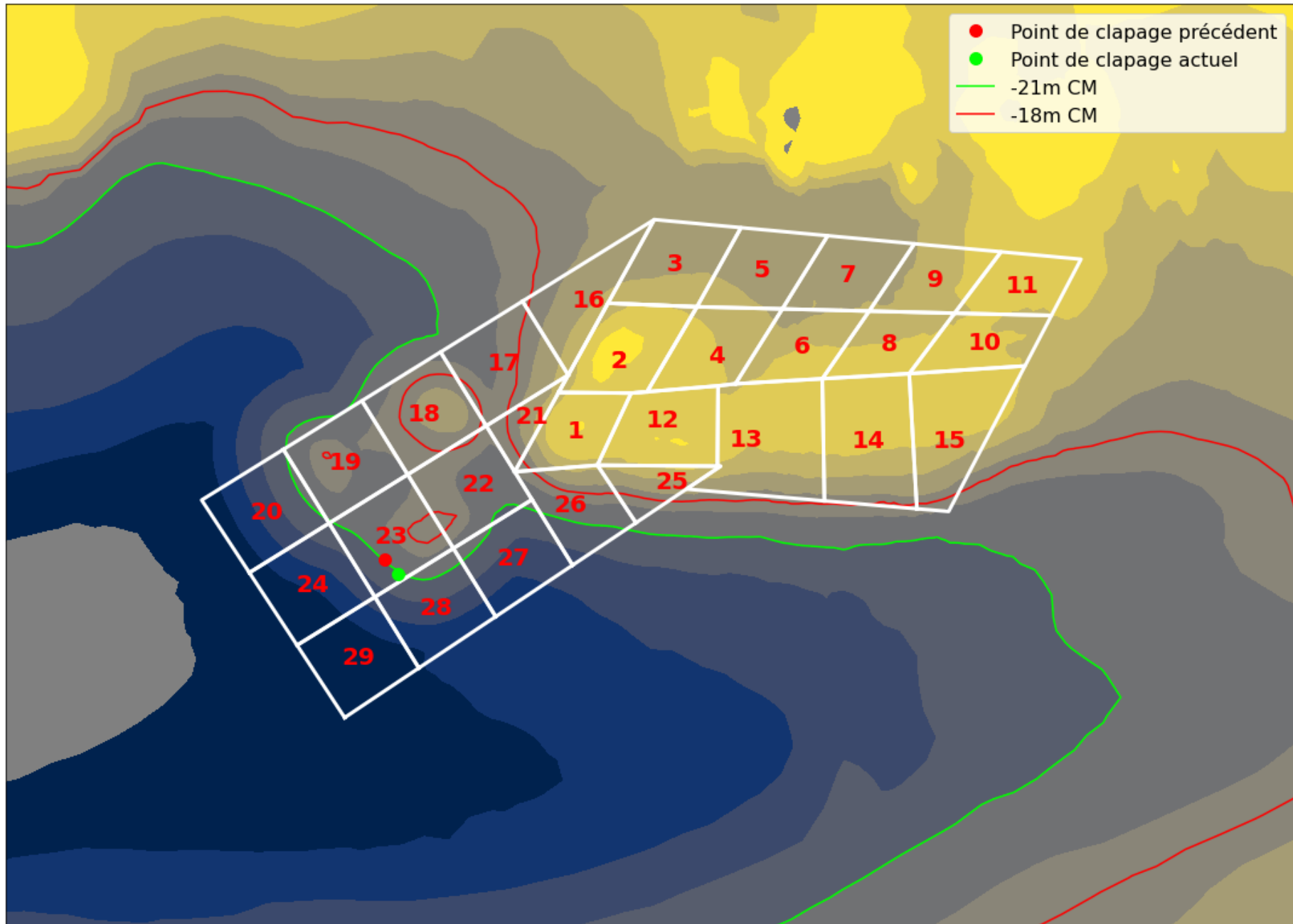




Date de changement de point : 04-02-2029

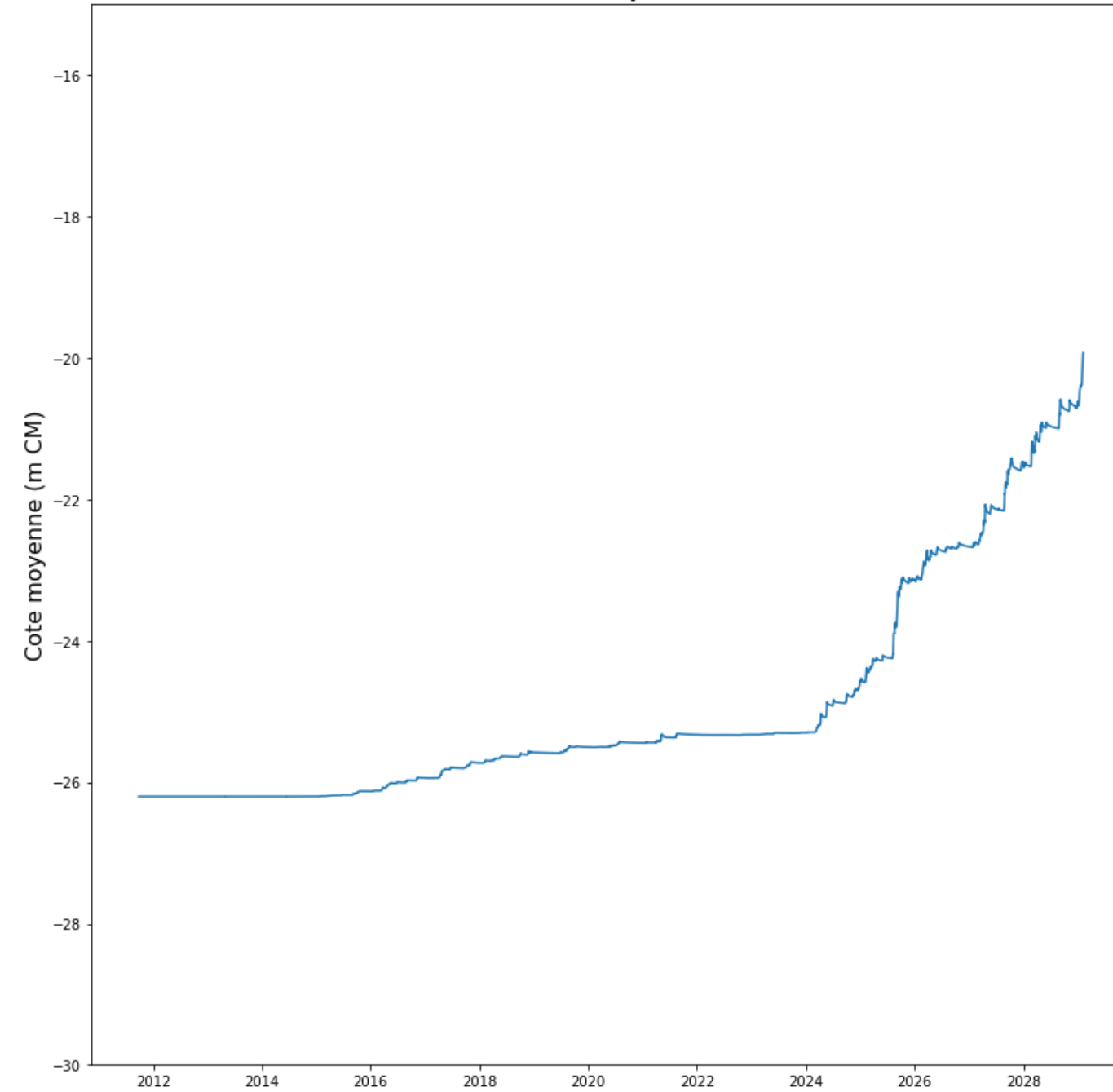
Evolution de la cote moyenne de la zone 23

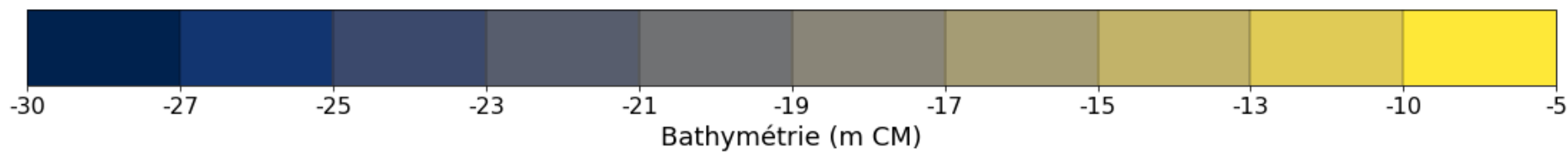
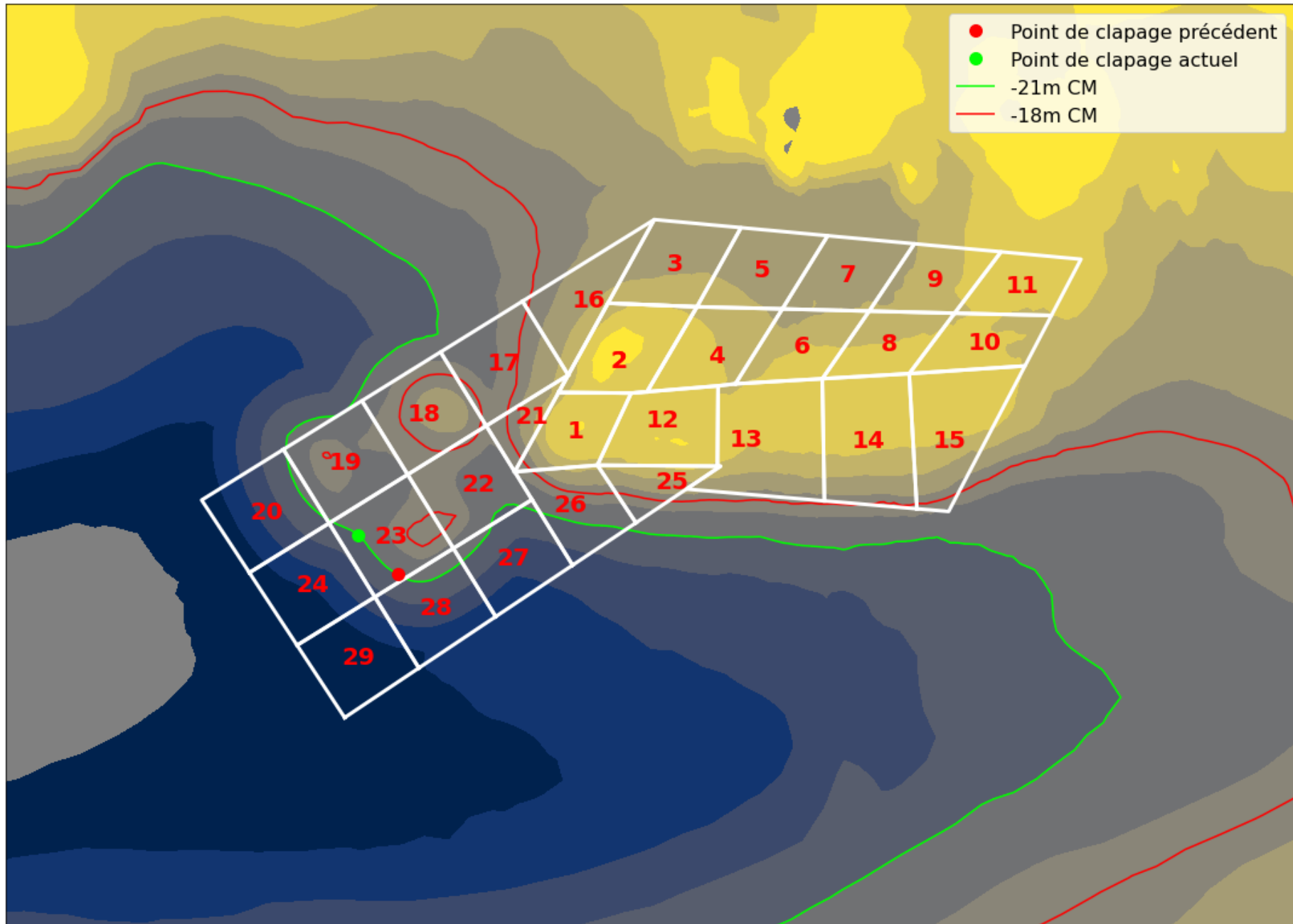




Date de changement de point : 06-02-2029

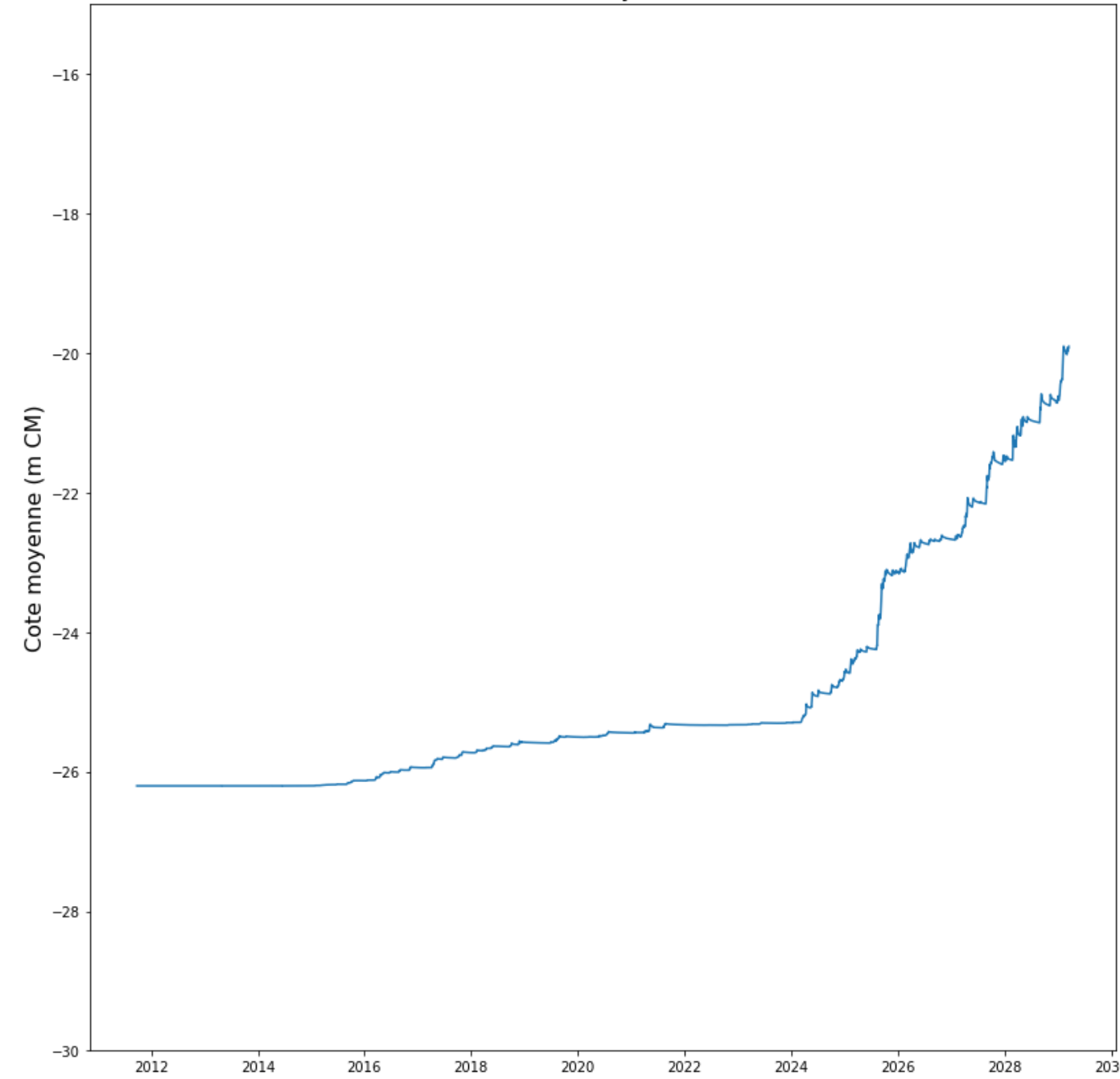
Evolution de la cote moyenne de la zone 23

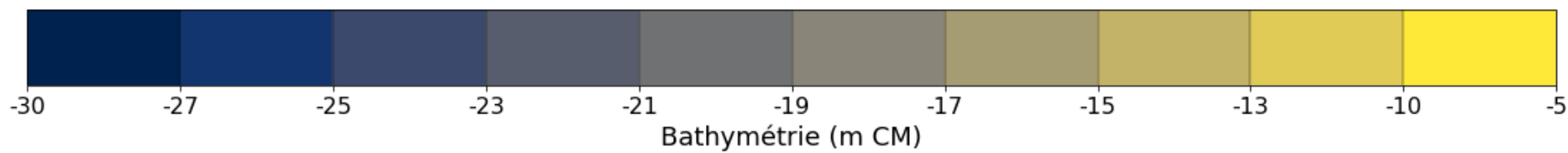
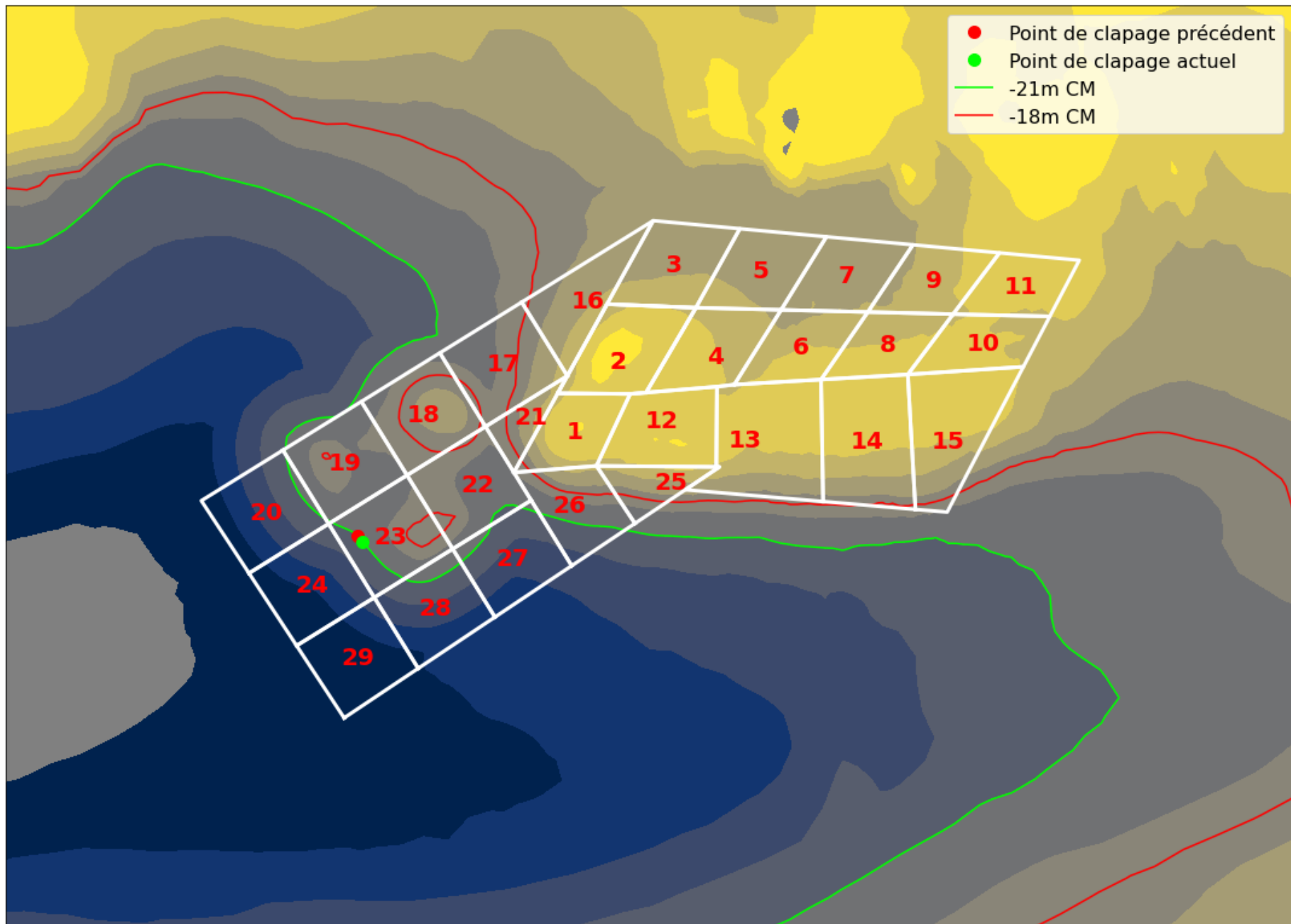




Date de changement de point : 14-03-2029

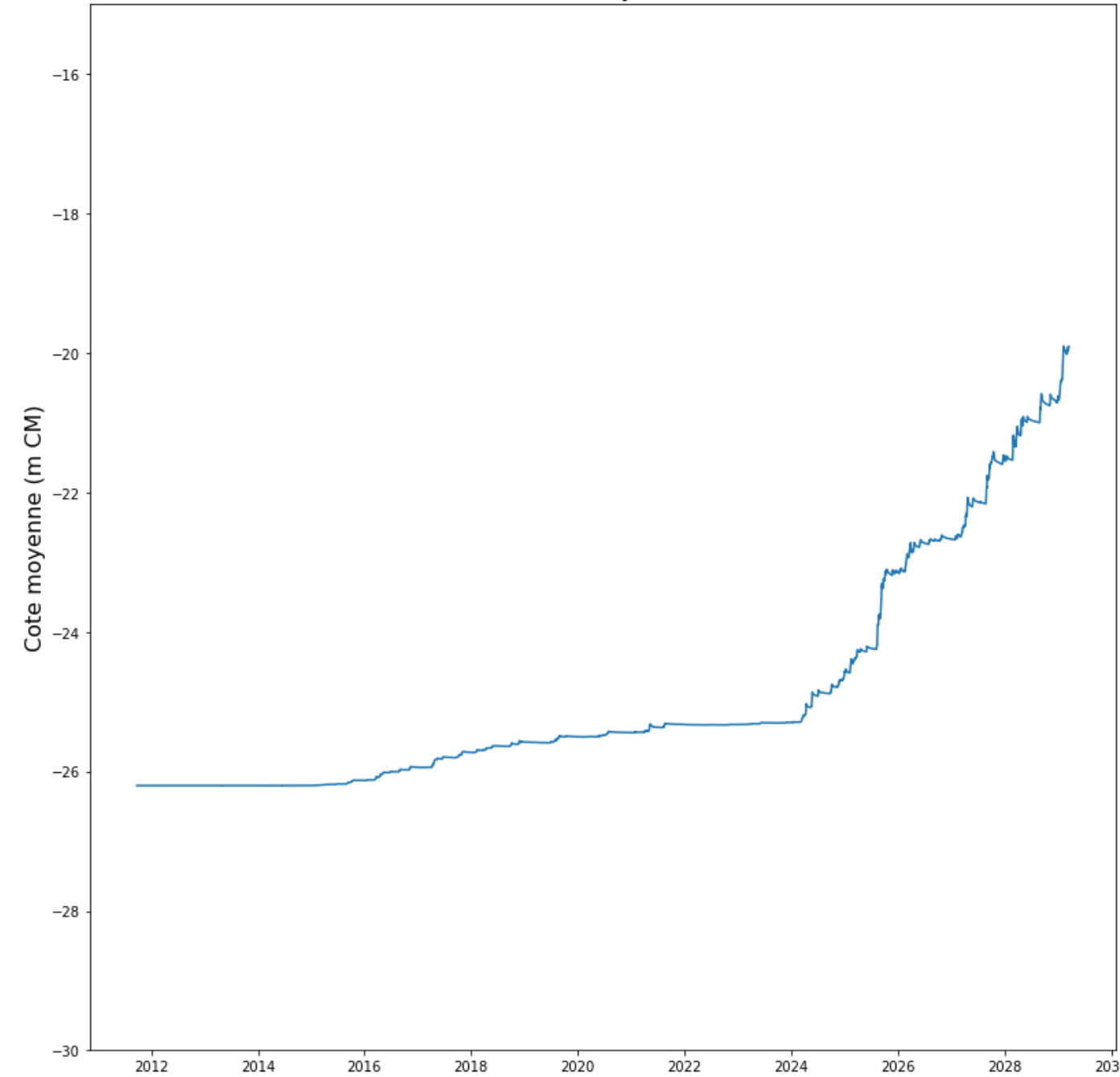
Evolution de la cote moyenne de la zone 23

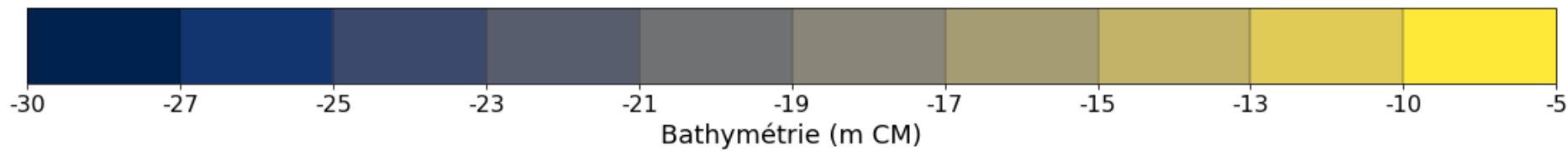
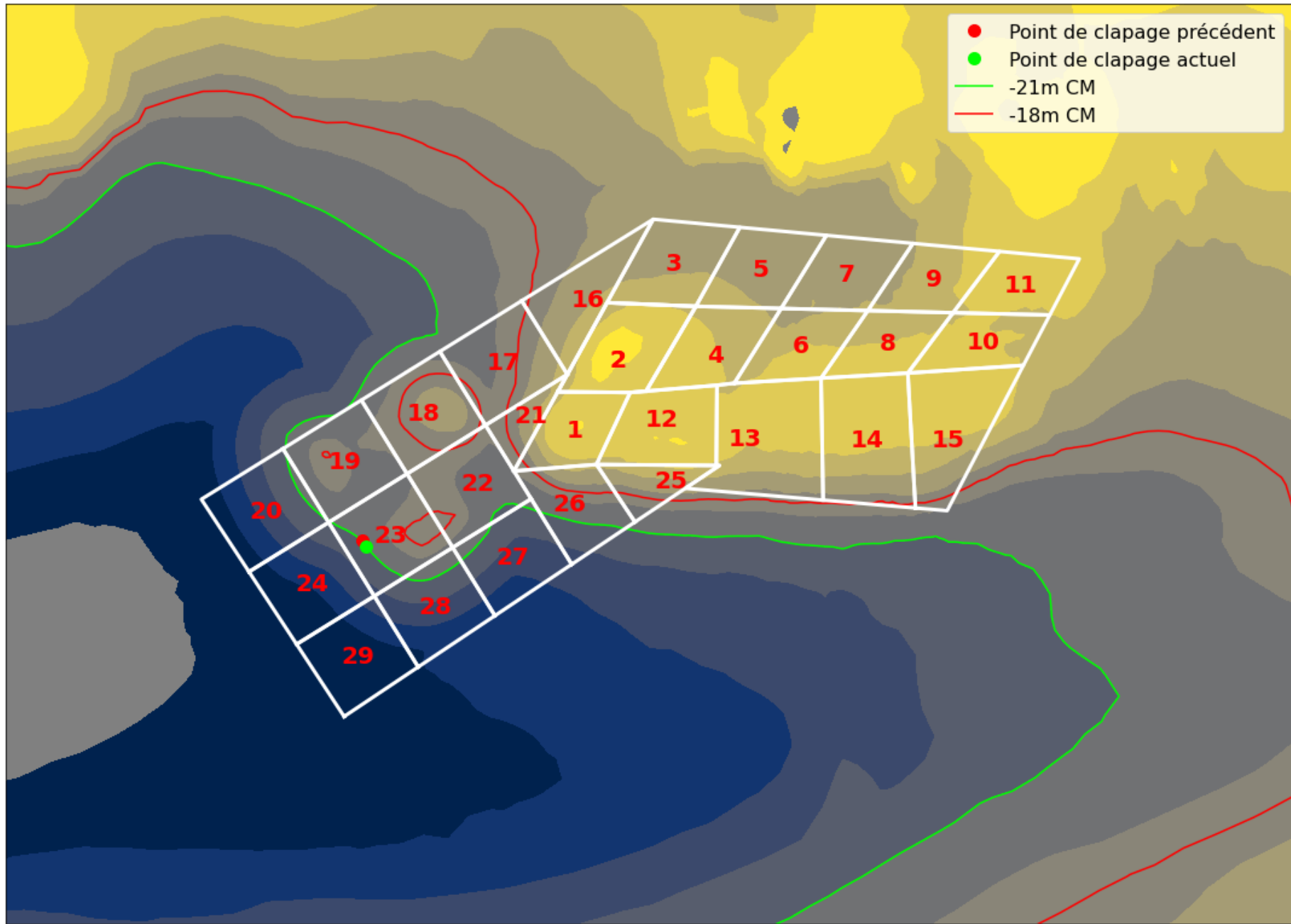




Date de changement de point : 15-03-2029

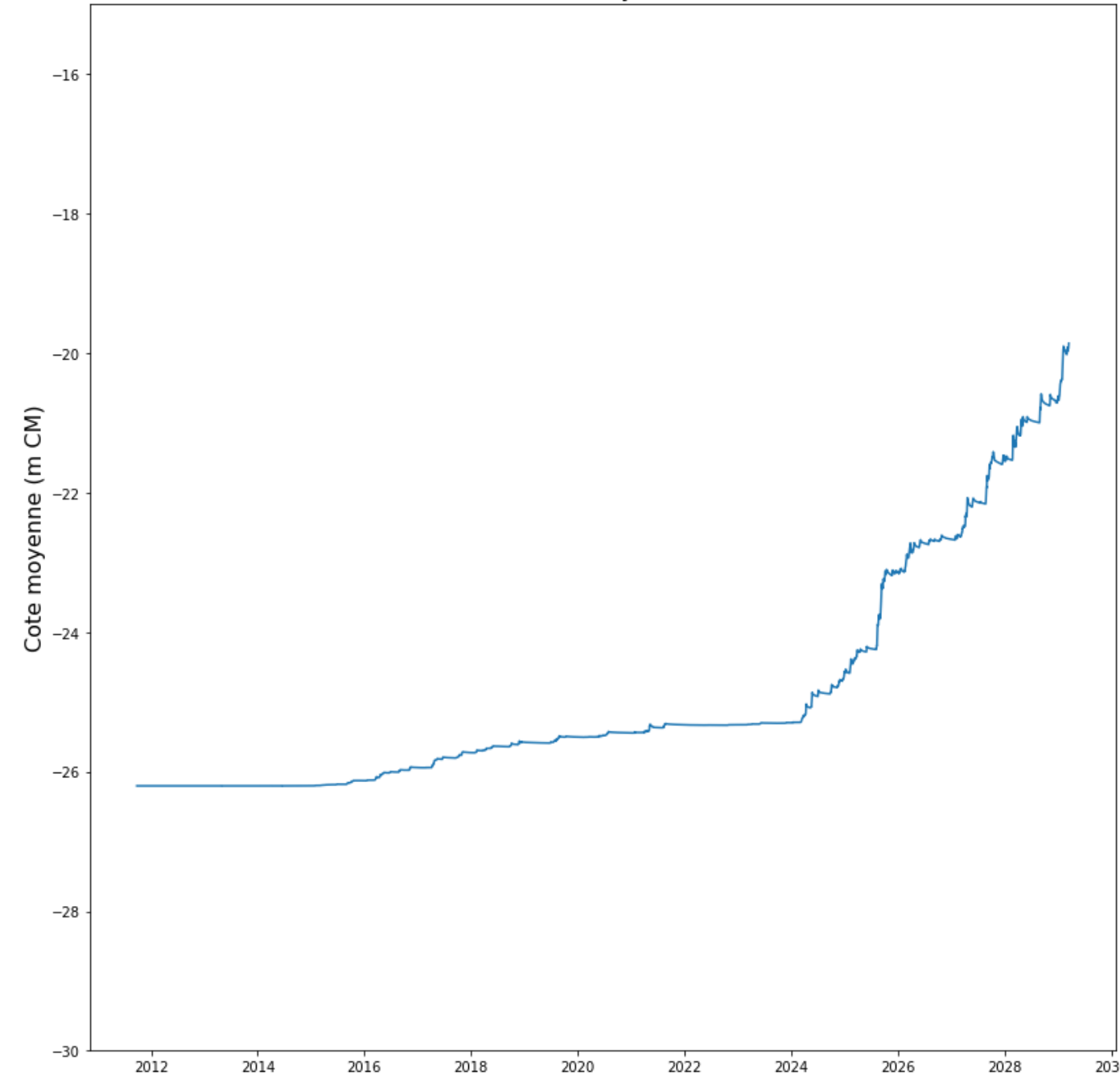
Evolution de la cote moyenne de la zone 23



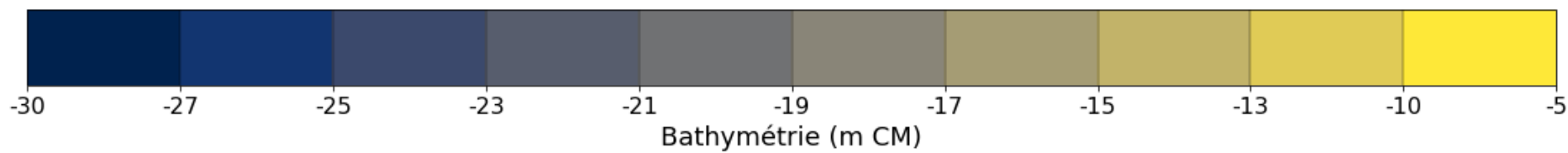
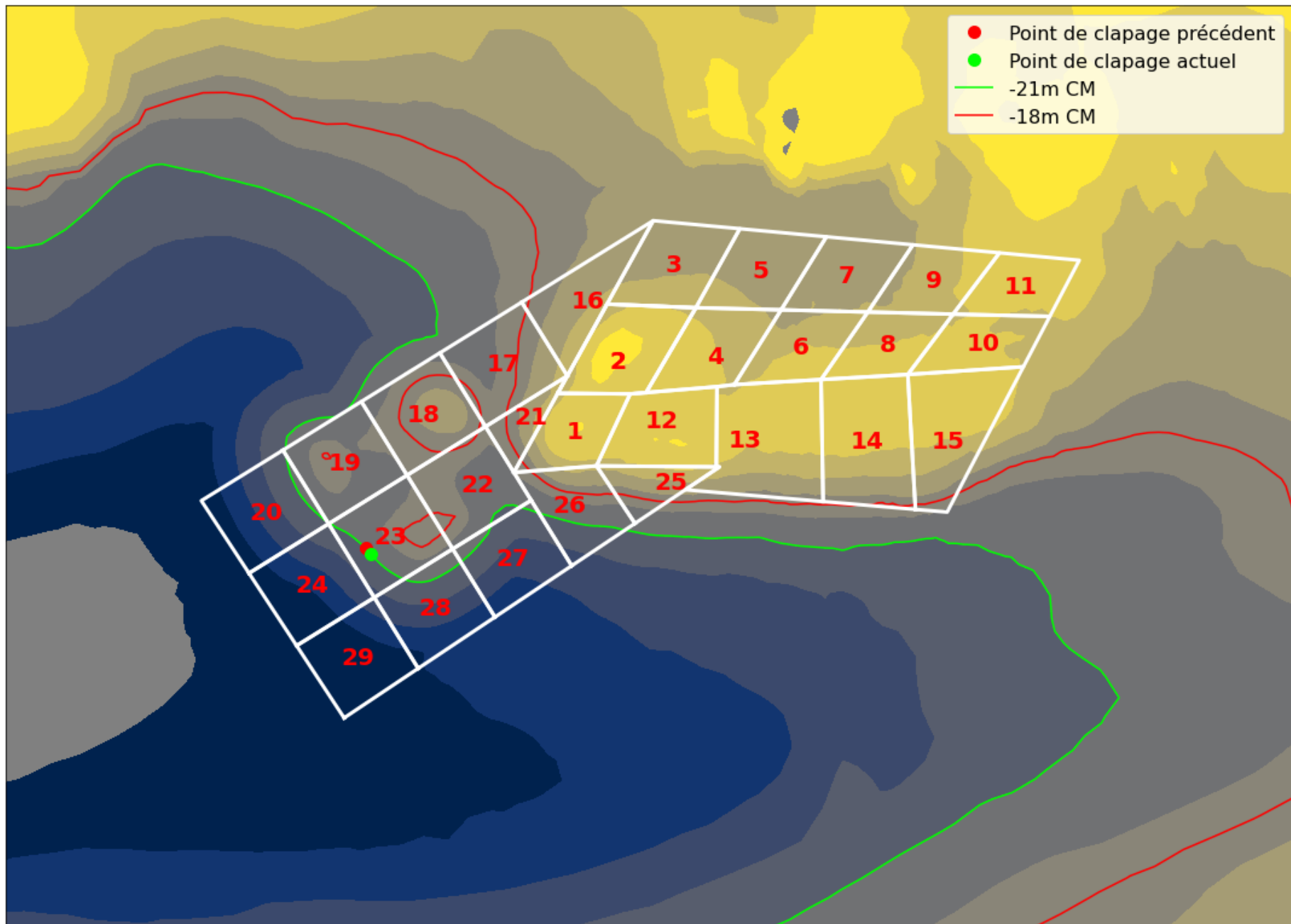


Date de changement de point : 15-03-2029

Evolution de la cote moyenne de la zone 23

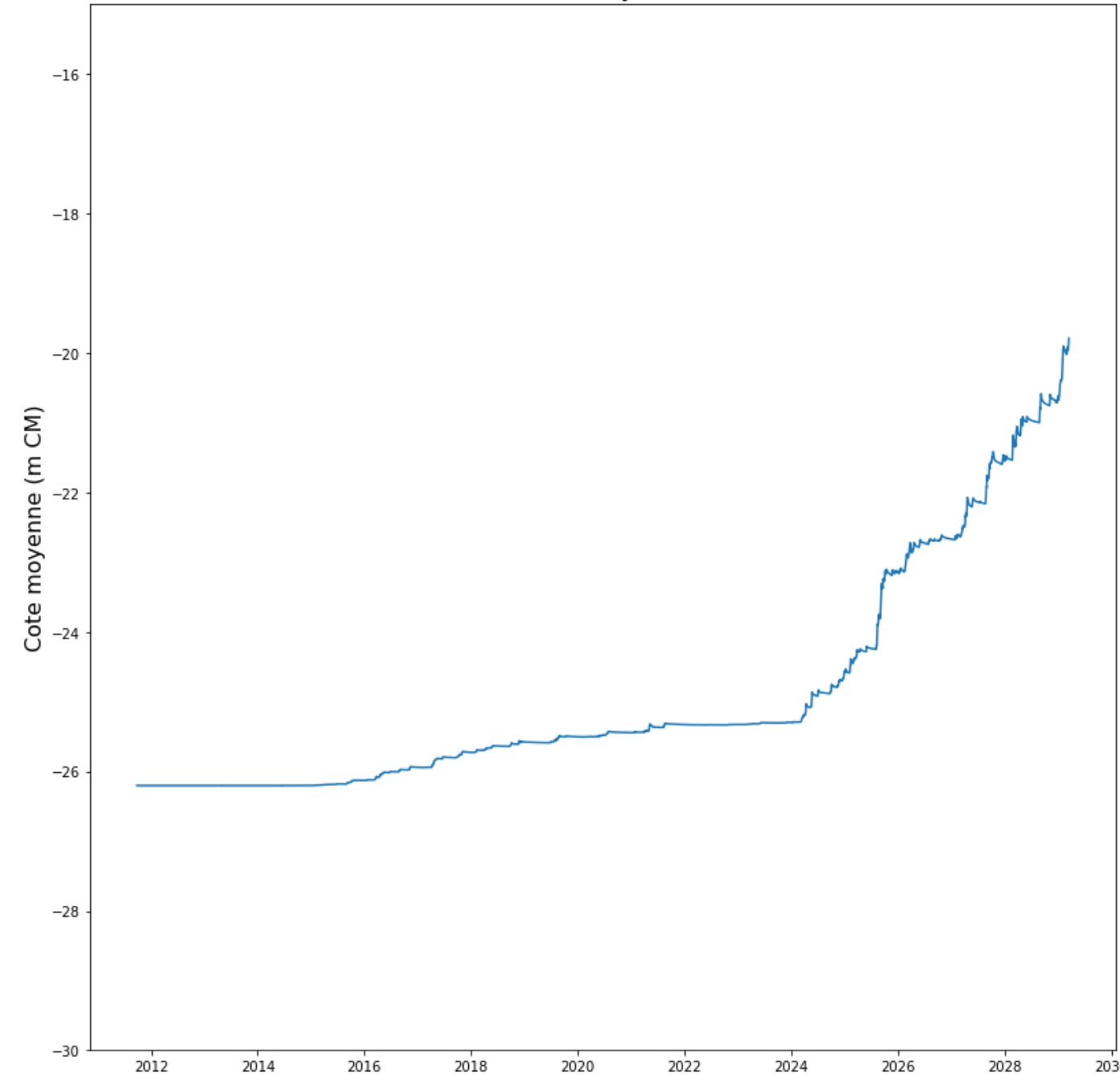


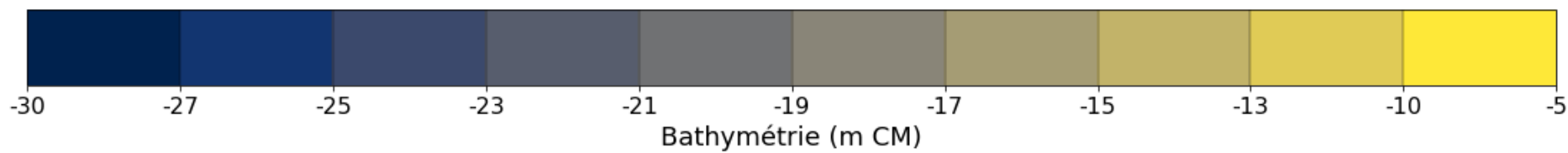
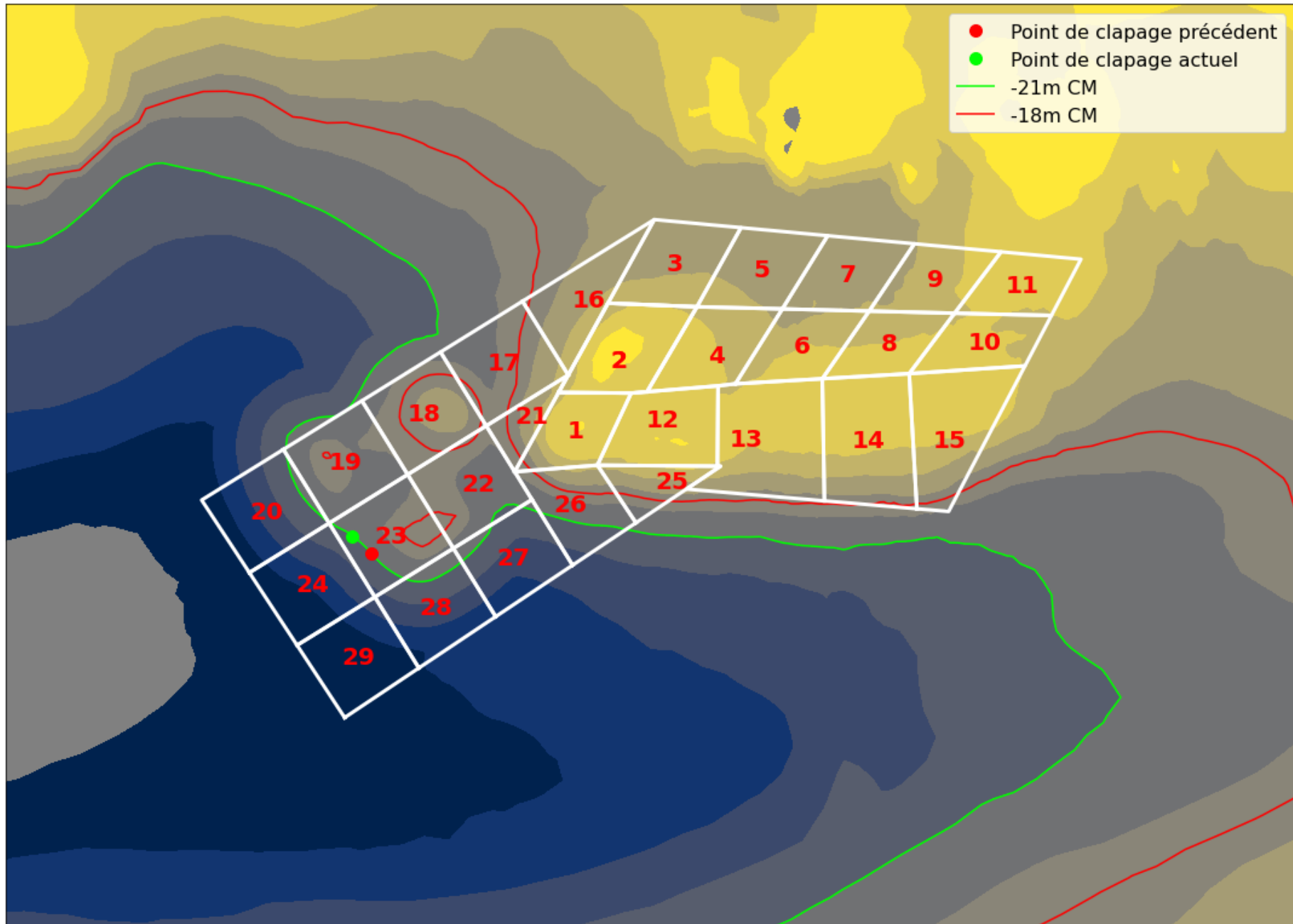




Date de changement de point : 16-03-2029

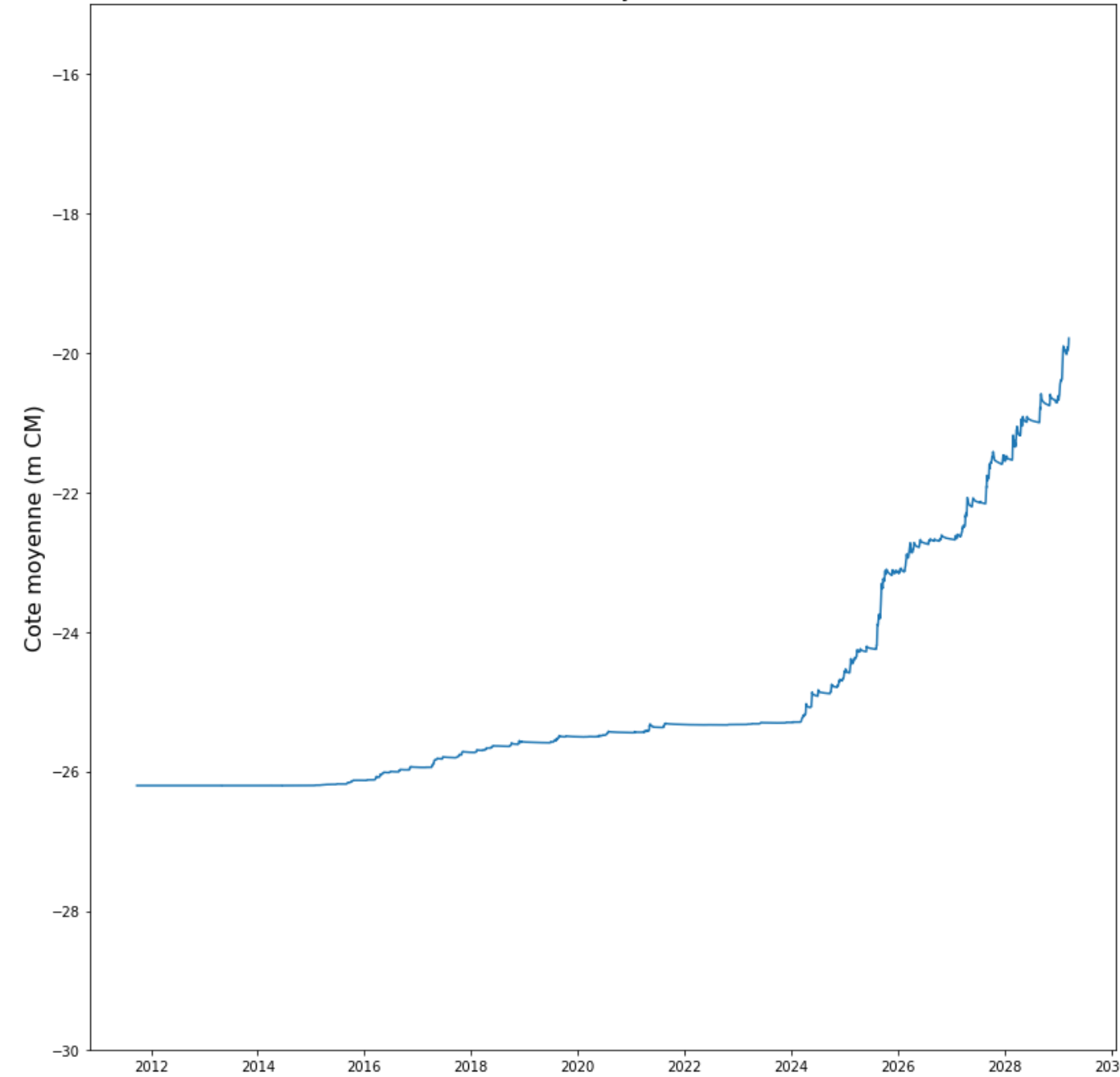
Evolution de la cote moyenne de la zone 23

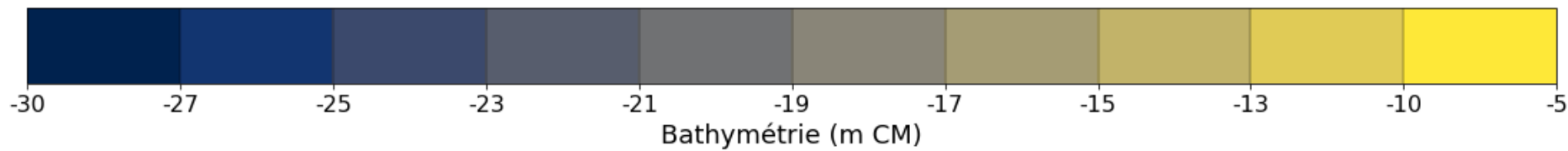
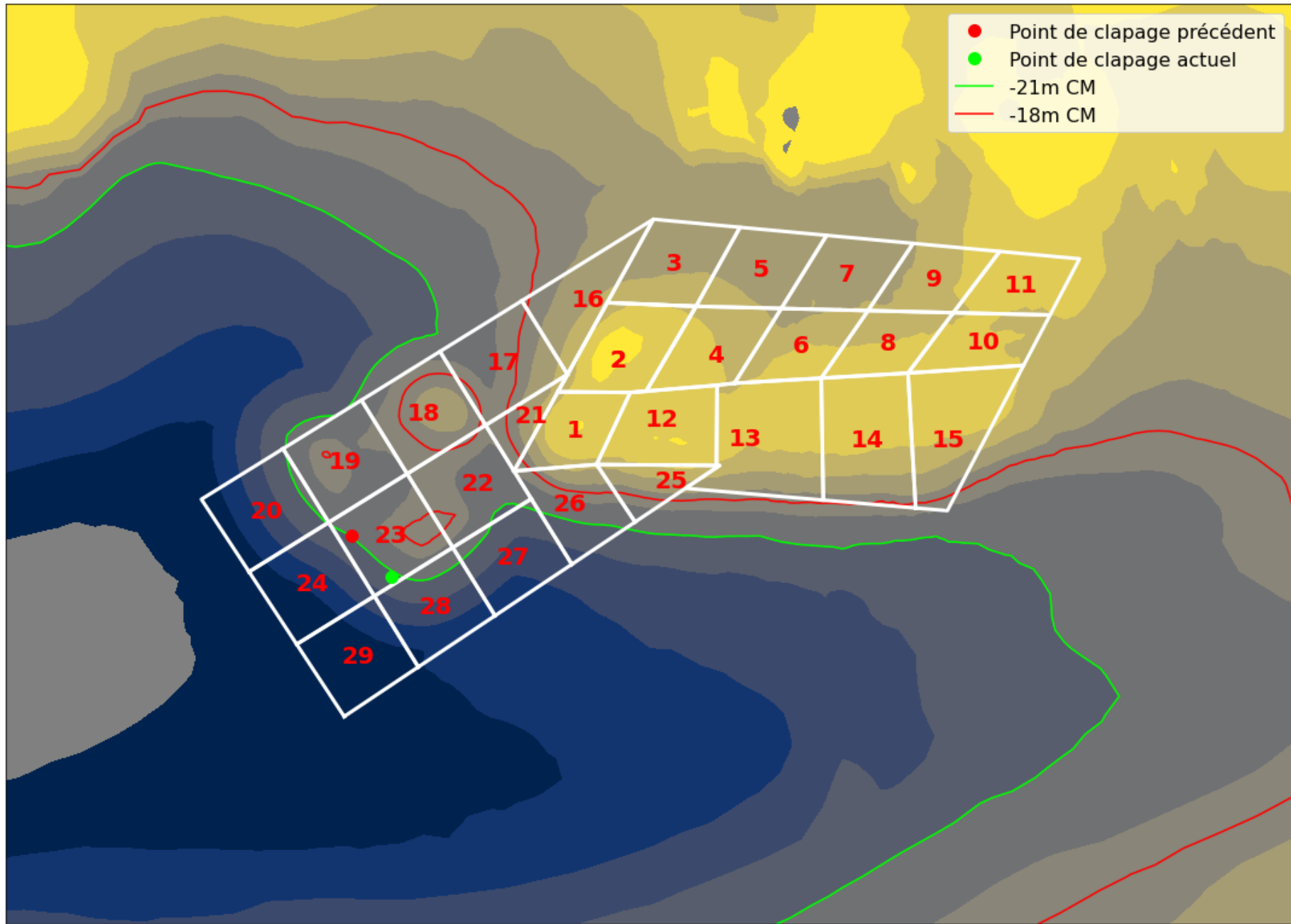




Date de changement de point : 17-03-2029

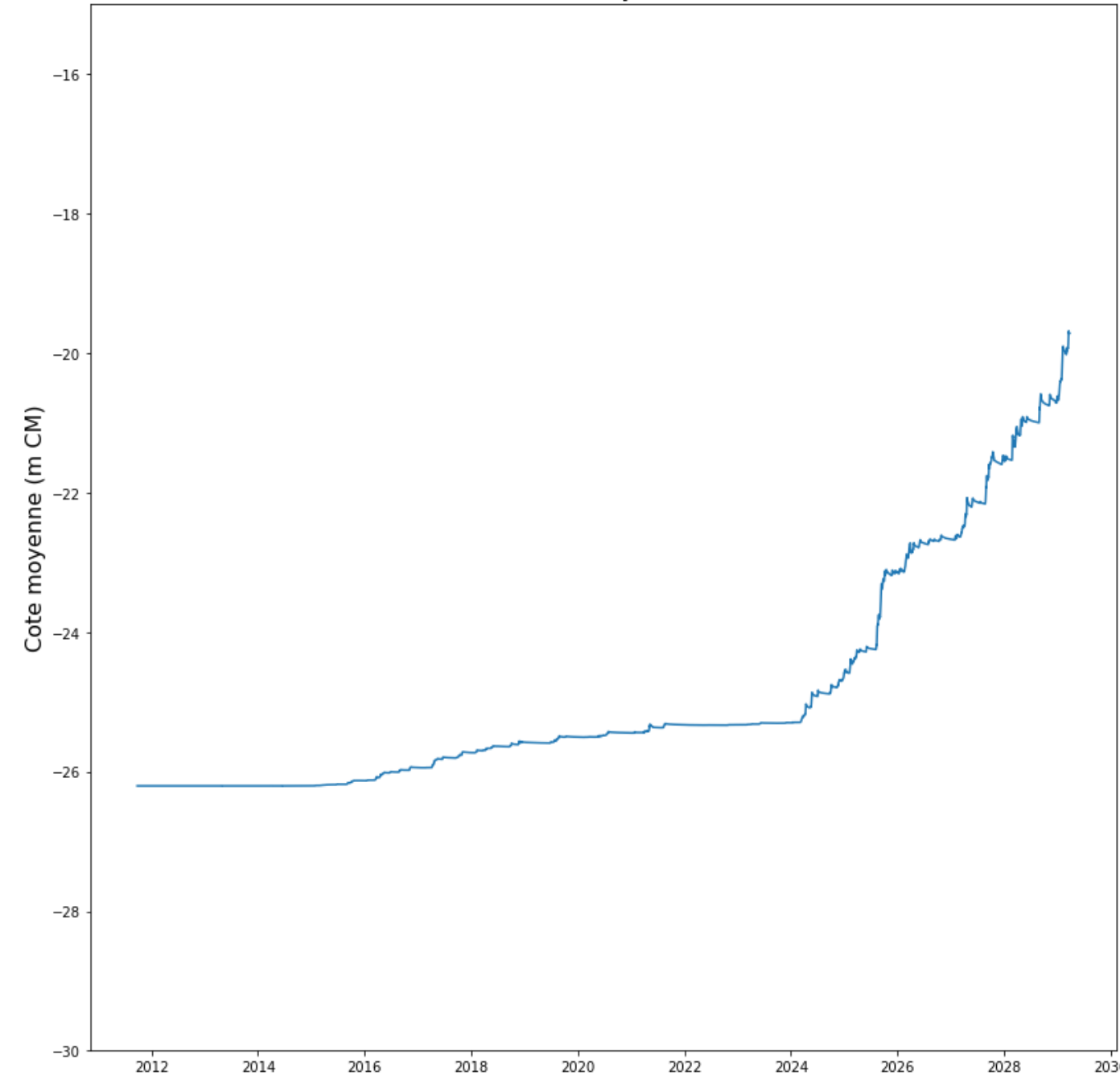
Evolution de la cote moyenne de la zone 23

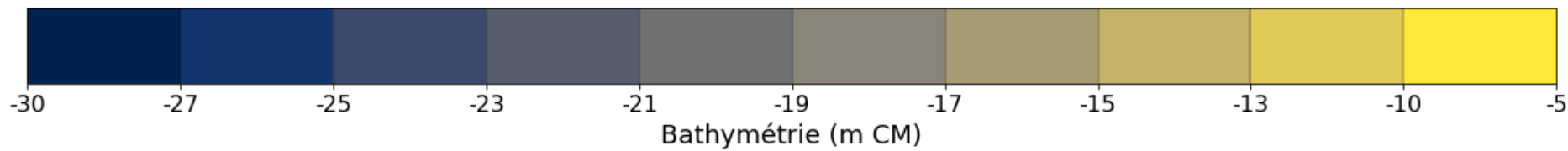
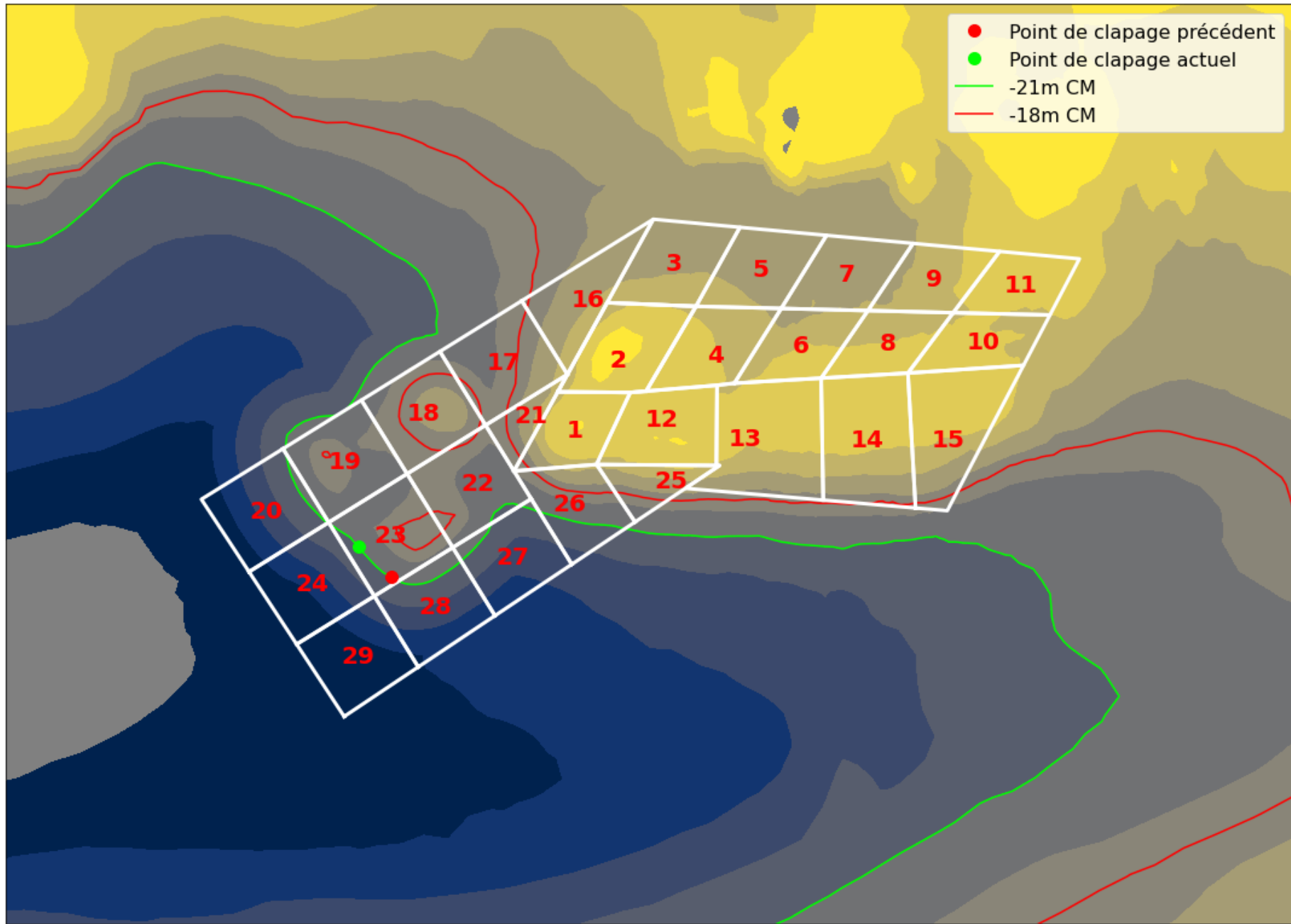




Date de changement de point : 22-03-2029

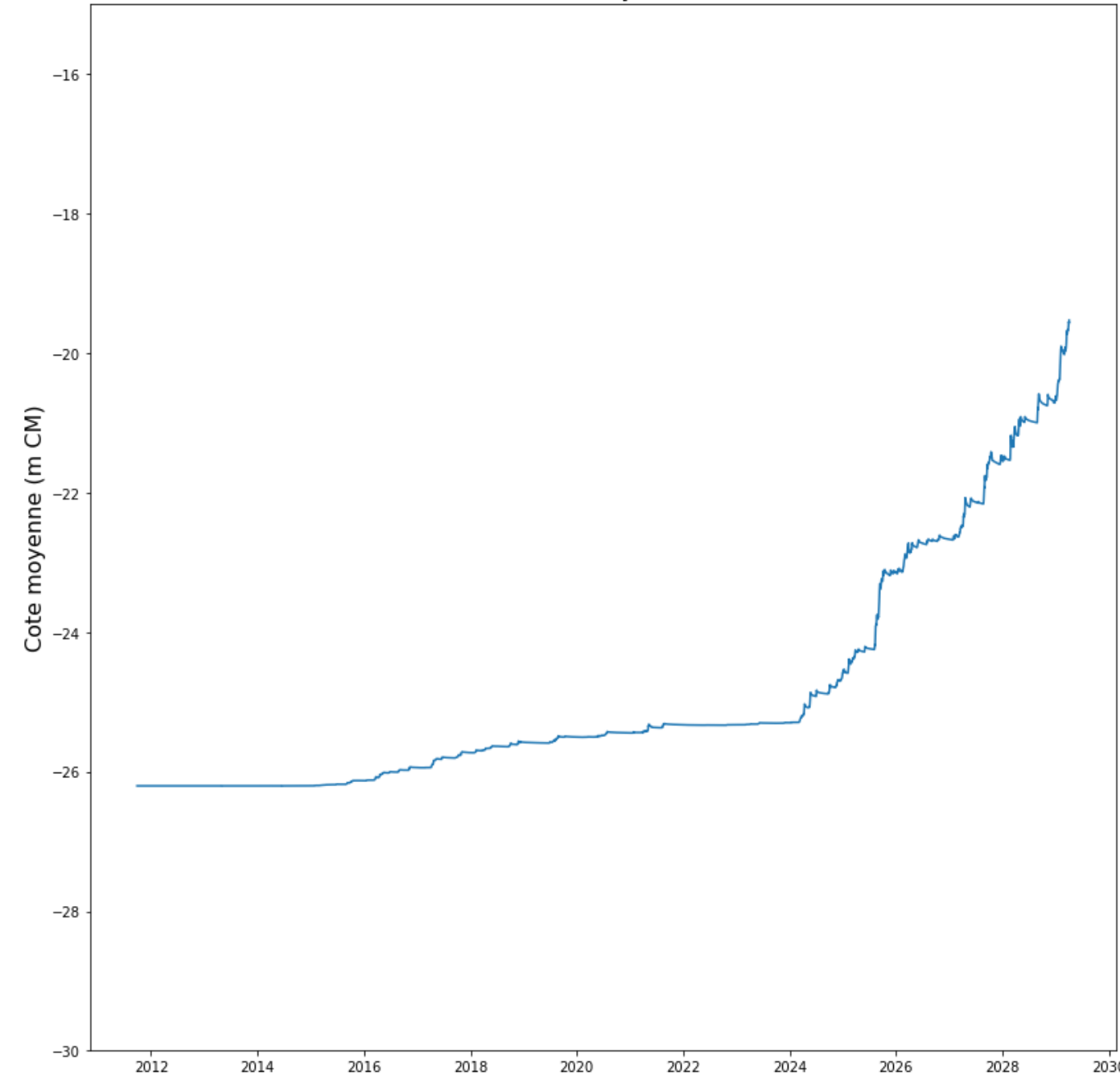
Evolution de la cote moyenne de la zone 23

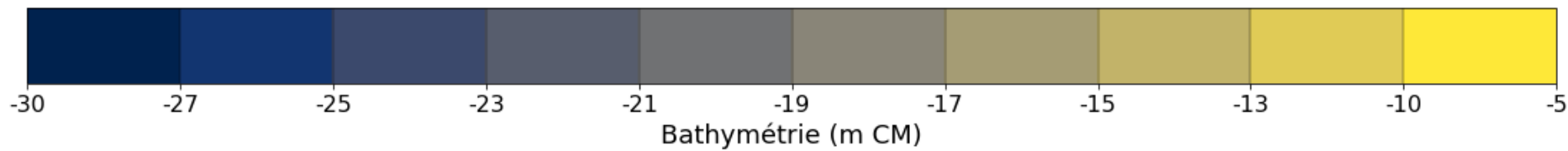
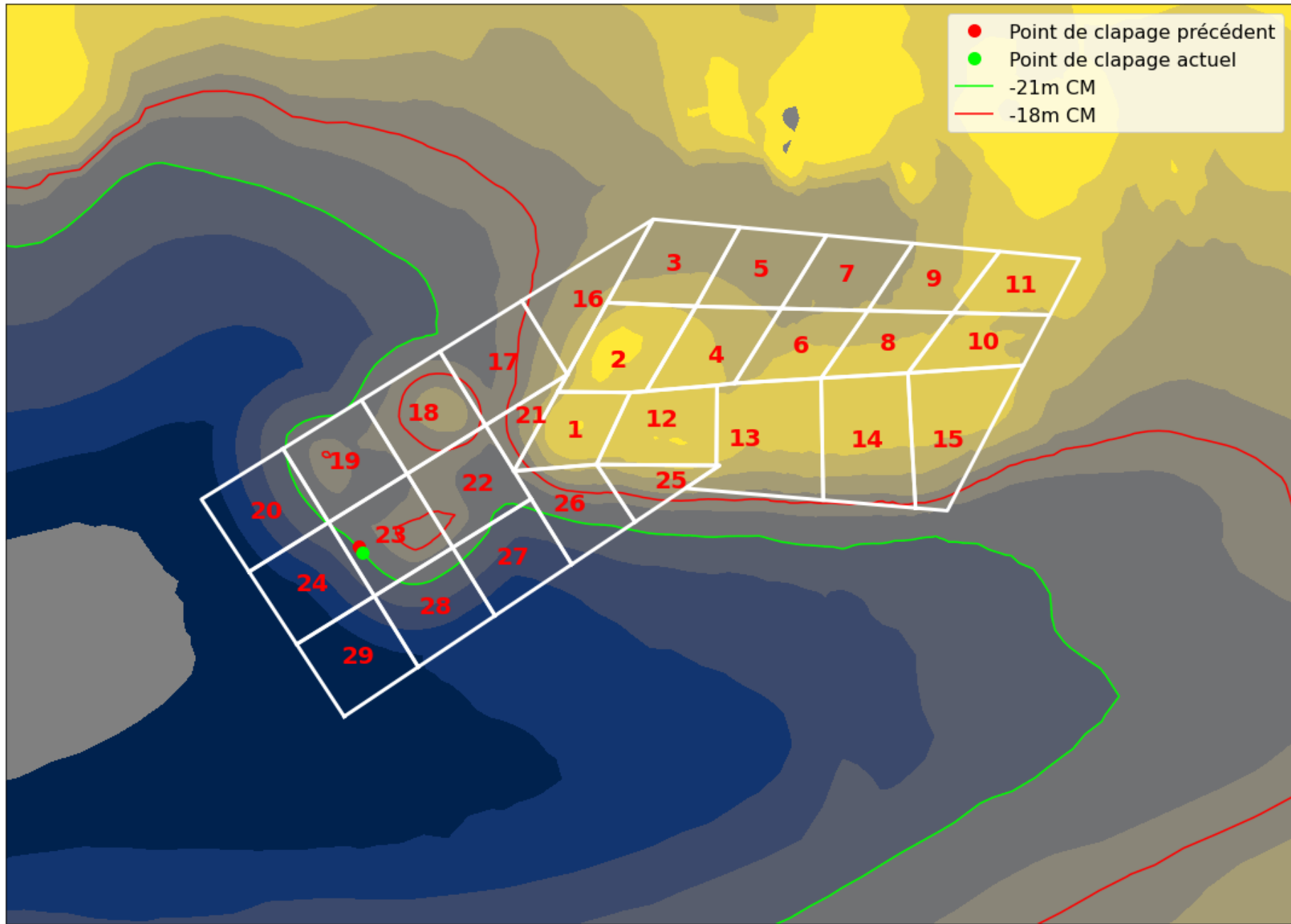




Date de changement de point : 03-04-2029

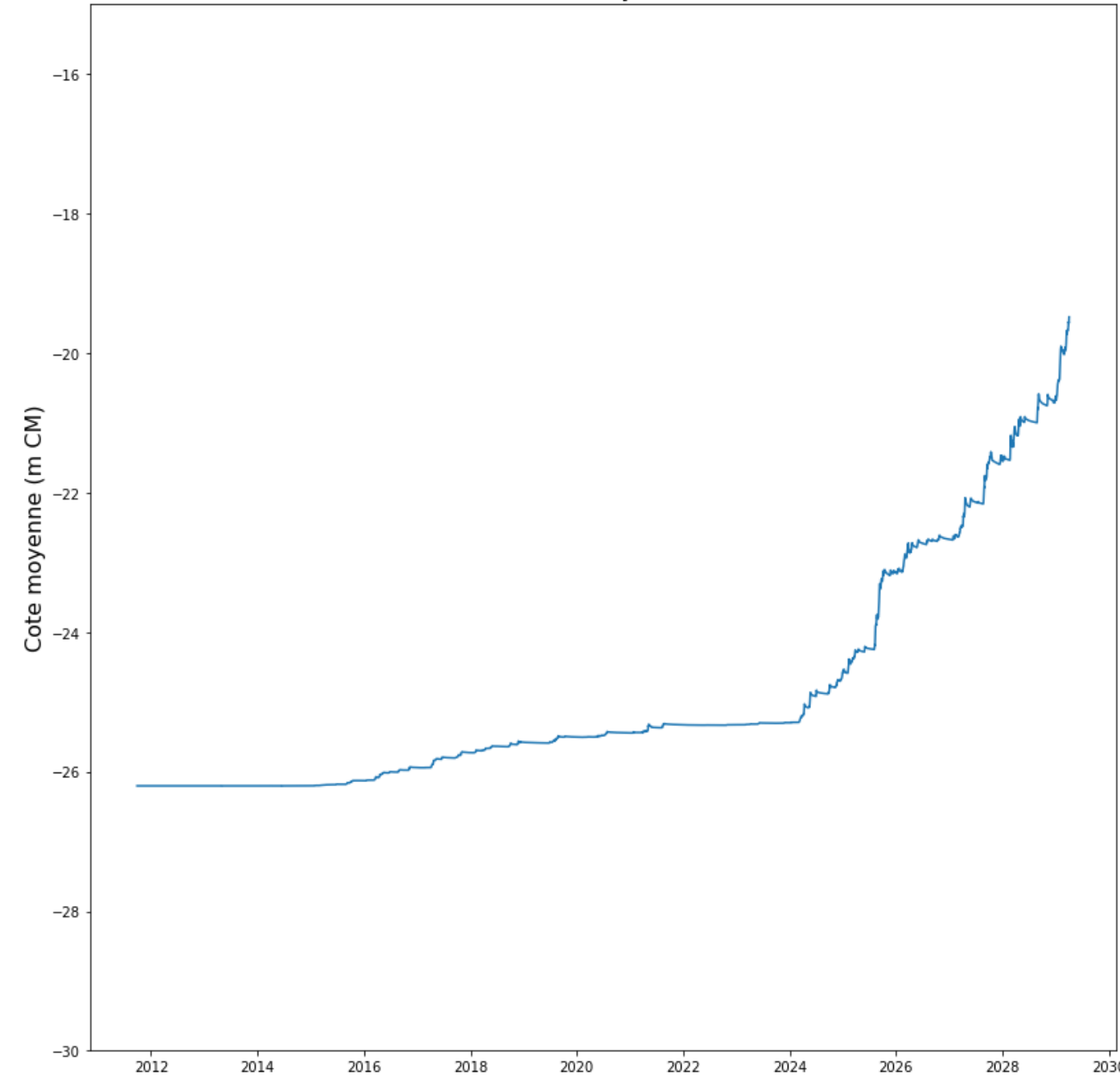
Evolution de la cote moyenne de la zone 23

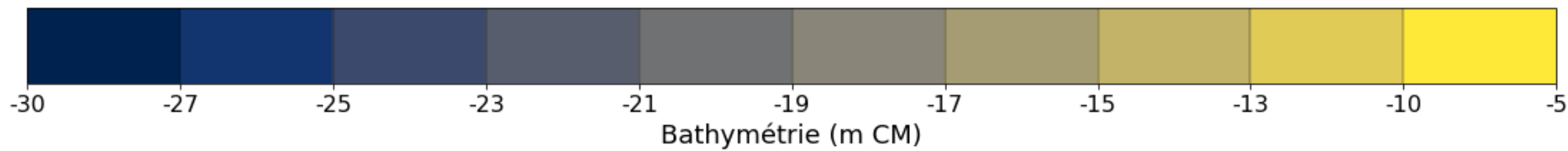
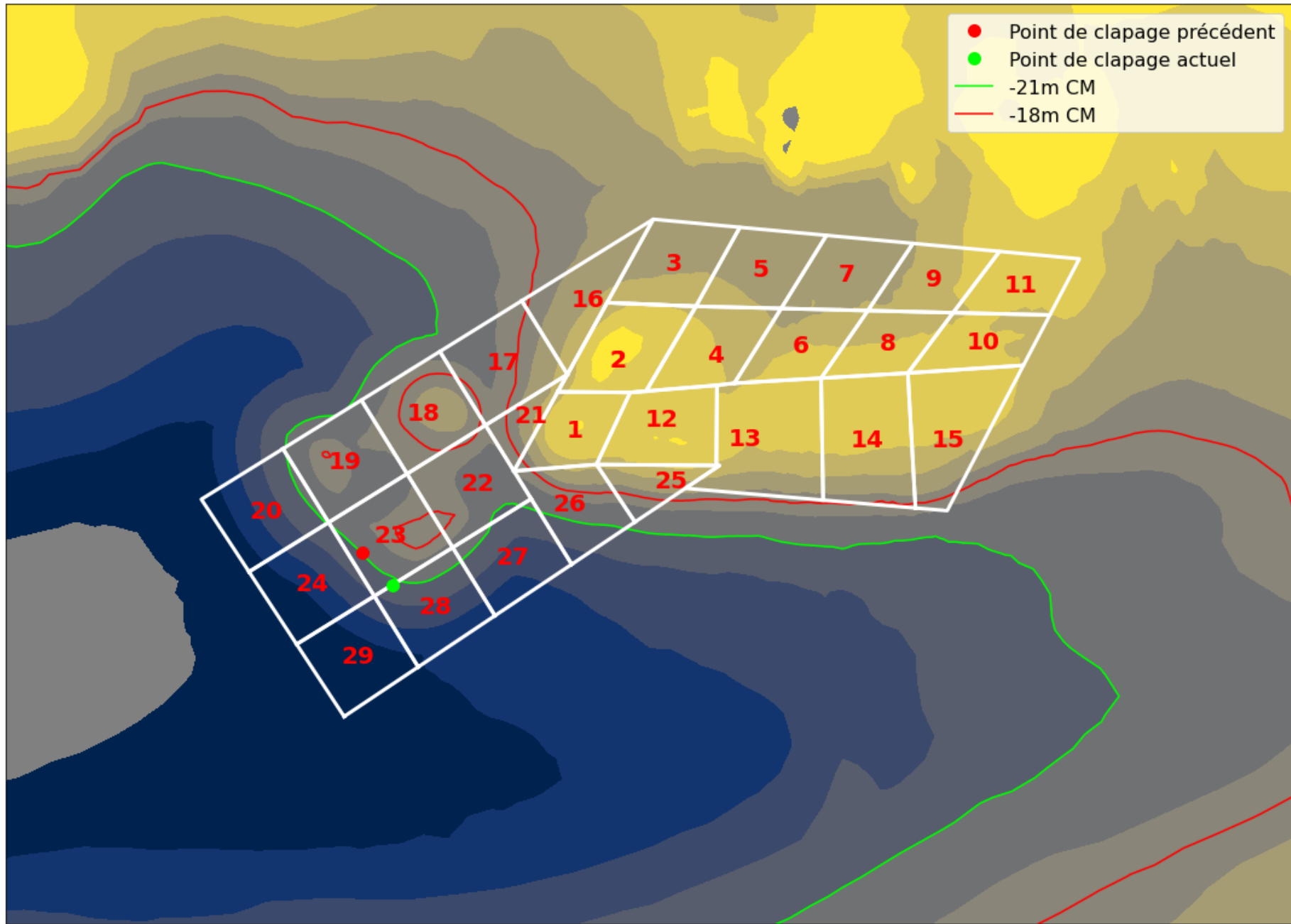




Date de changement de point : 04-04-2029

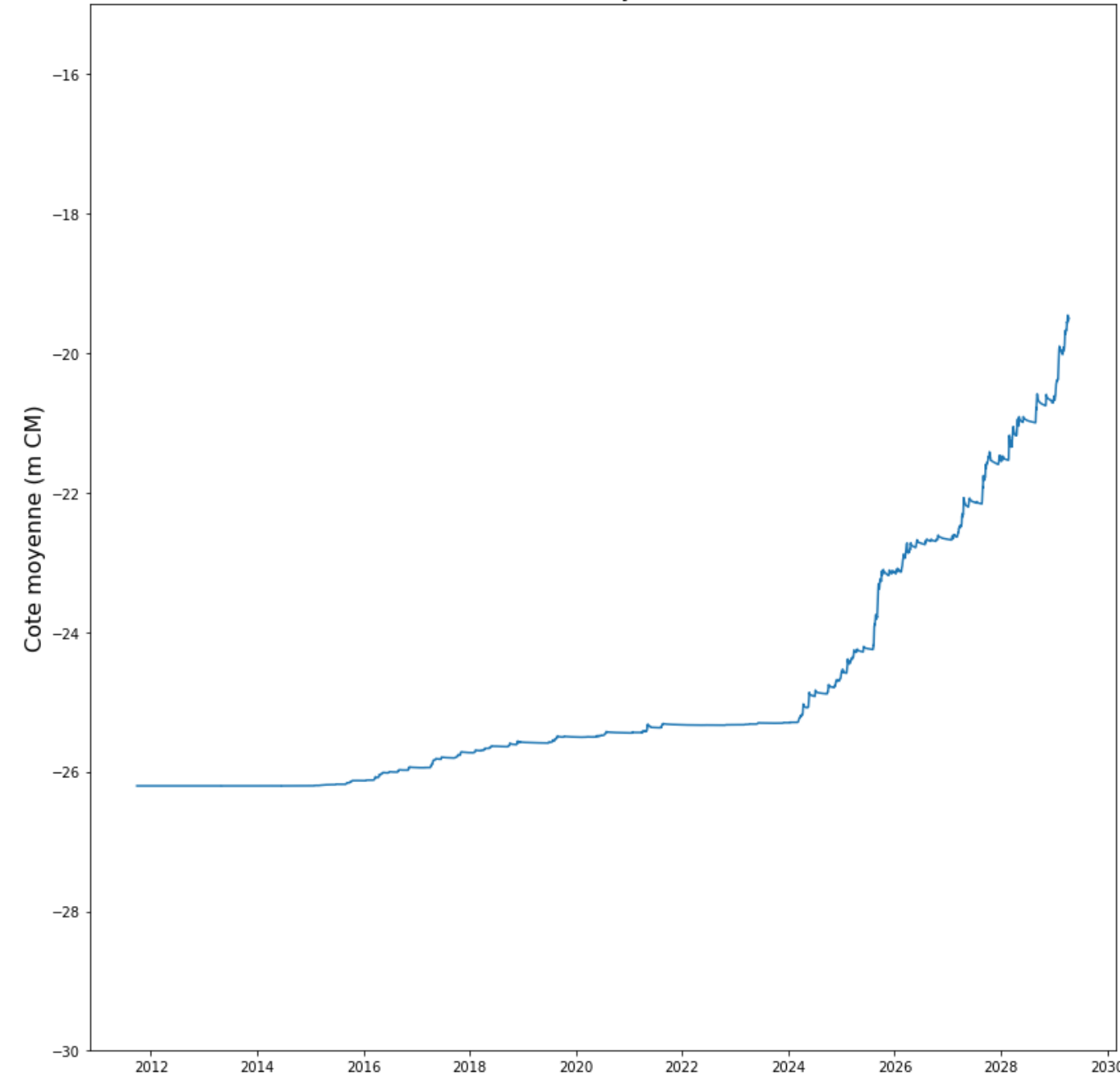
Evolution de la cote moyenne de la zone 23



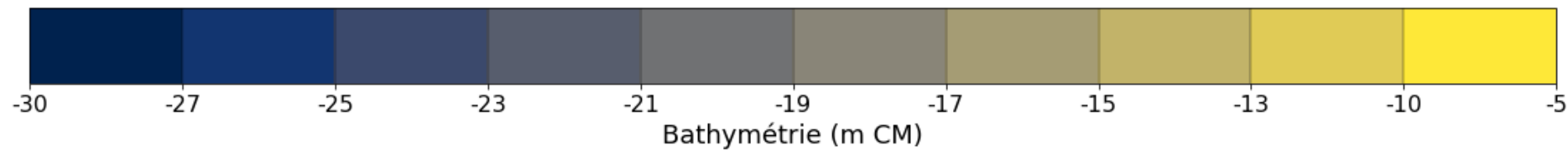
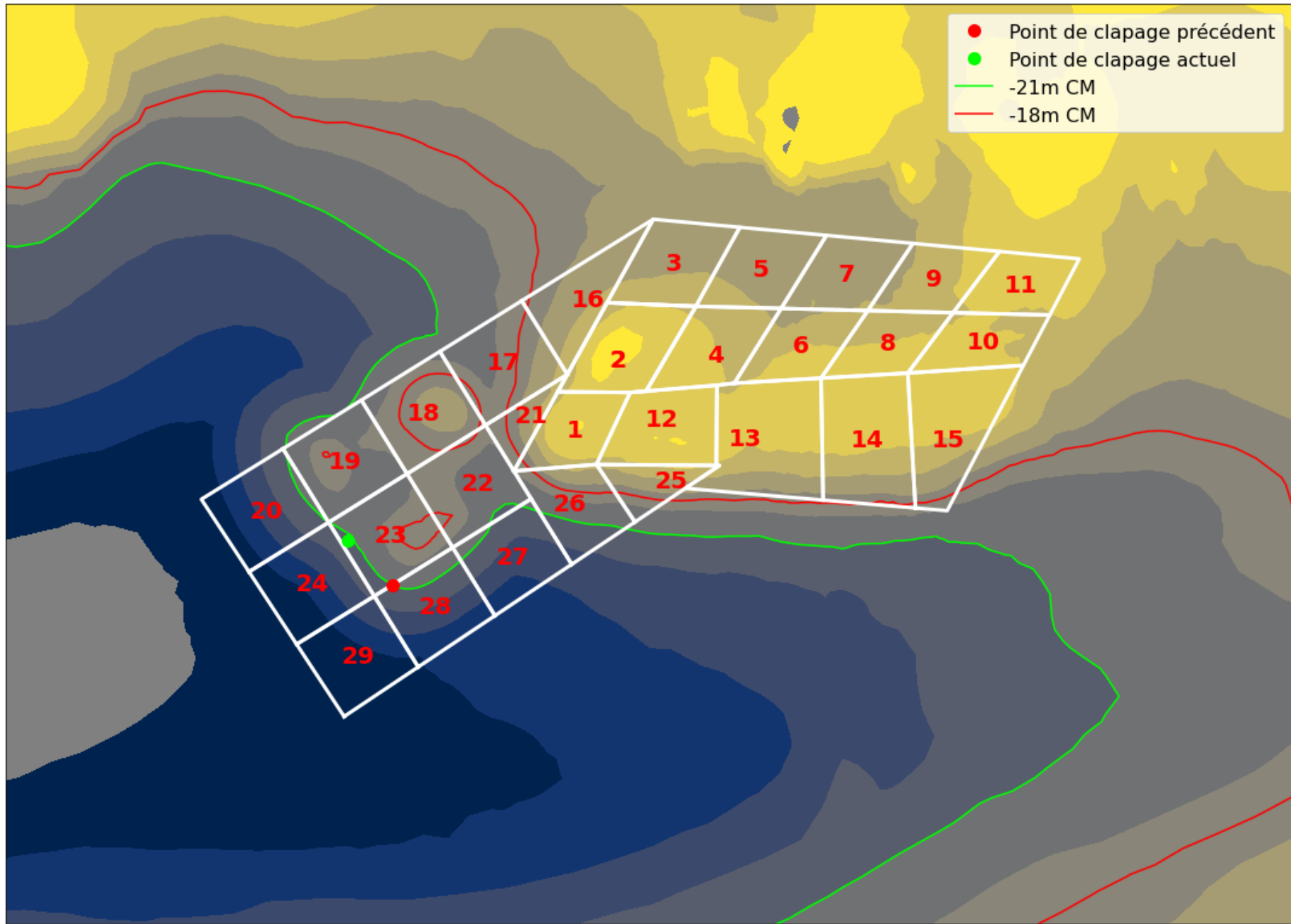


Date de changement de point : 14-04-2029

Evolution de la cote moyenne de la zone 23

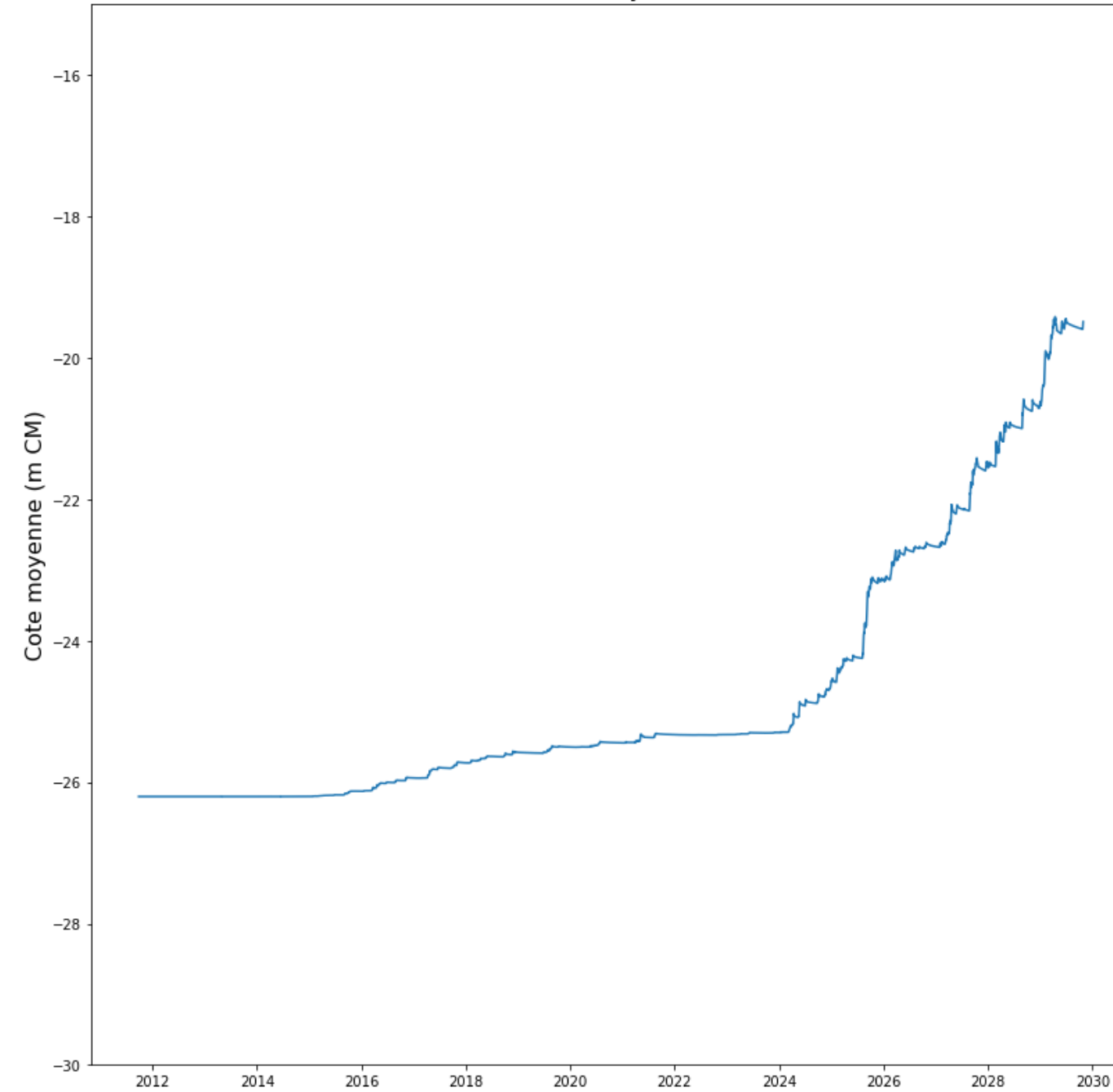


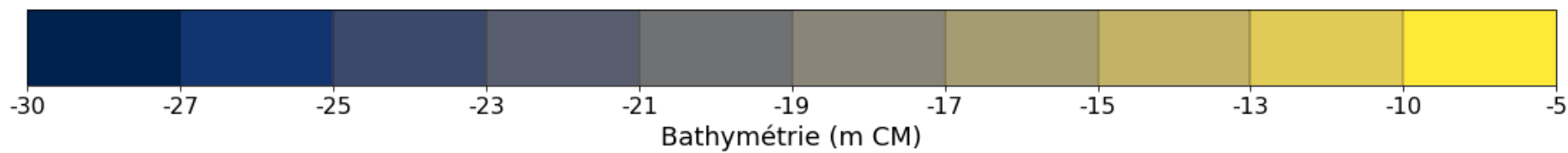
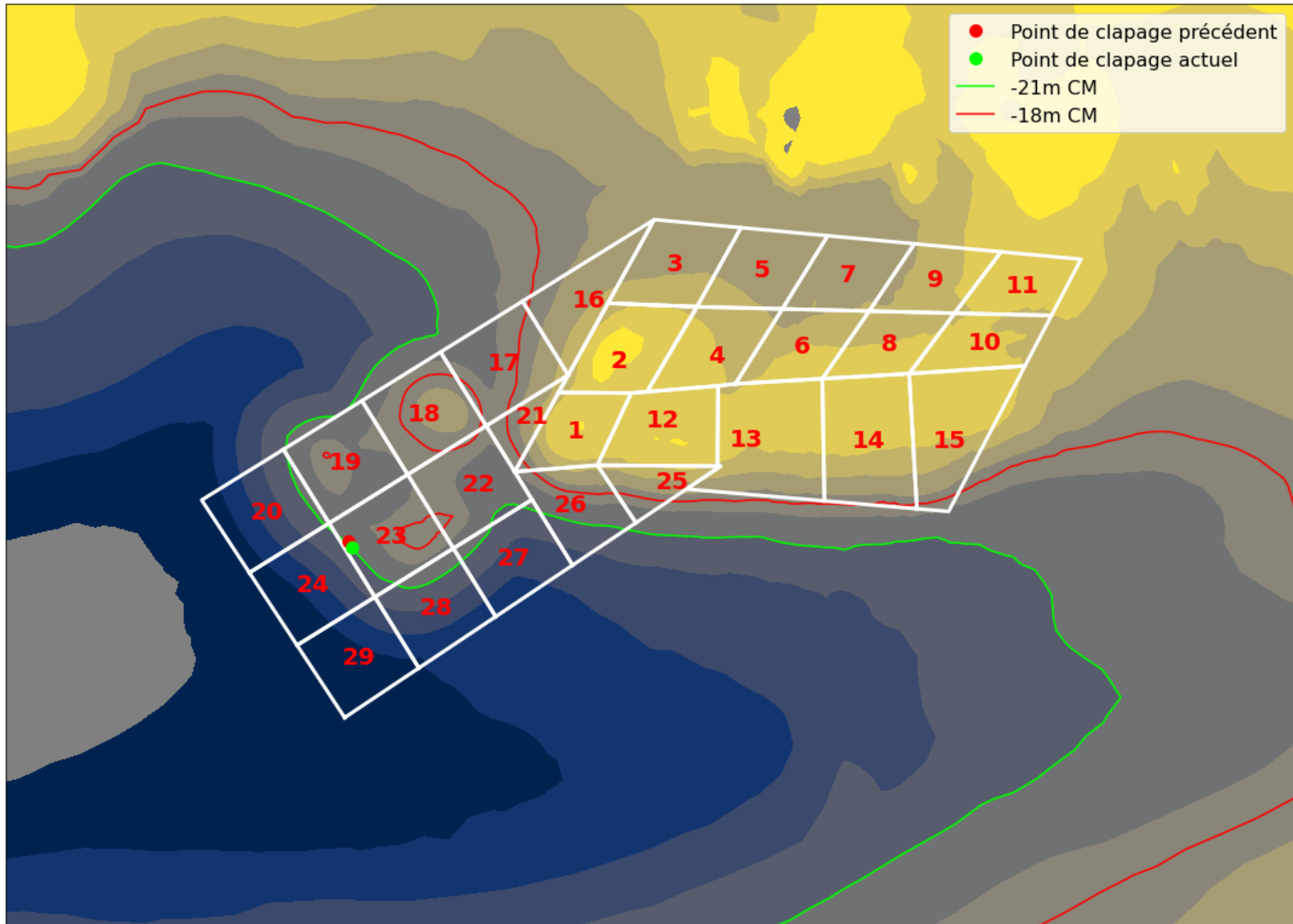




Date de changement de point : 28-10-2029

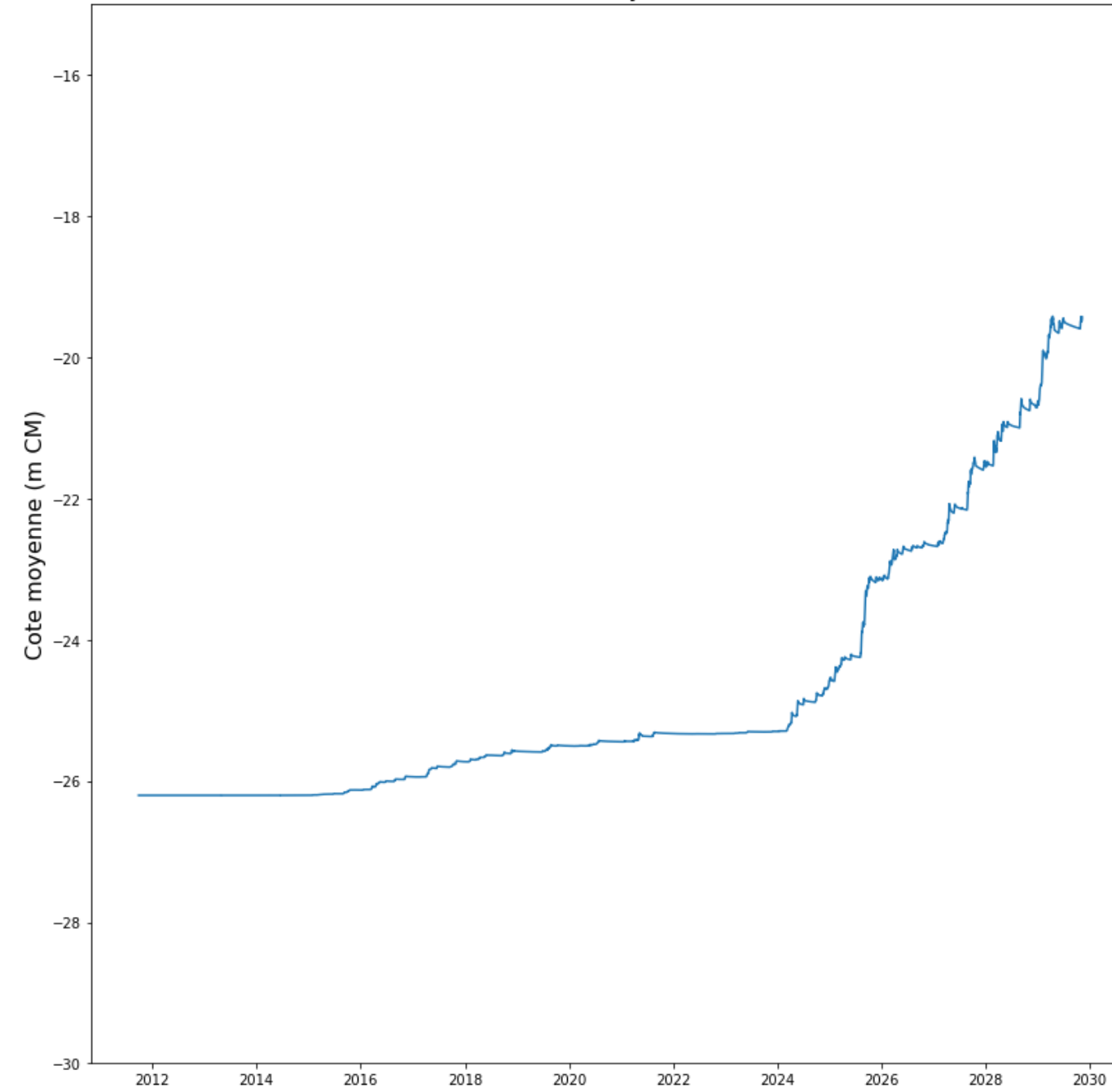
Evolution de la cote moyenne de la zone 23

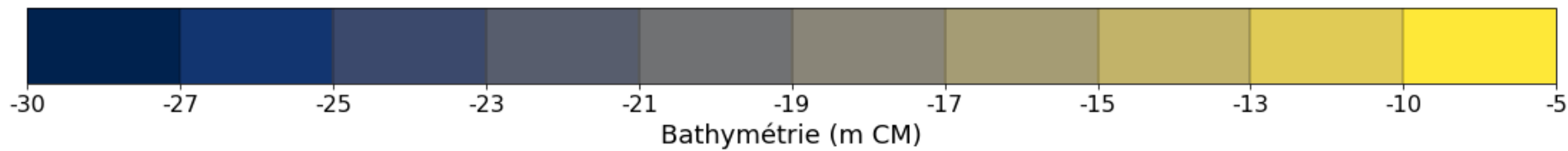
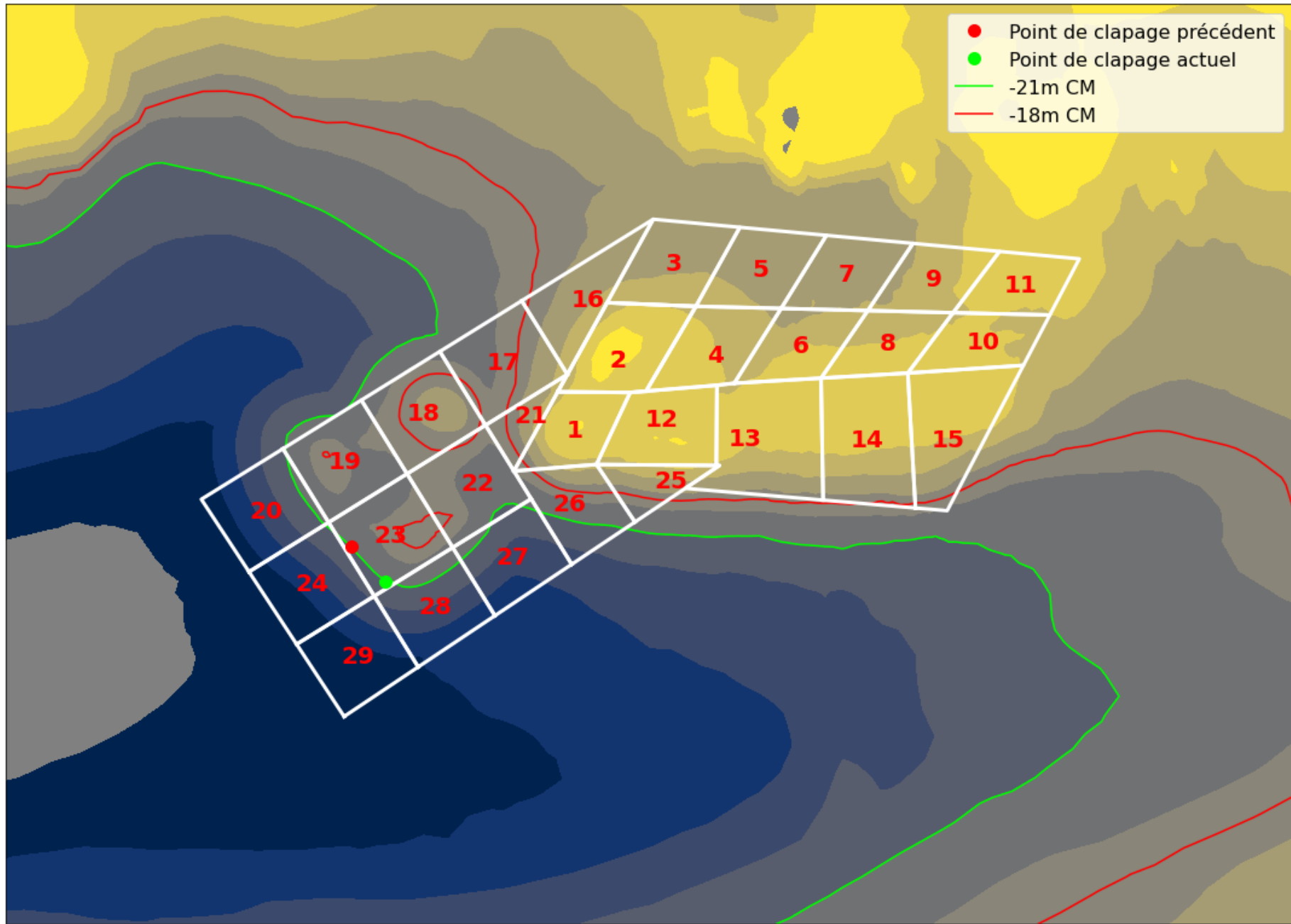




Date de changement de point : 08-11-2029

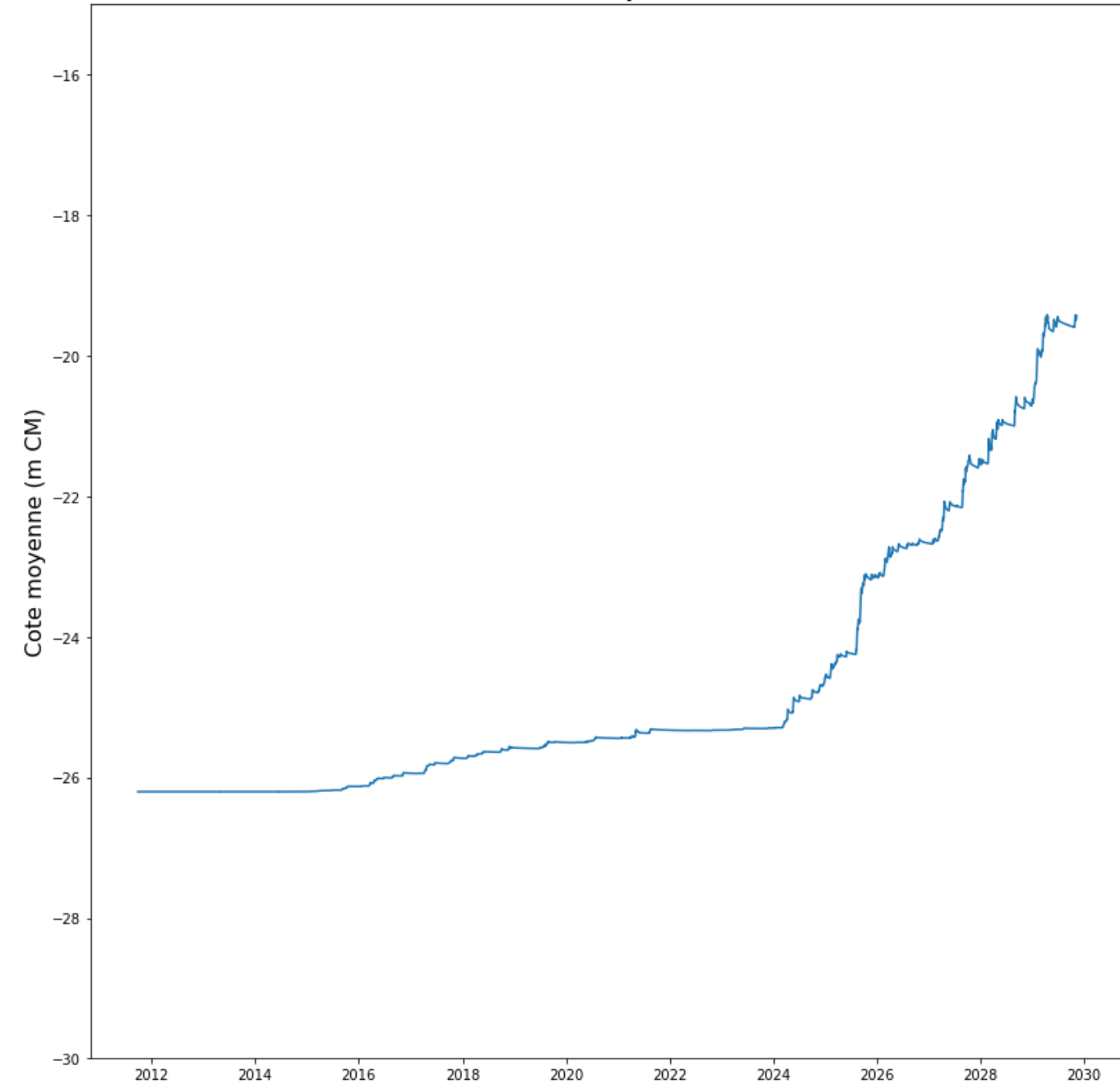
Evolution de la cote moyenne de la zone 23

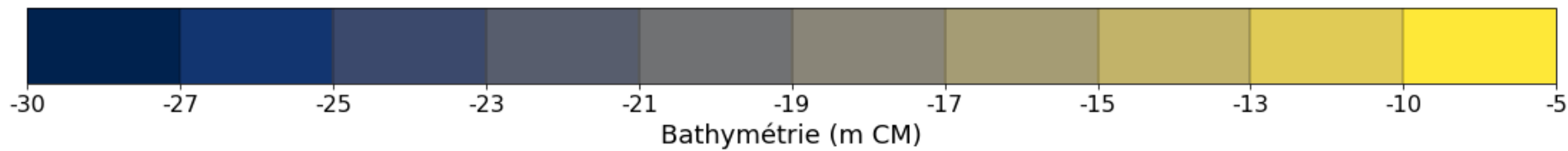
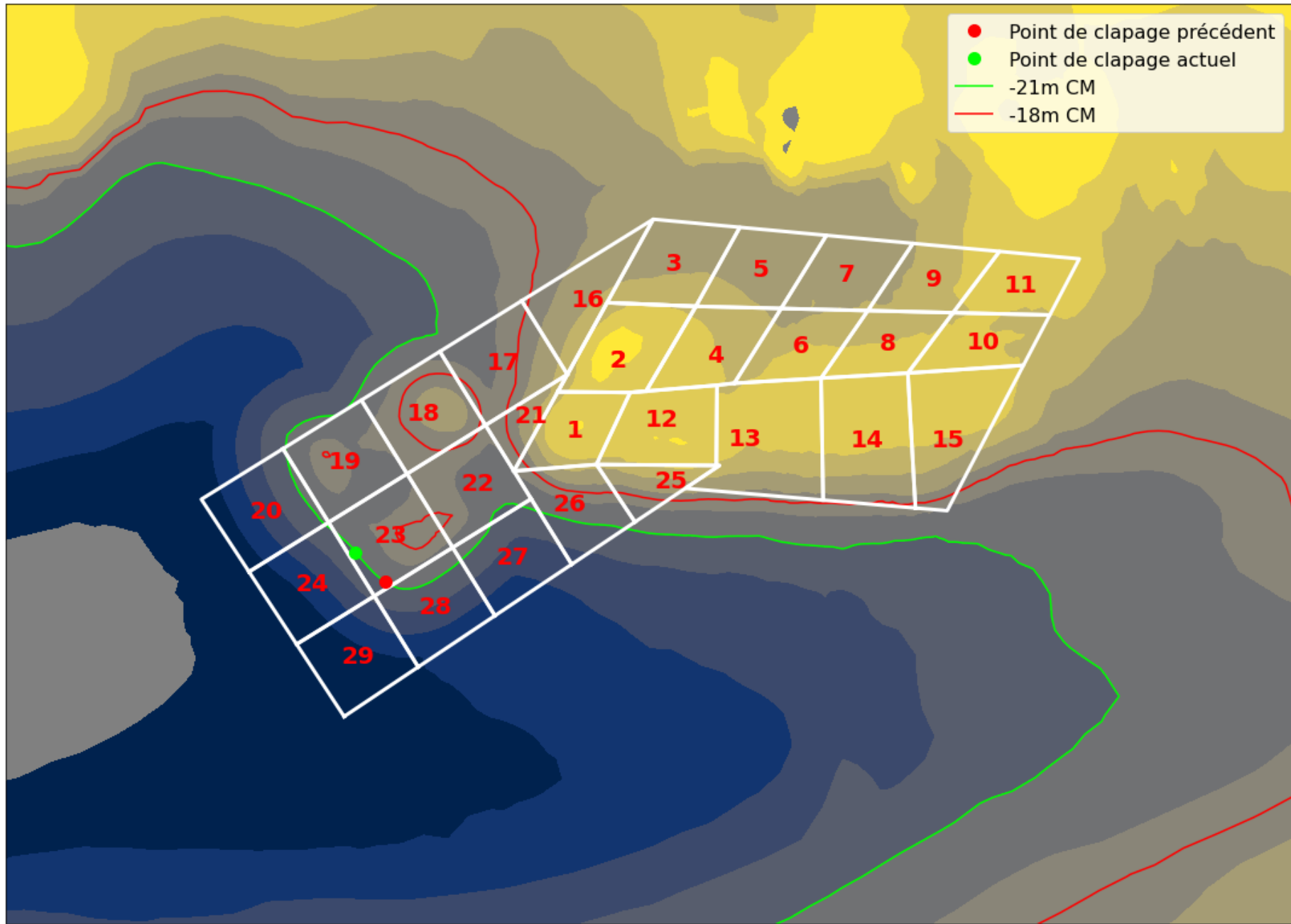




Date de changement de point : 09-11-2029

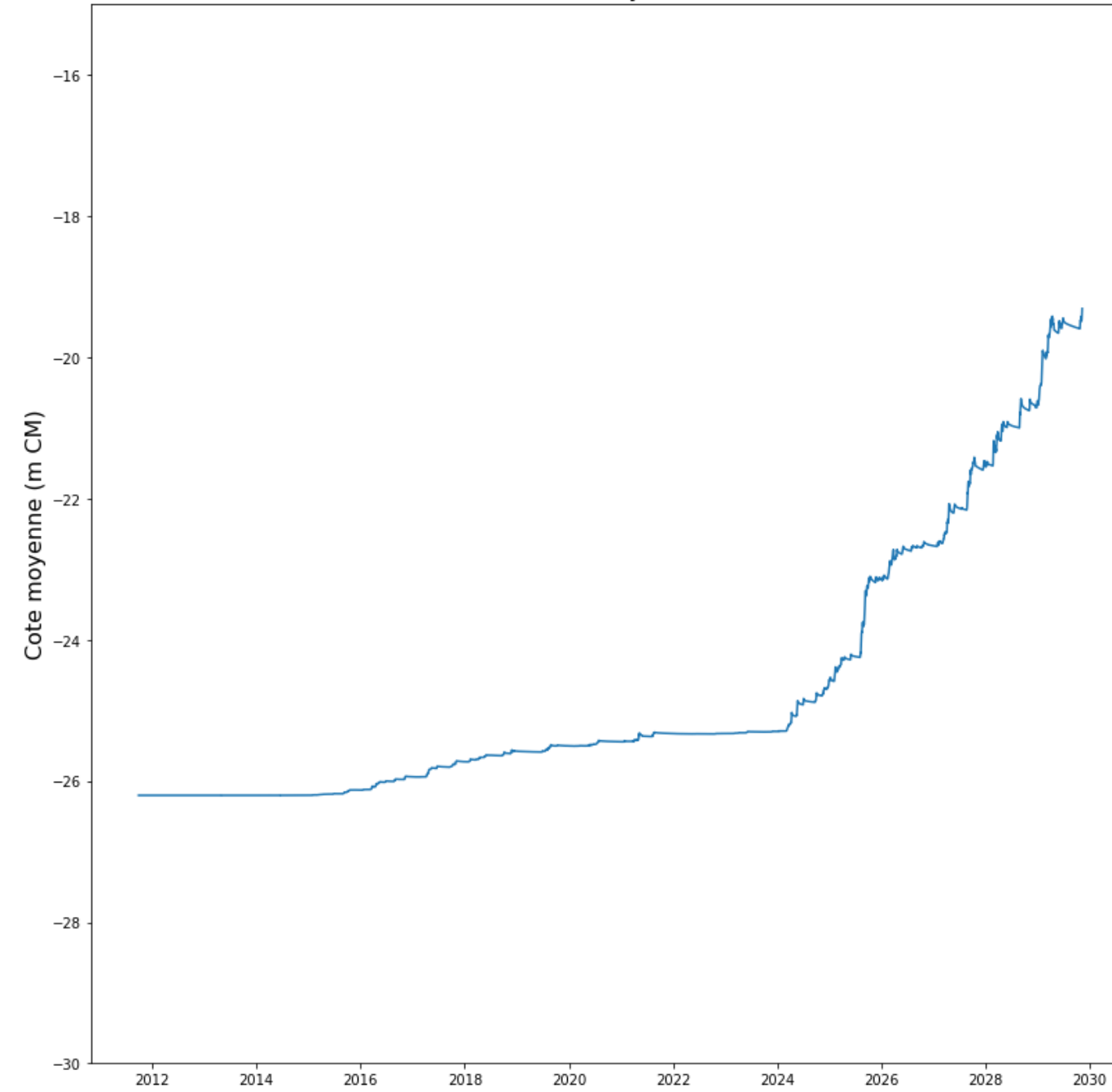
Evolution de la cote moyenne de la zone 23

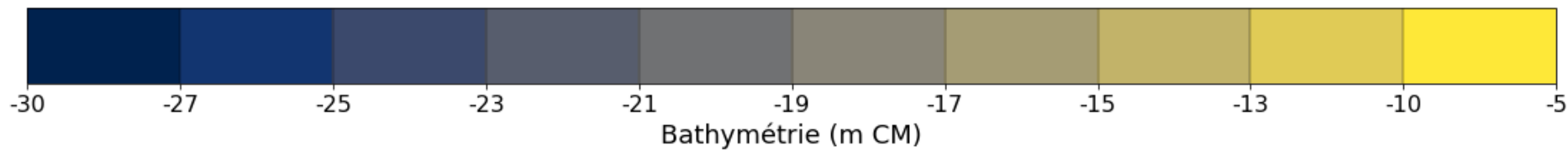
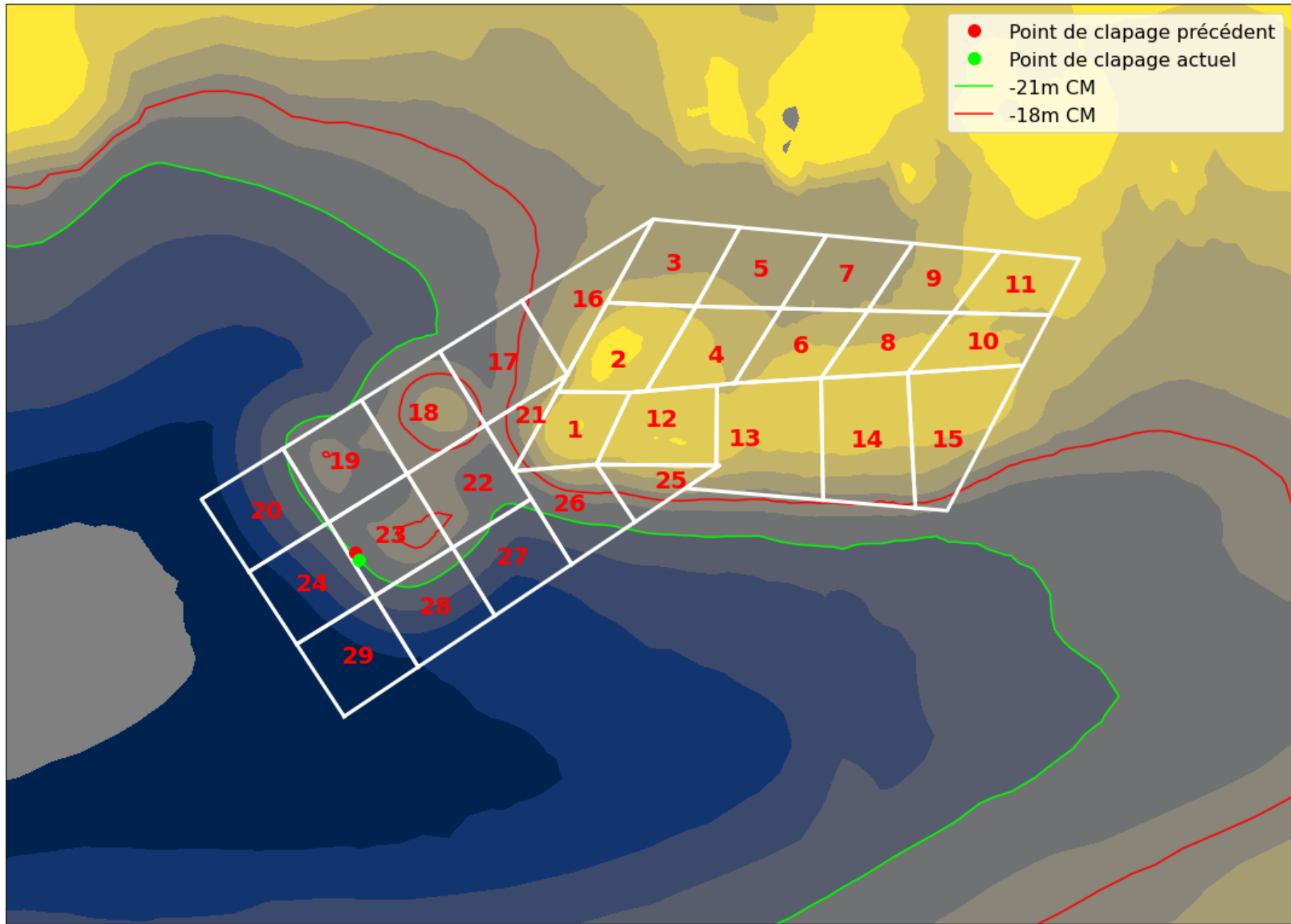




Date de changement de point : 10-11-2029

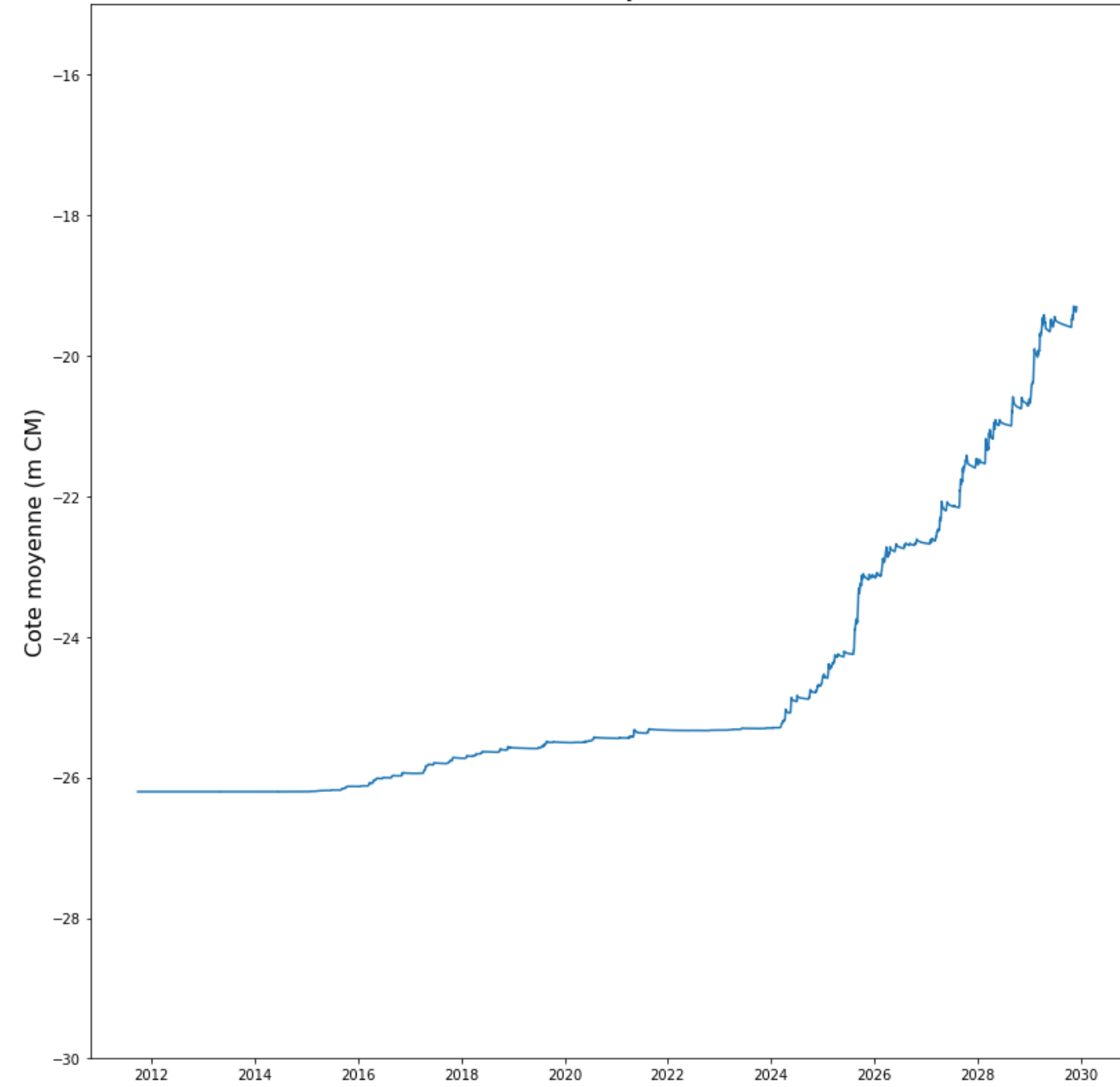
Evolution de la cote moyenne de la zone 23

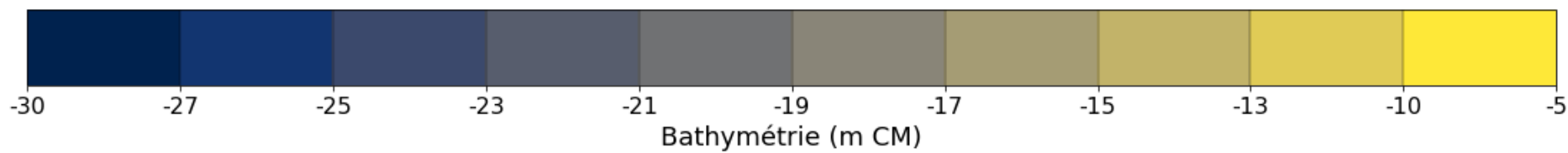
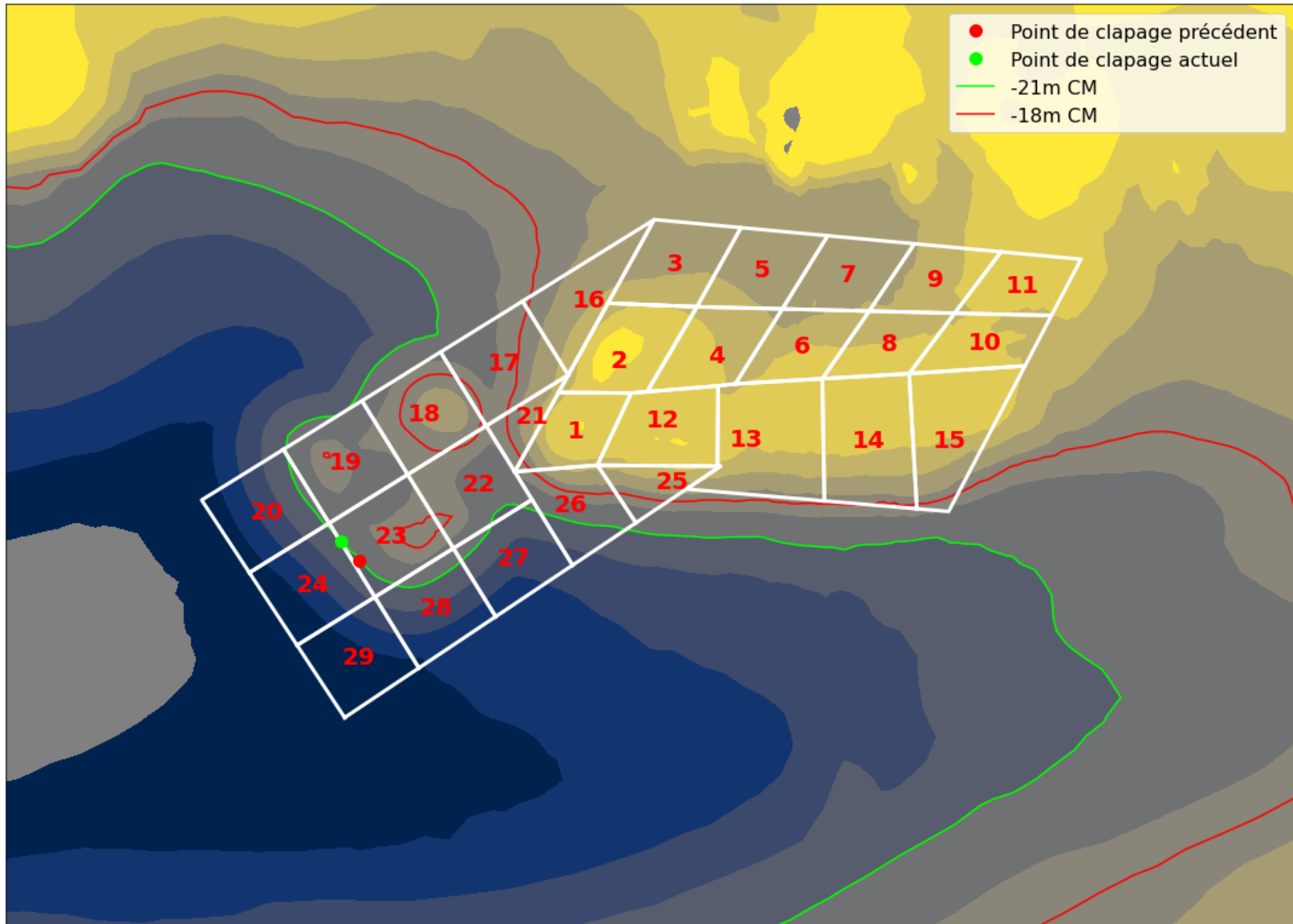




Date de changement de point : 01-12-2029

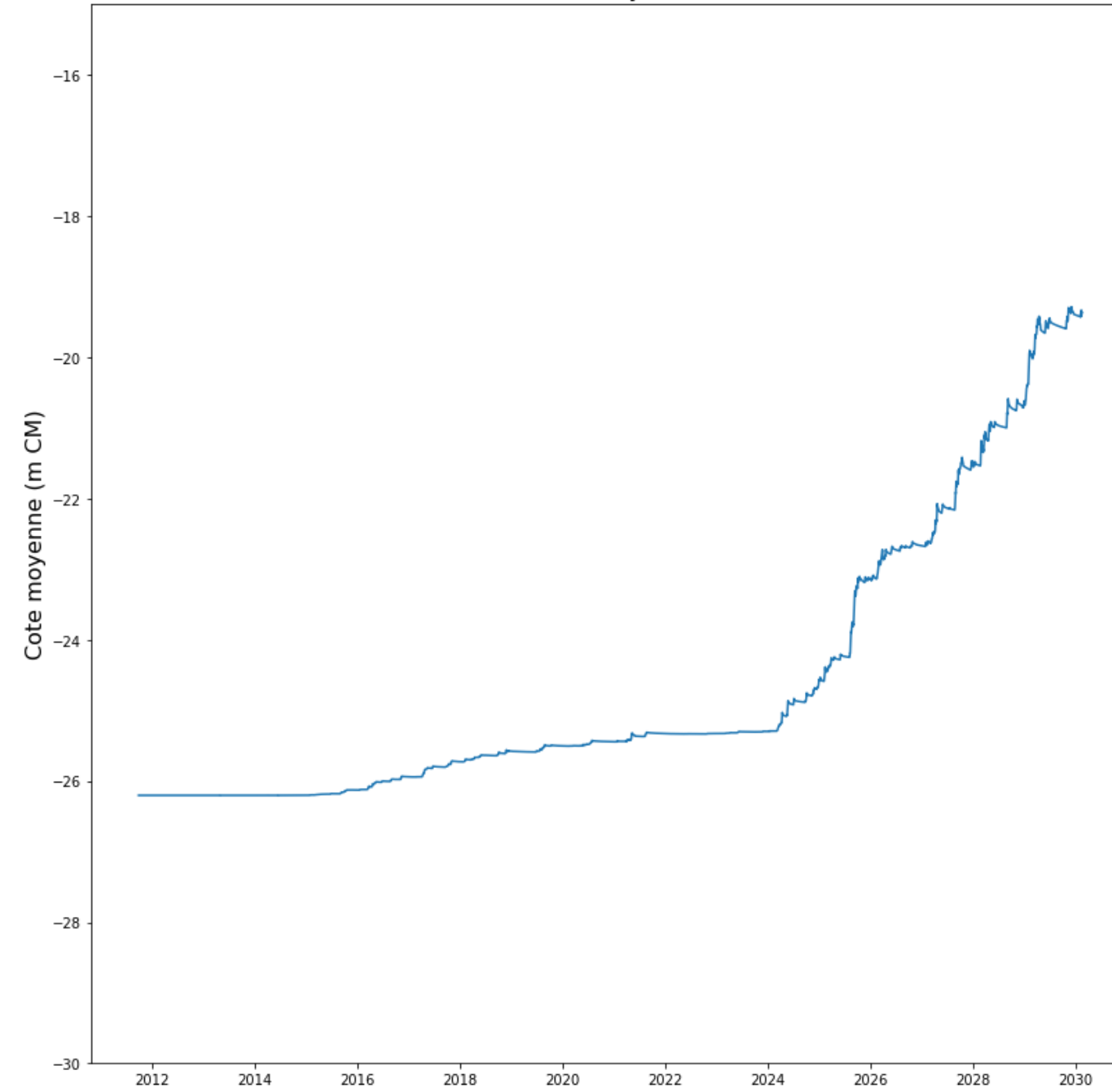
Evolution de la cote moyenne de la zone 23



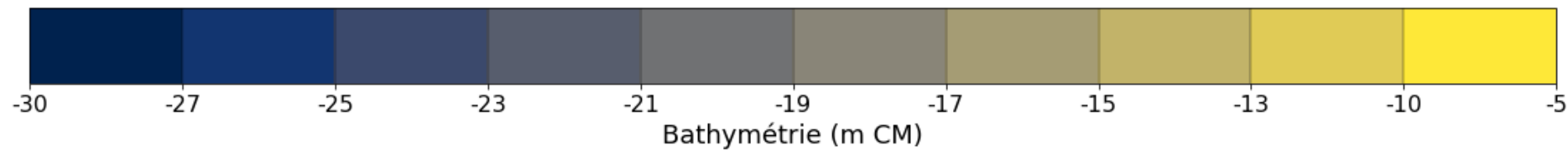
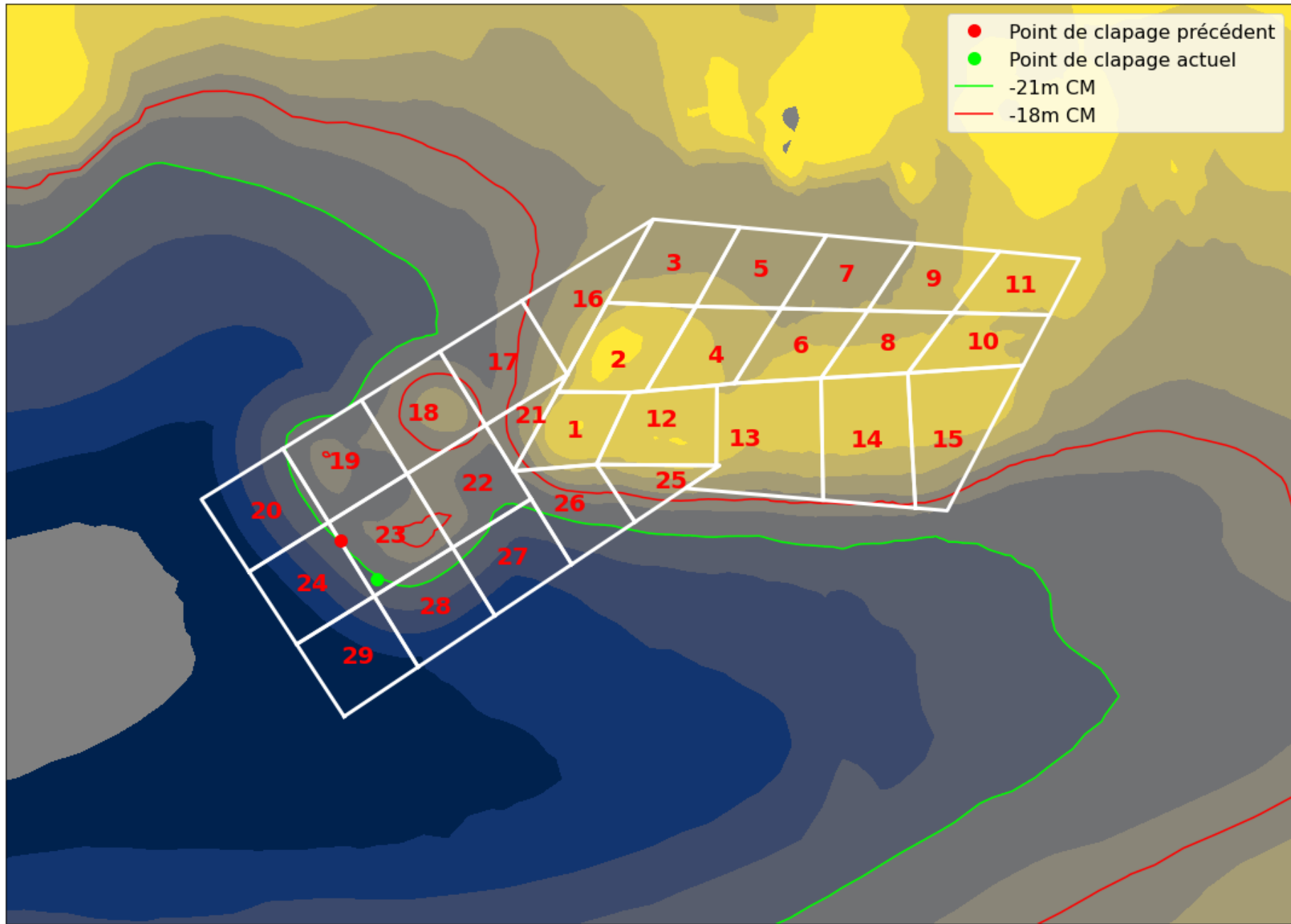


Date de changement de point : 17-02-2030

Evolution de la cote moyenne de la zone 23

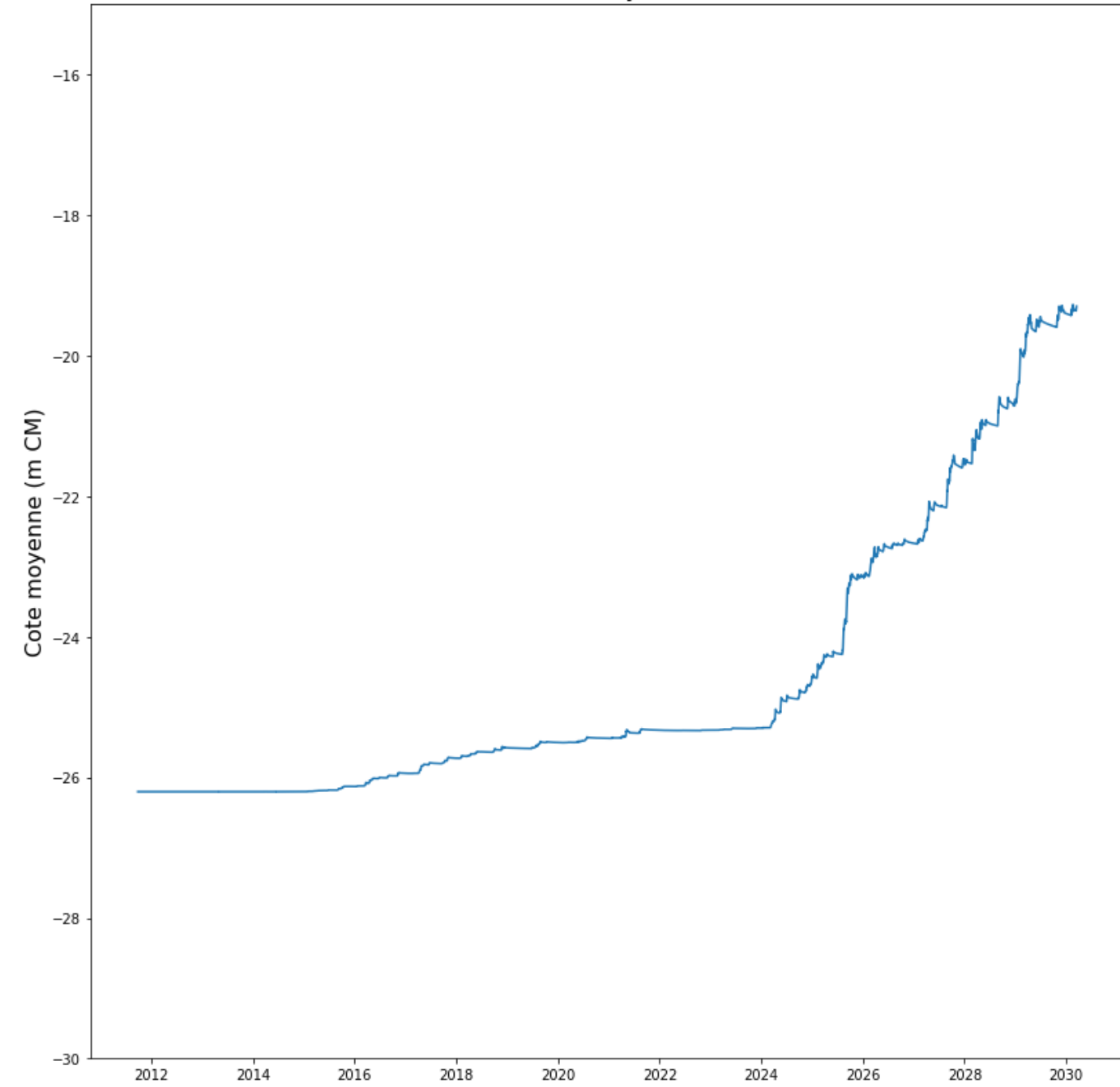


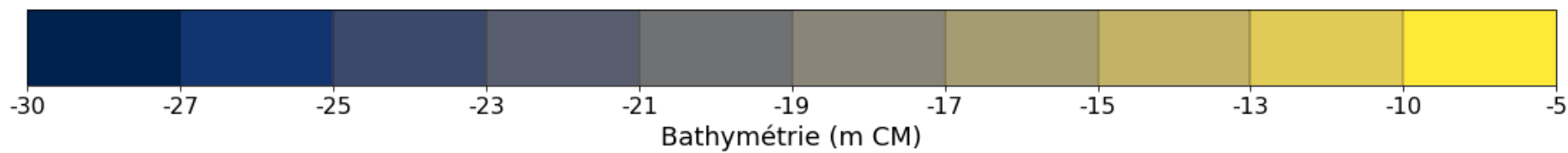
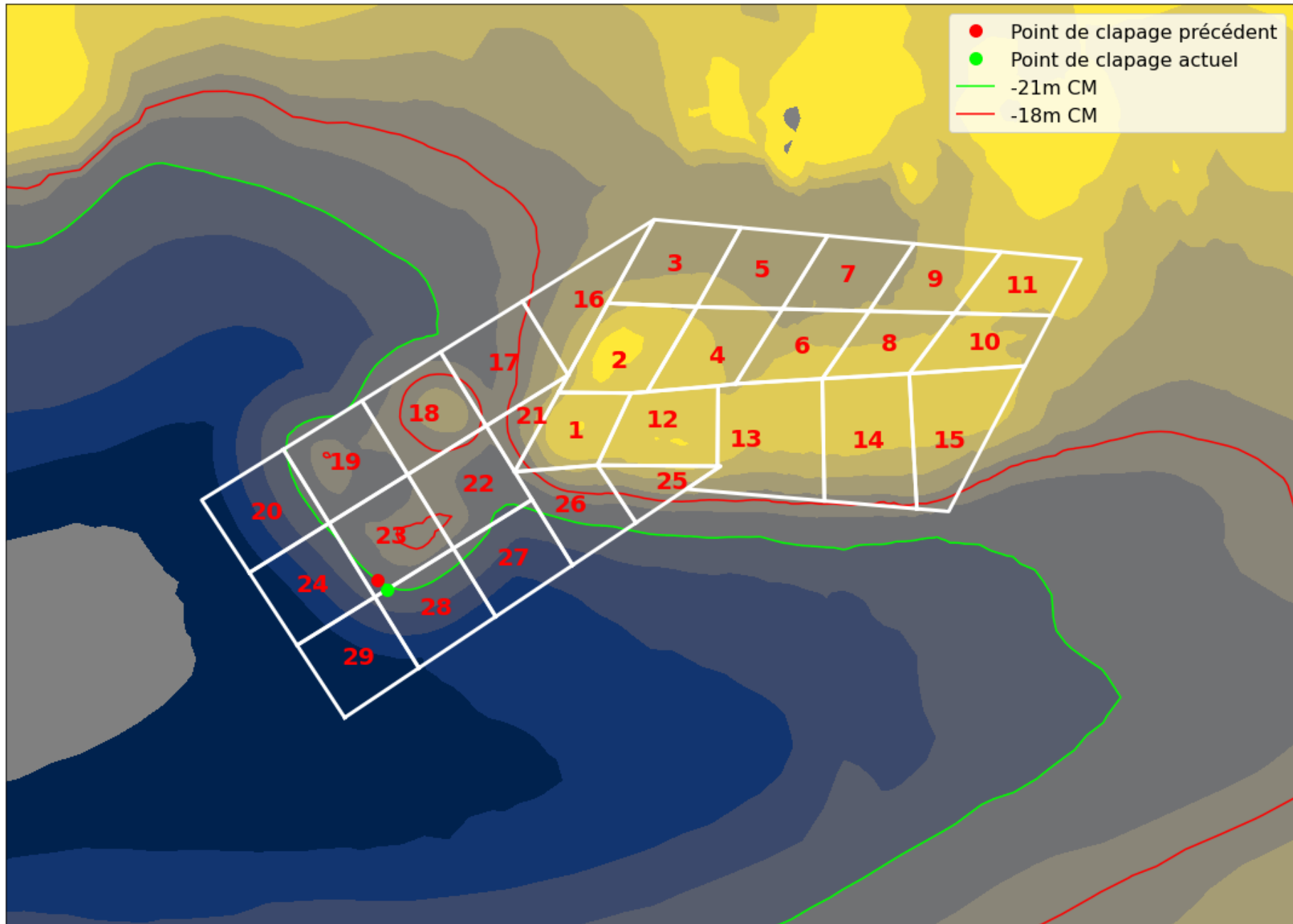




Date de changement de point : 16-03-2030

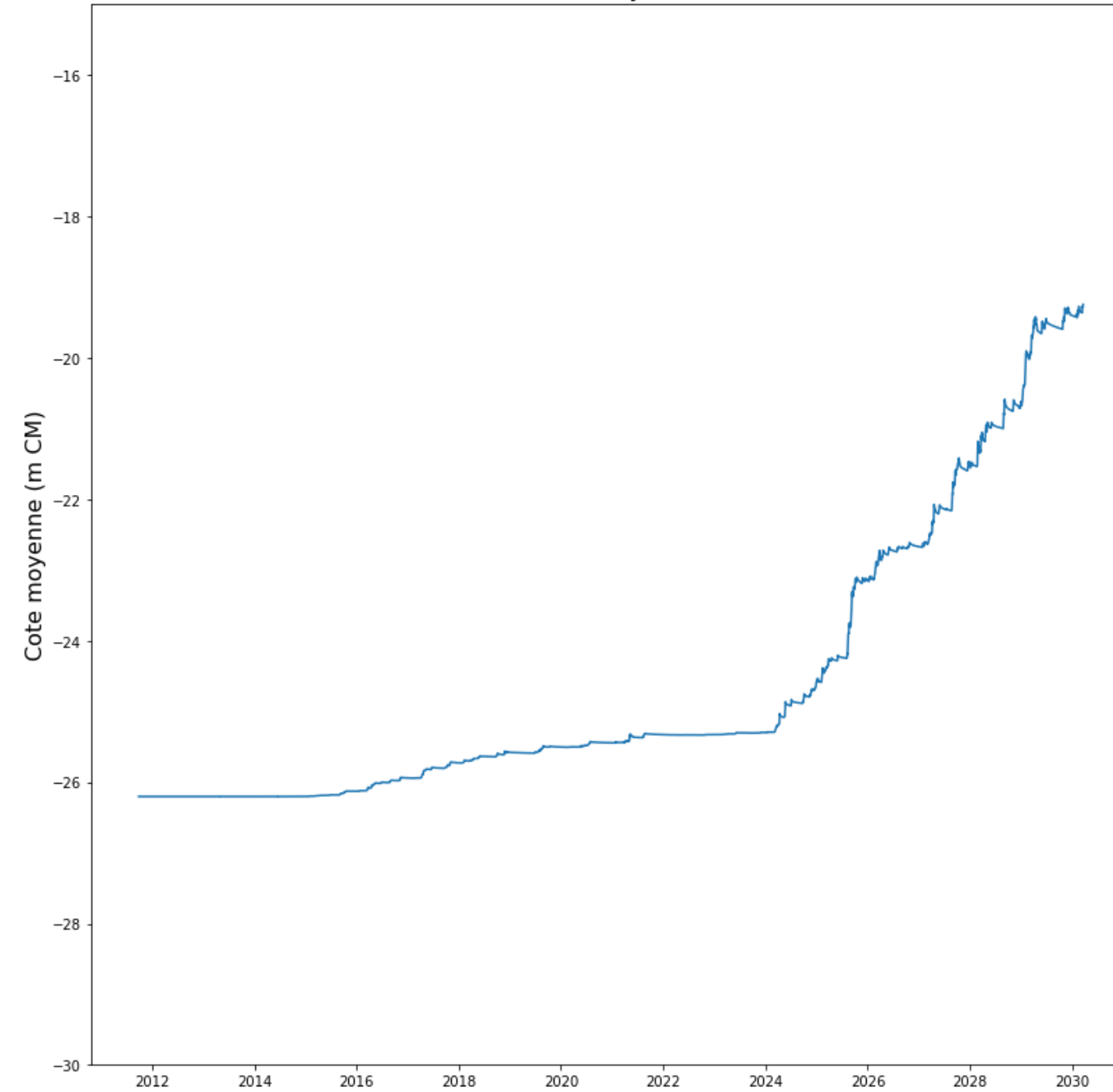
Evolution de la cote moyenne de la zone 23

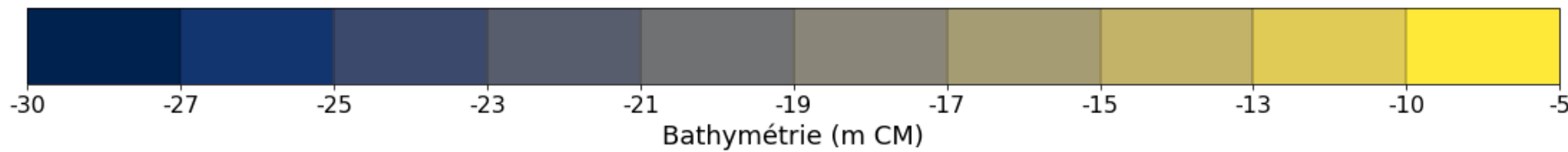
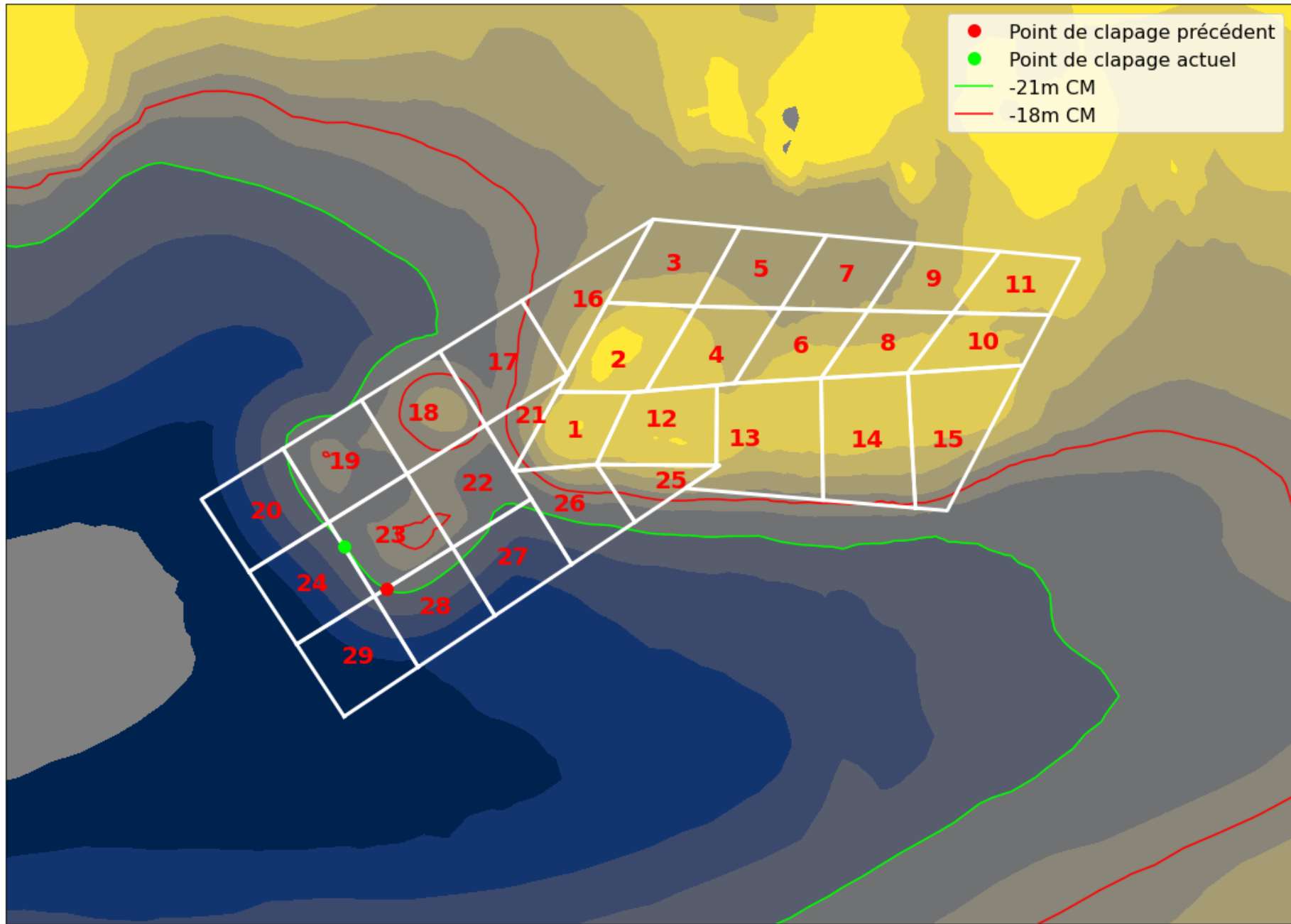




Date de changement de point : 22-03-2030

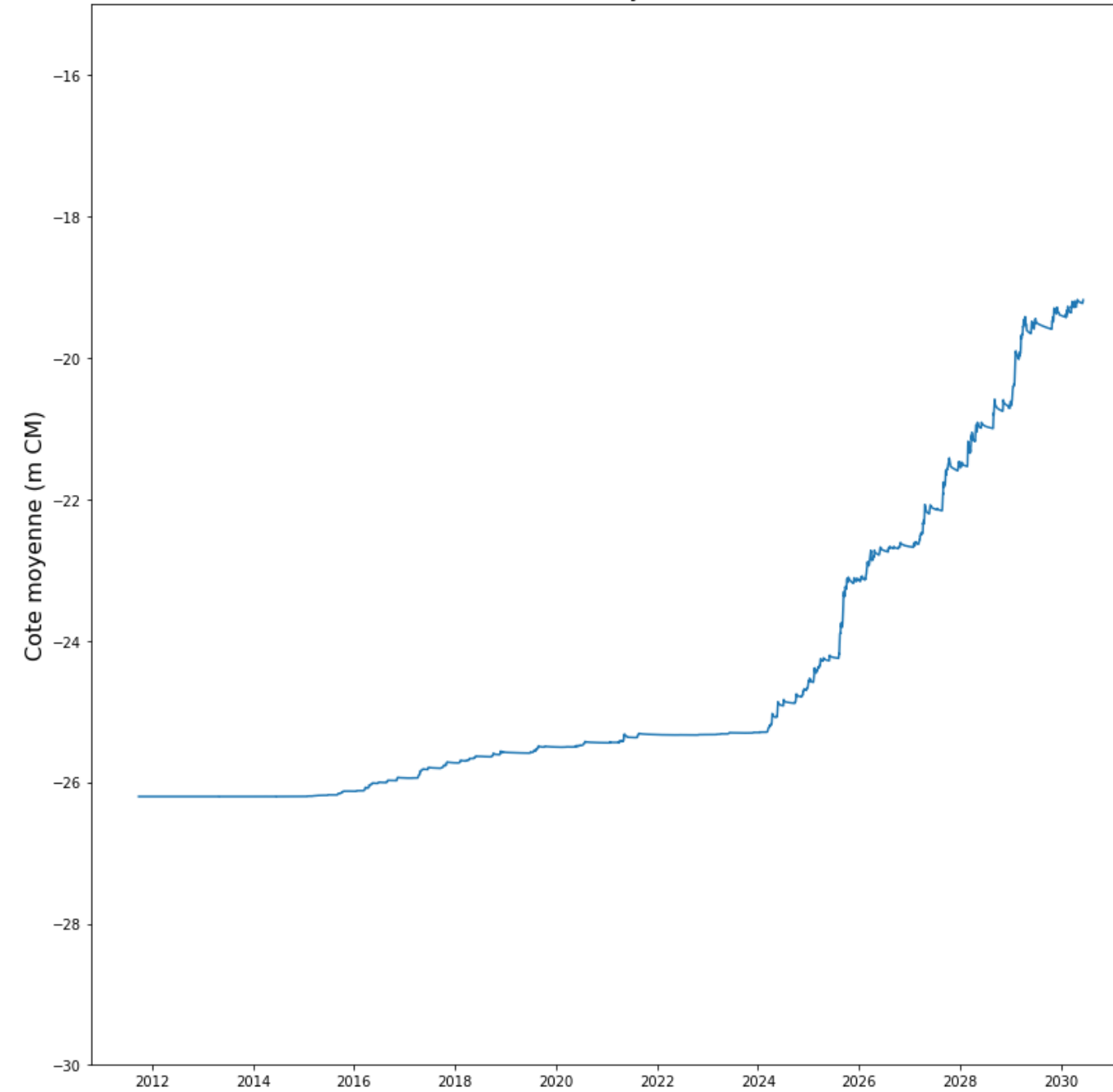
Evolution de la cote moyenne de la zone 23

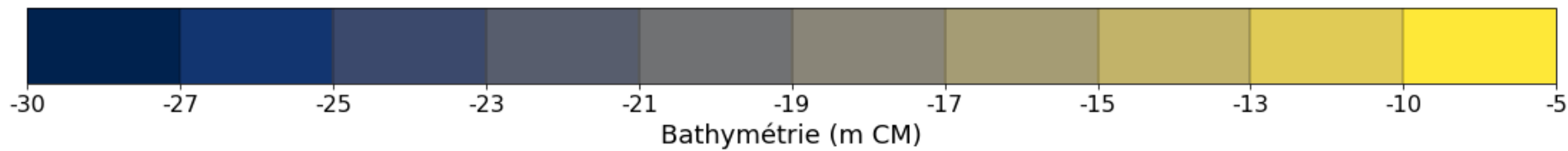
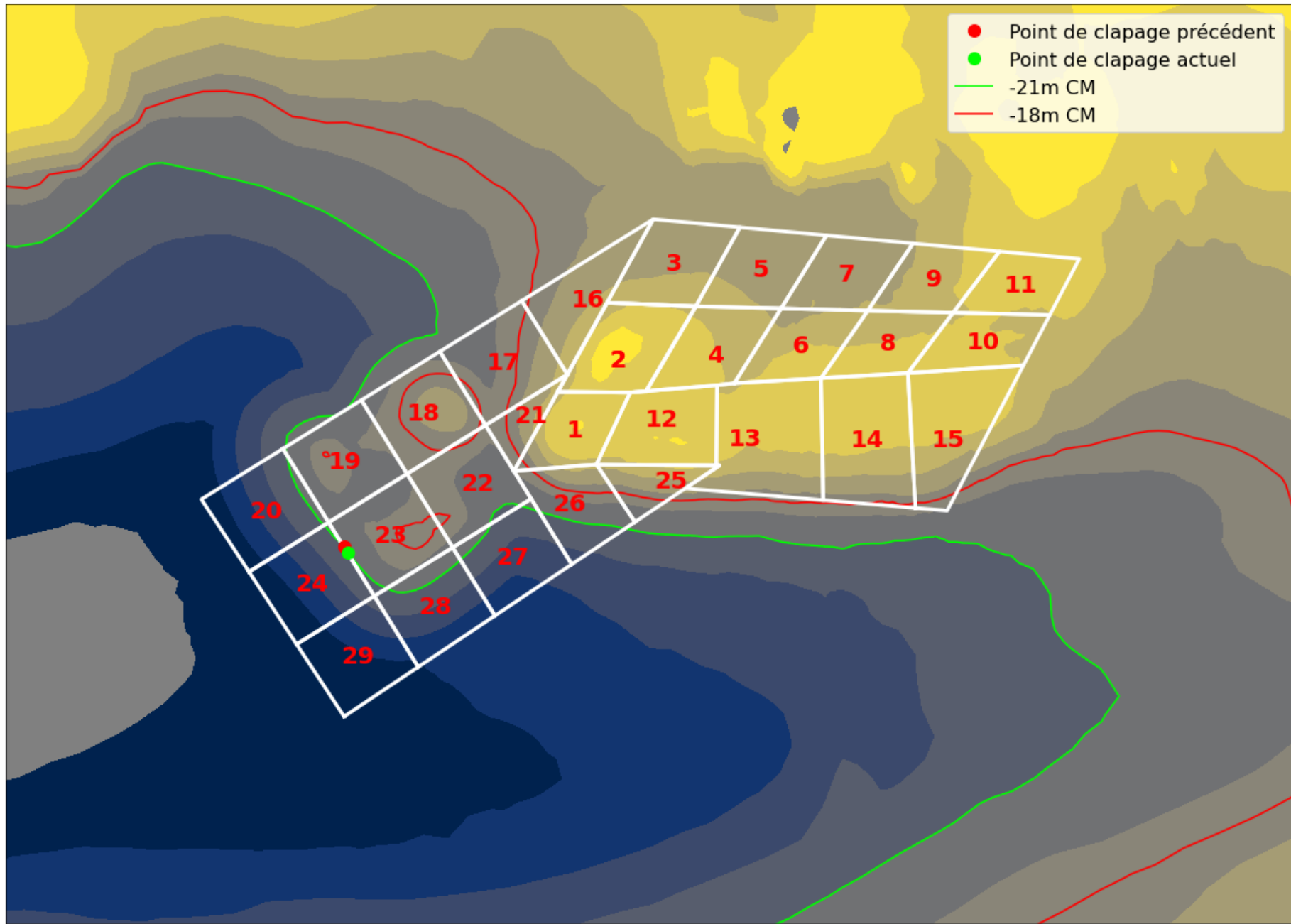




Date de changement de point : 09-06-2030

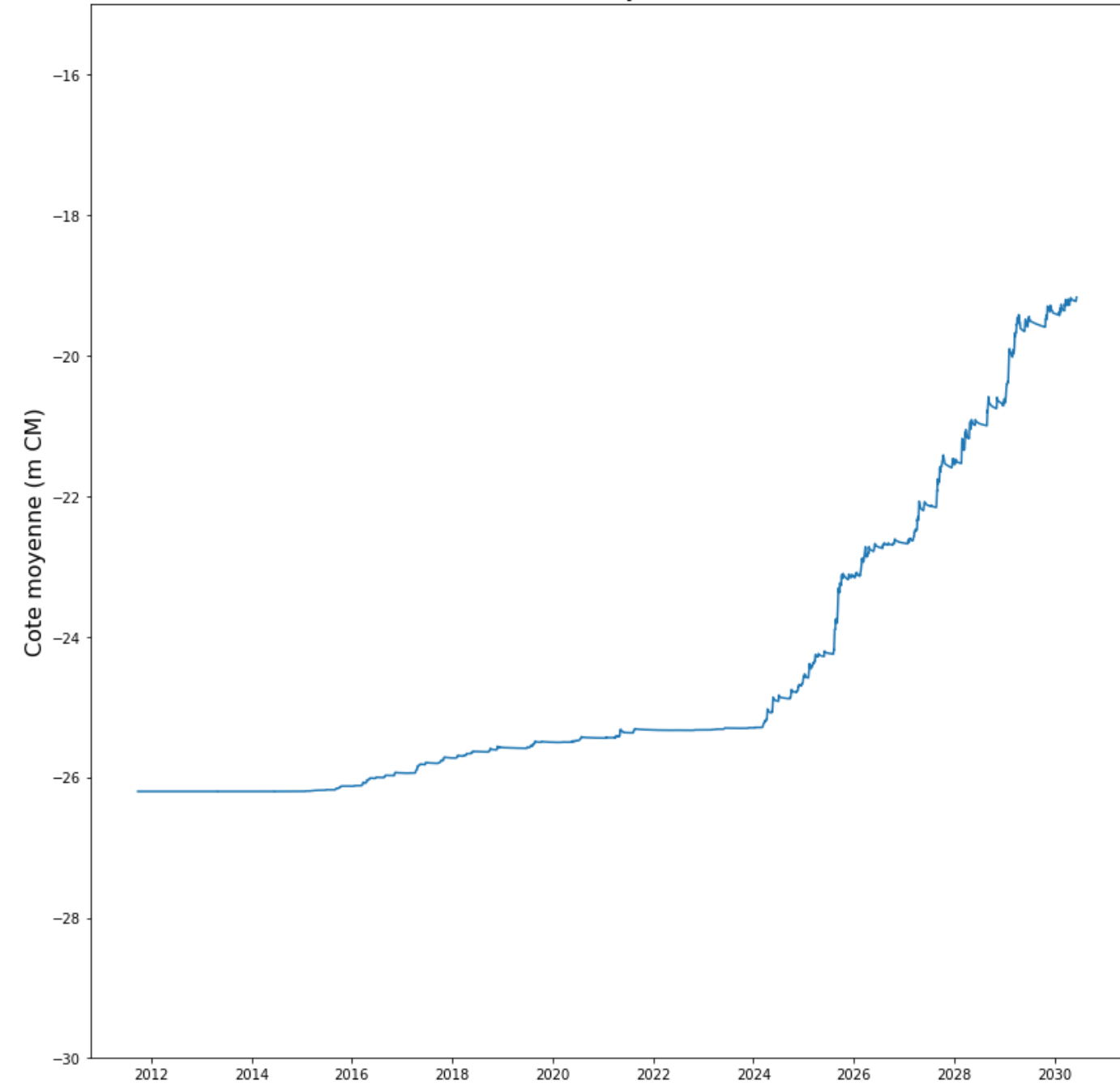
Evolution de la cote moyenne de la zone 23

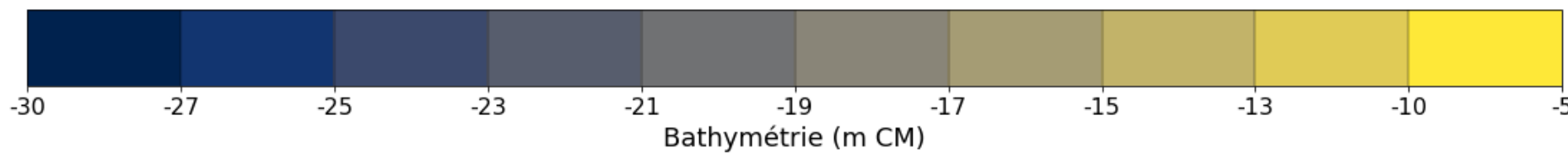
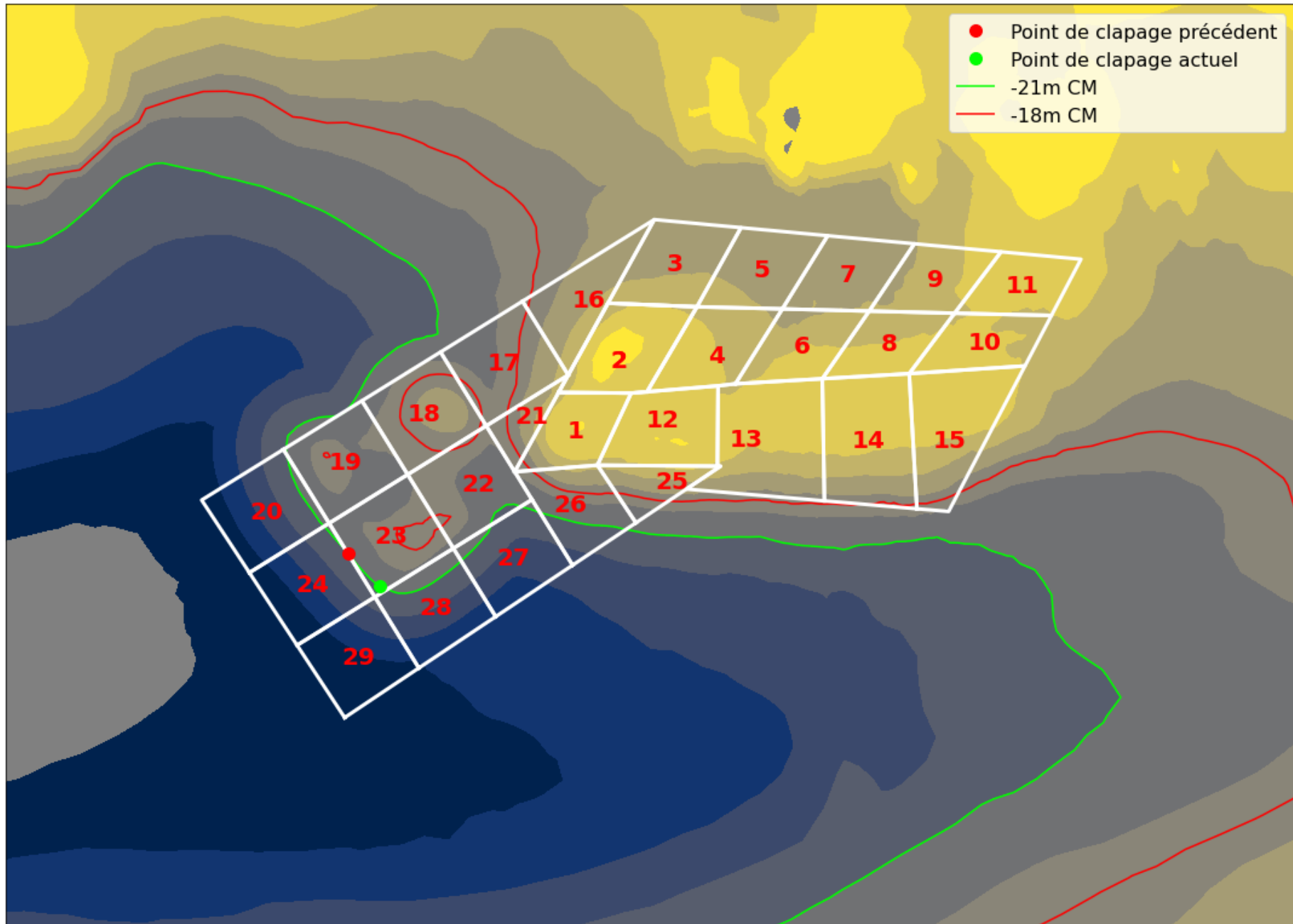




Date de changement de point : 11-06-2030

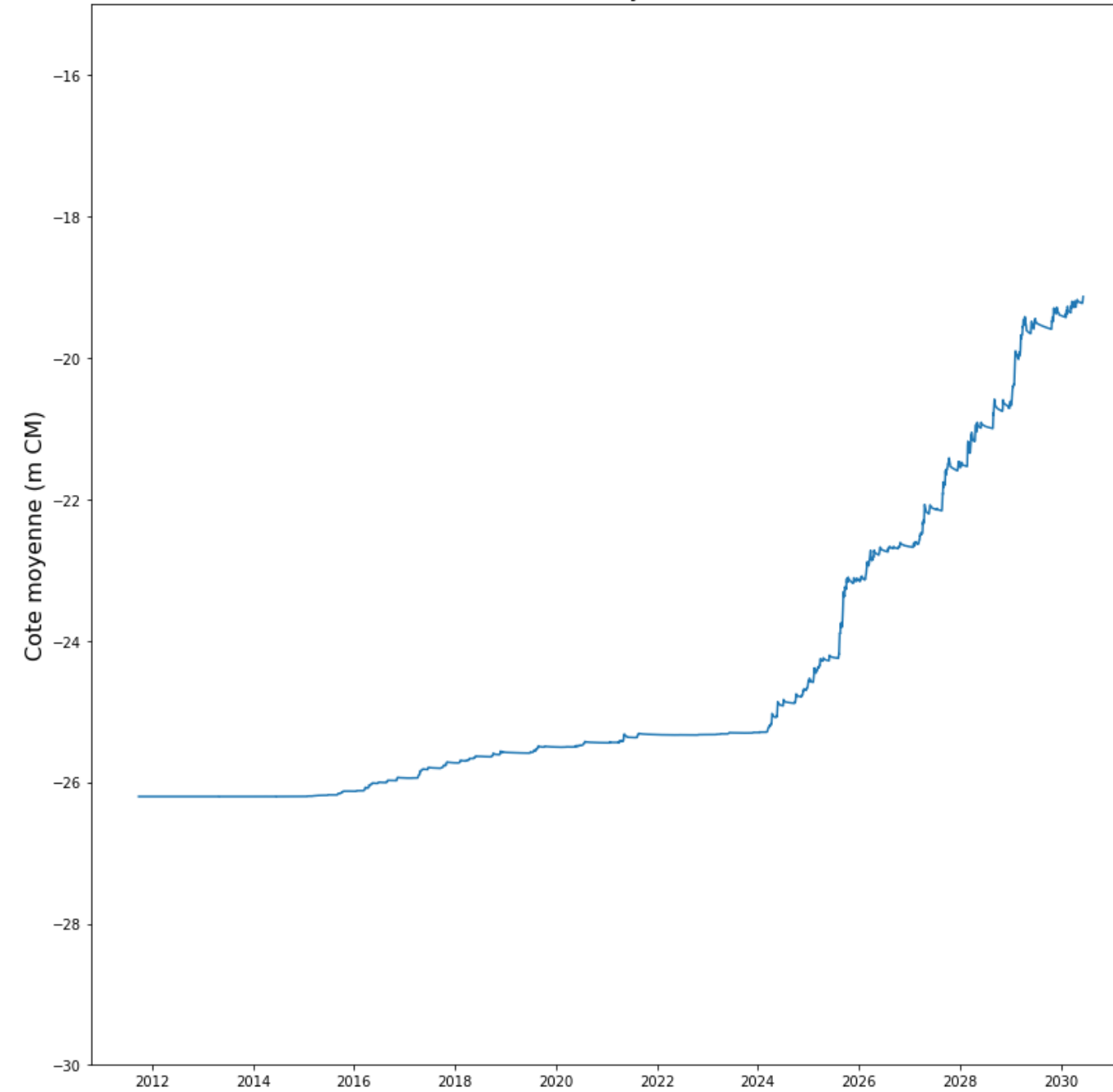
Evolution de la cote moyenne de la zone 23

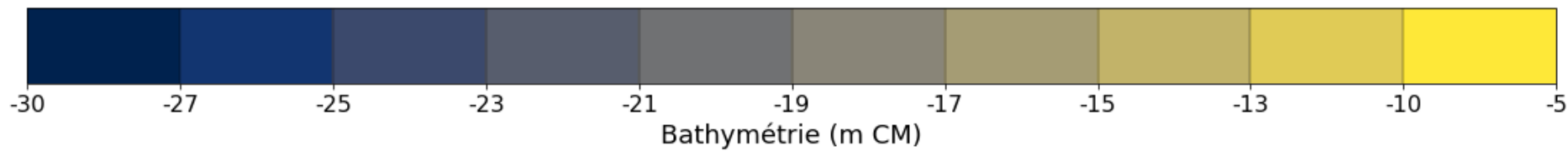
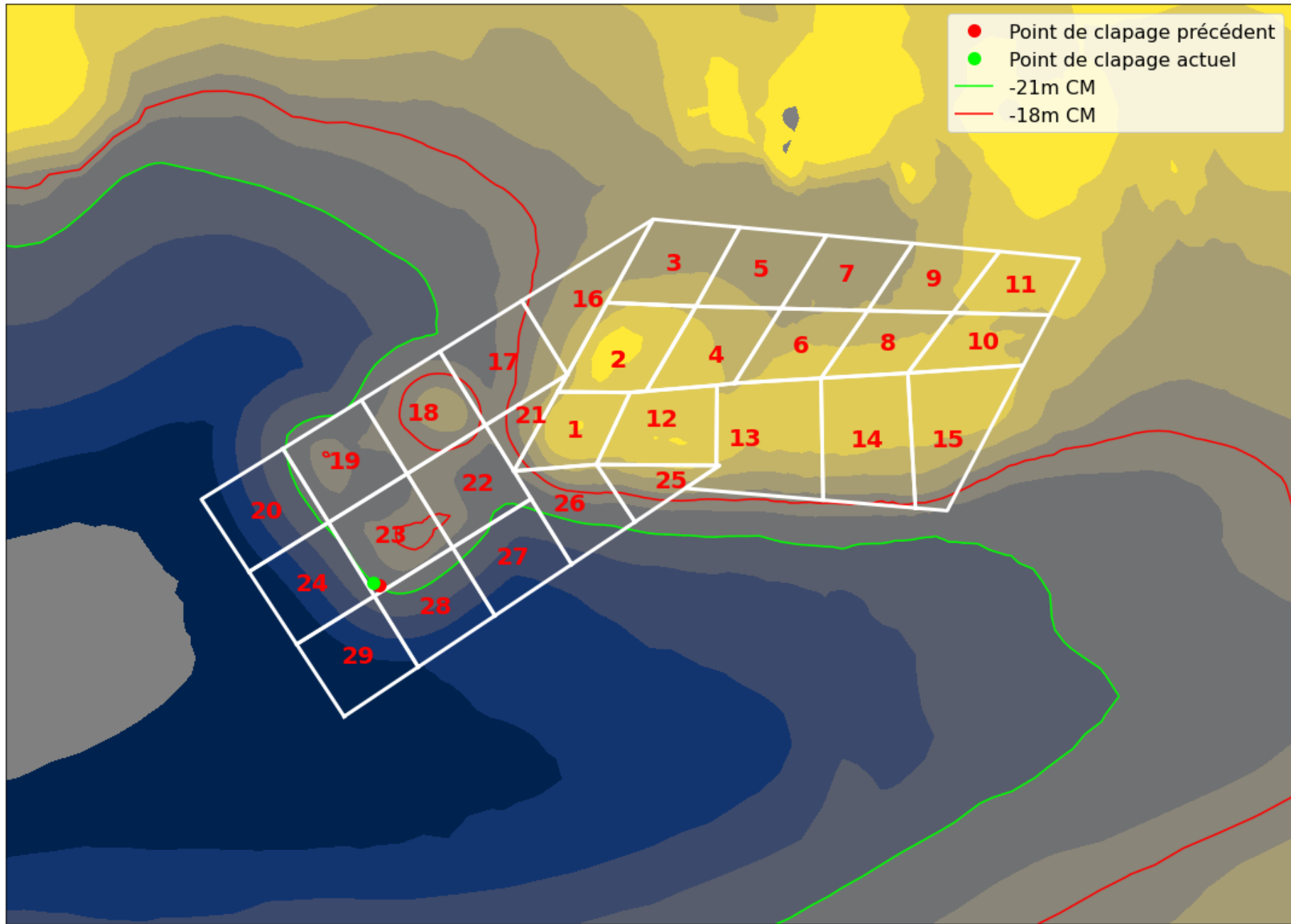




Date de changement de point : 12-06-2030

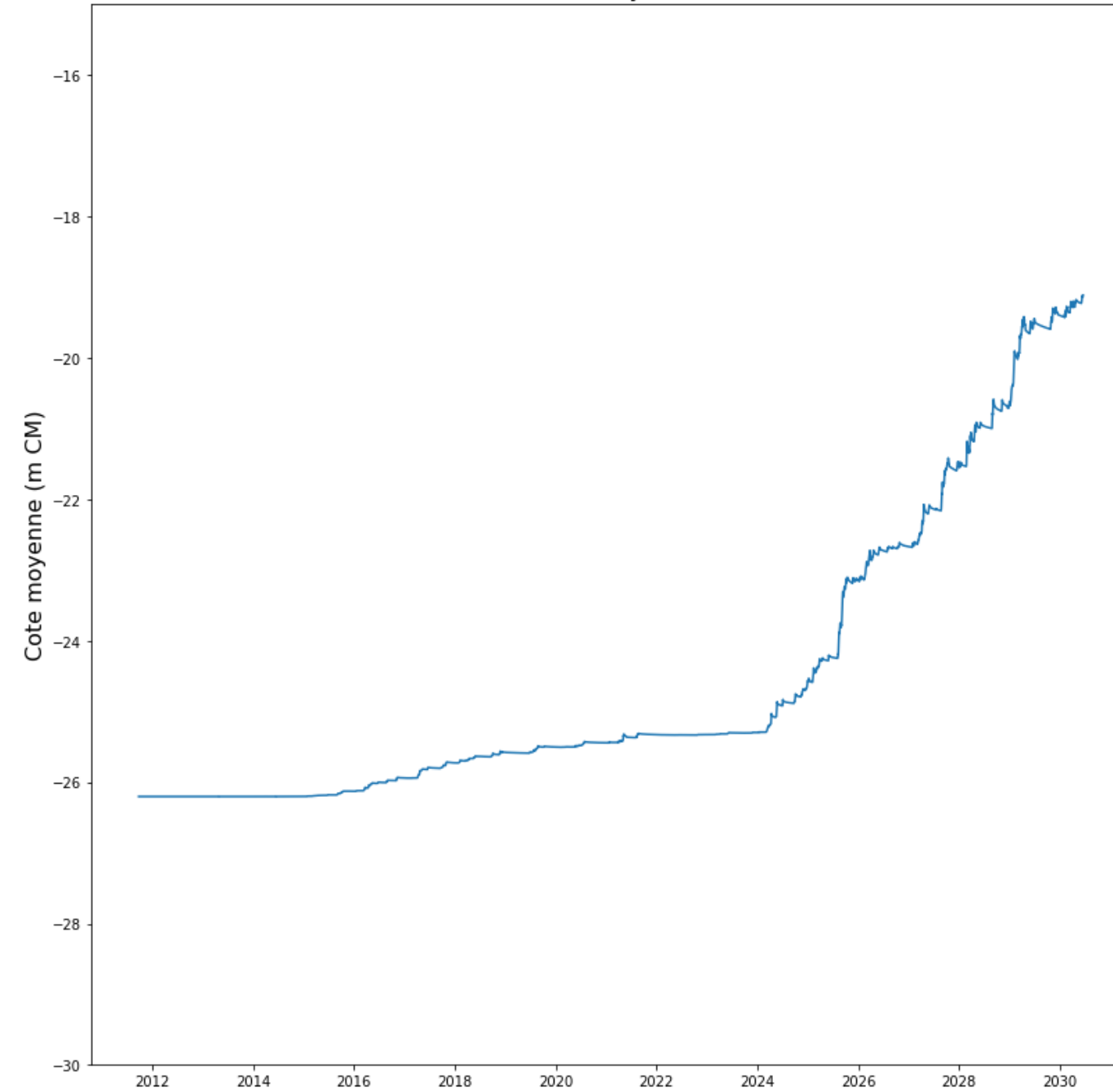
Evolution de la cote moyenne de la zone 23



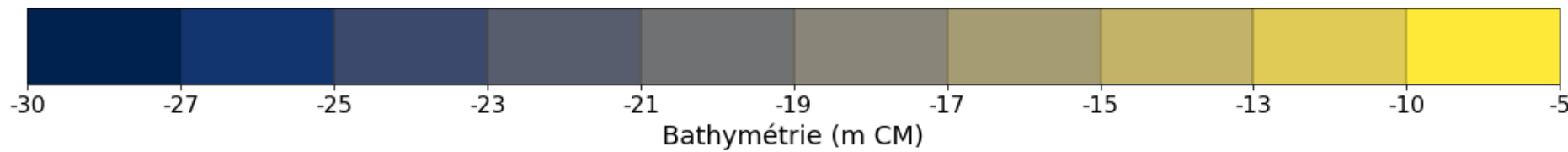
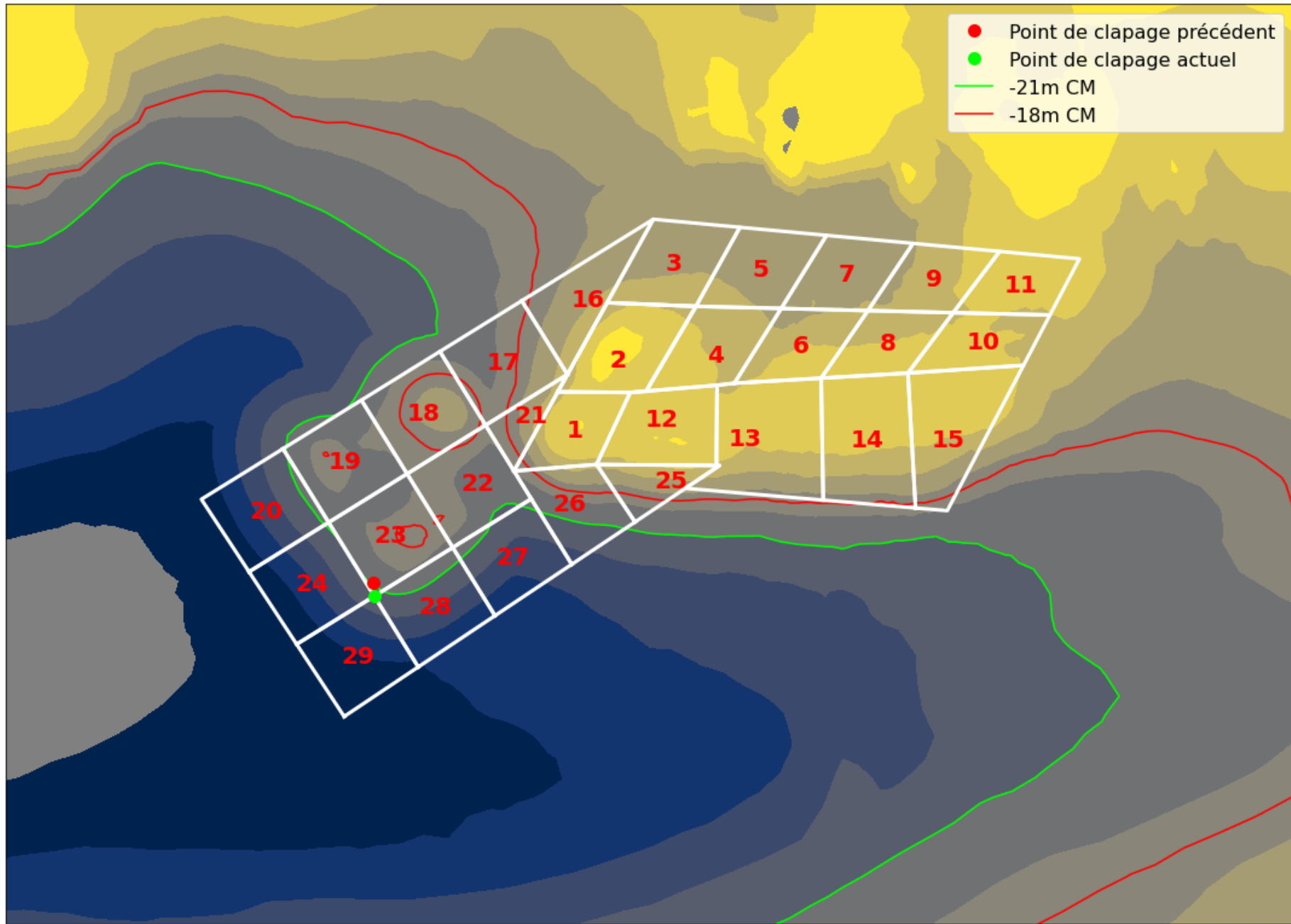


Date de changement de point : 19-06-2030

Evolution de la cote moyenne de la zone 23

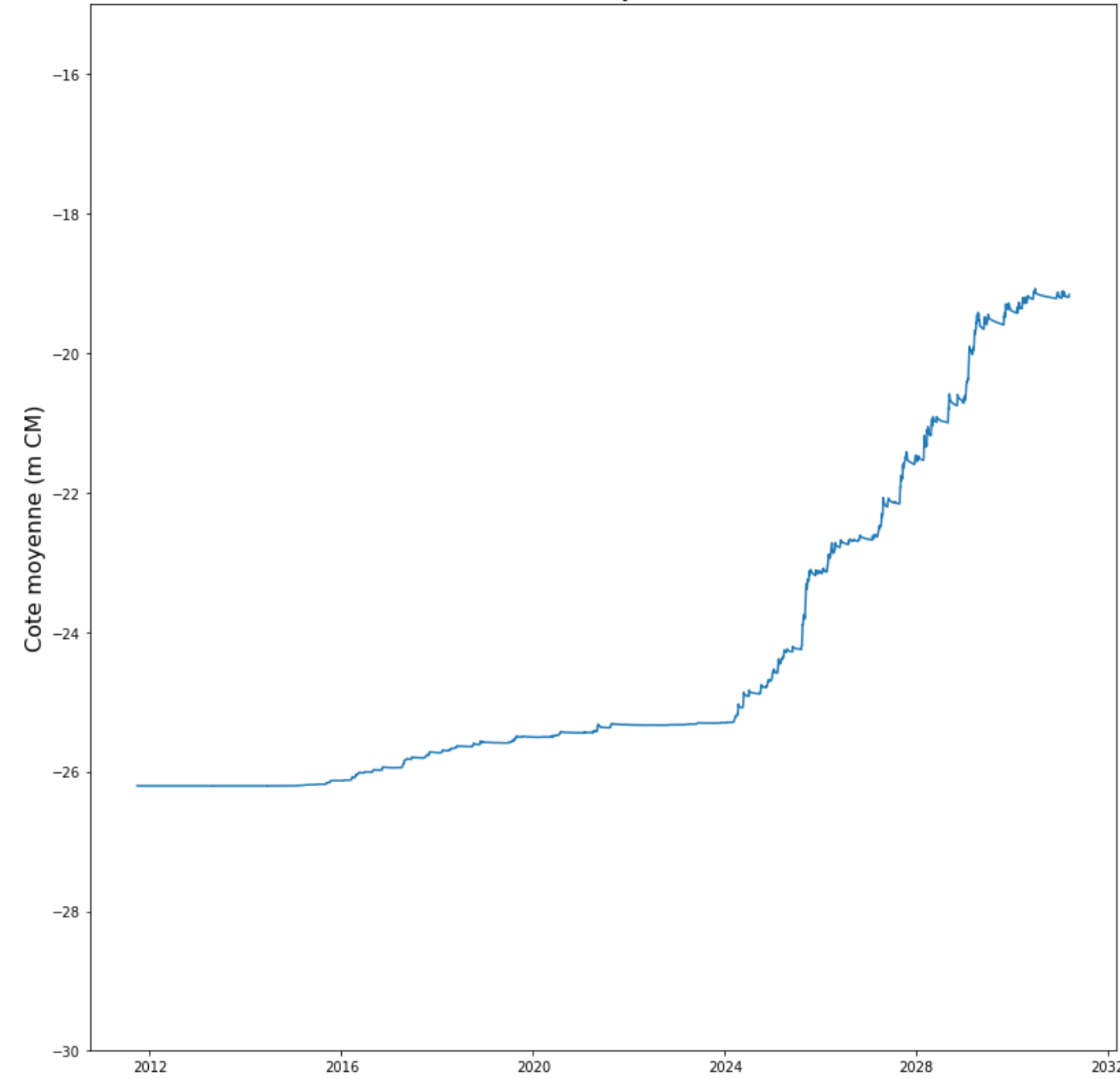


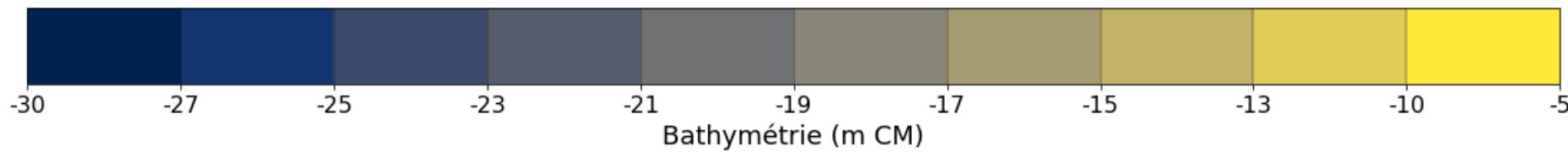
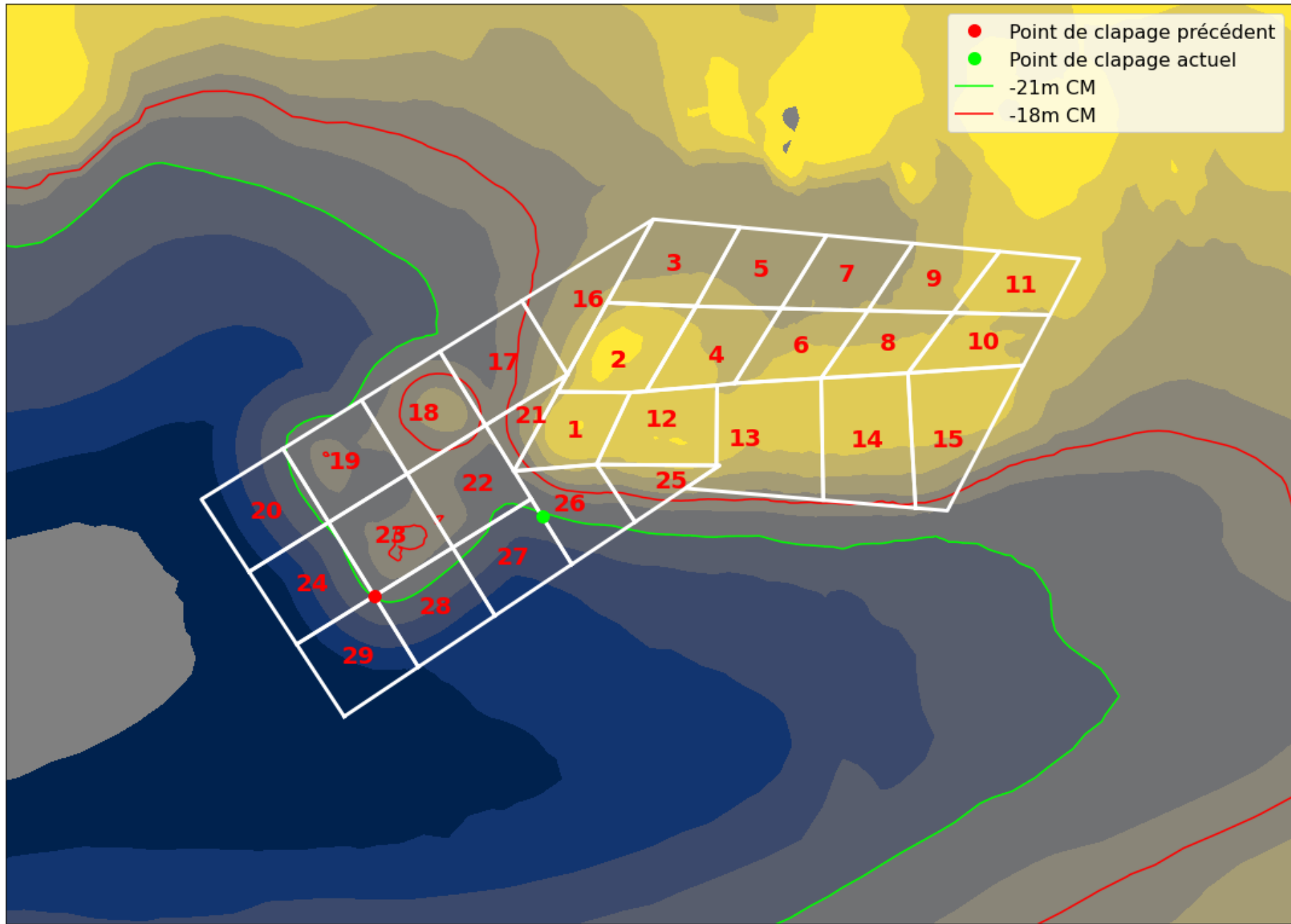




Date de changement de point : 08-03-2031

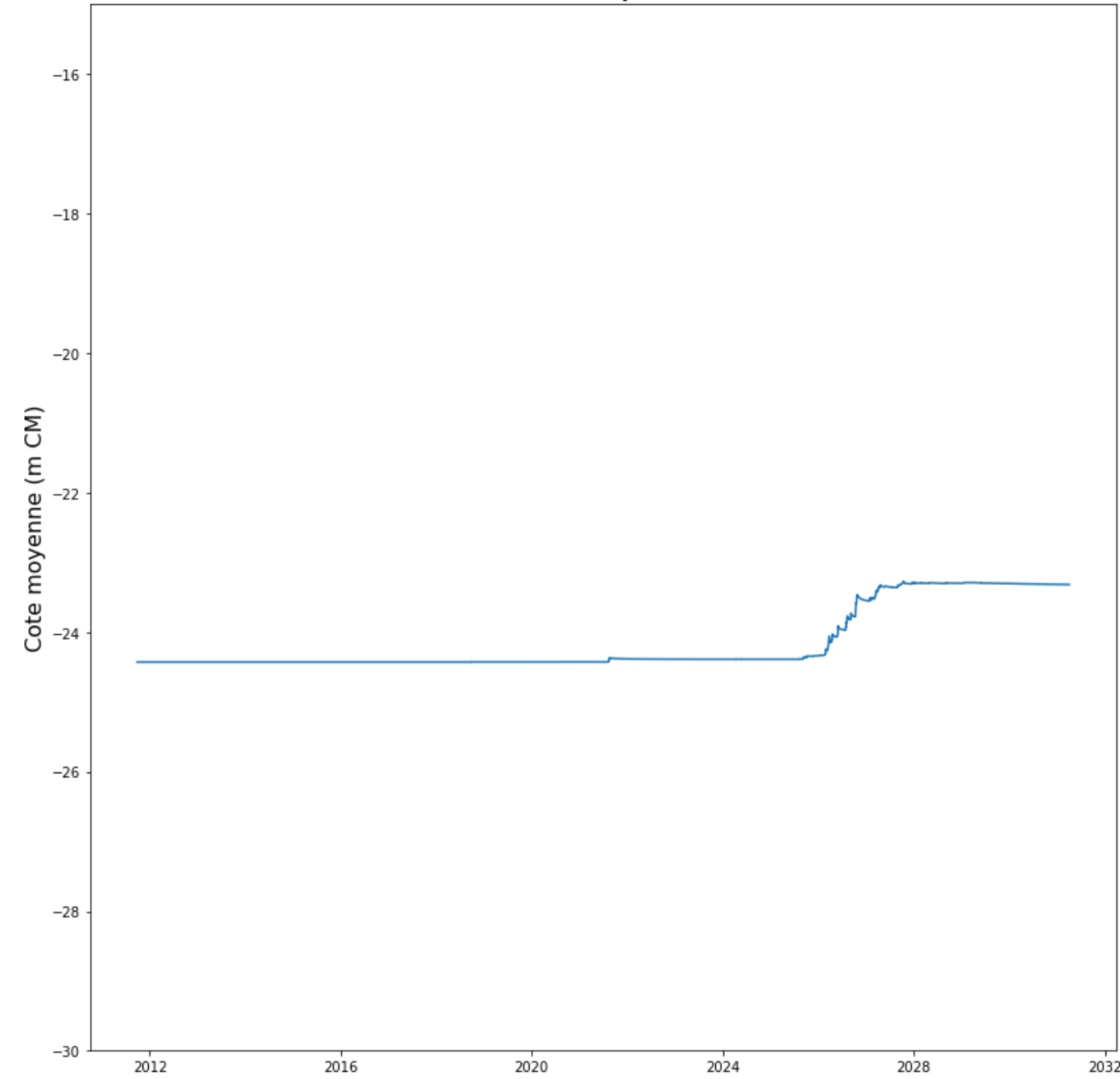
Evolution de la cote moyenne de la zone 23

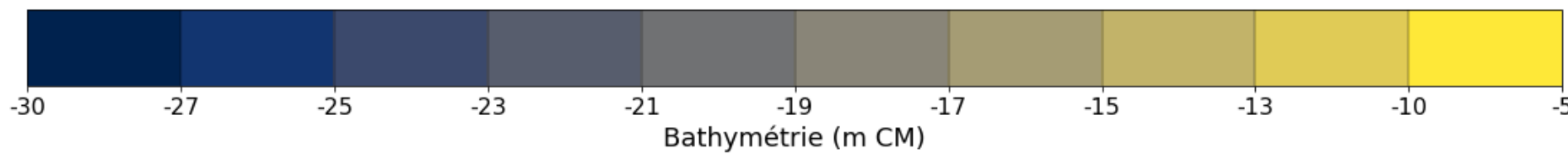
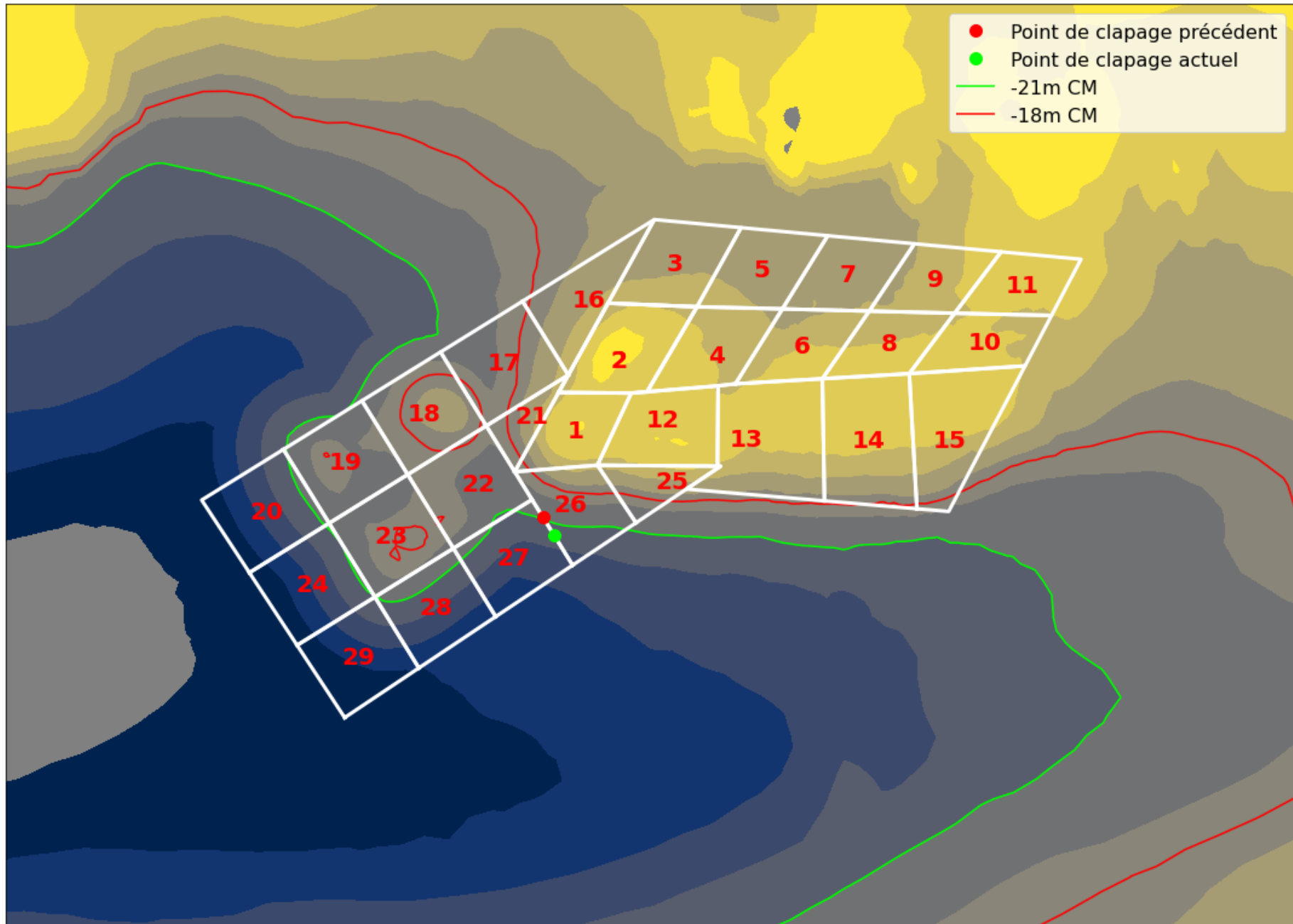




Date de changement de point : 06-04-2031

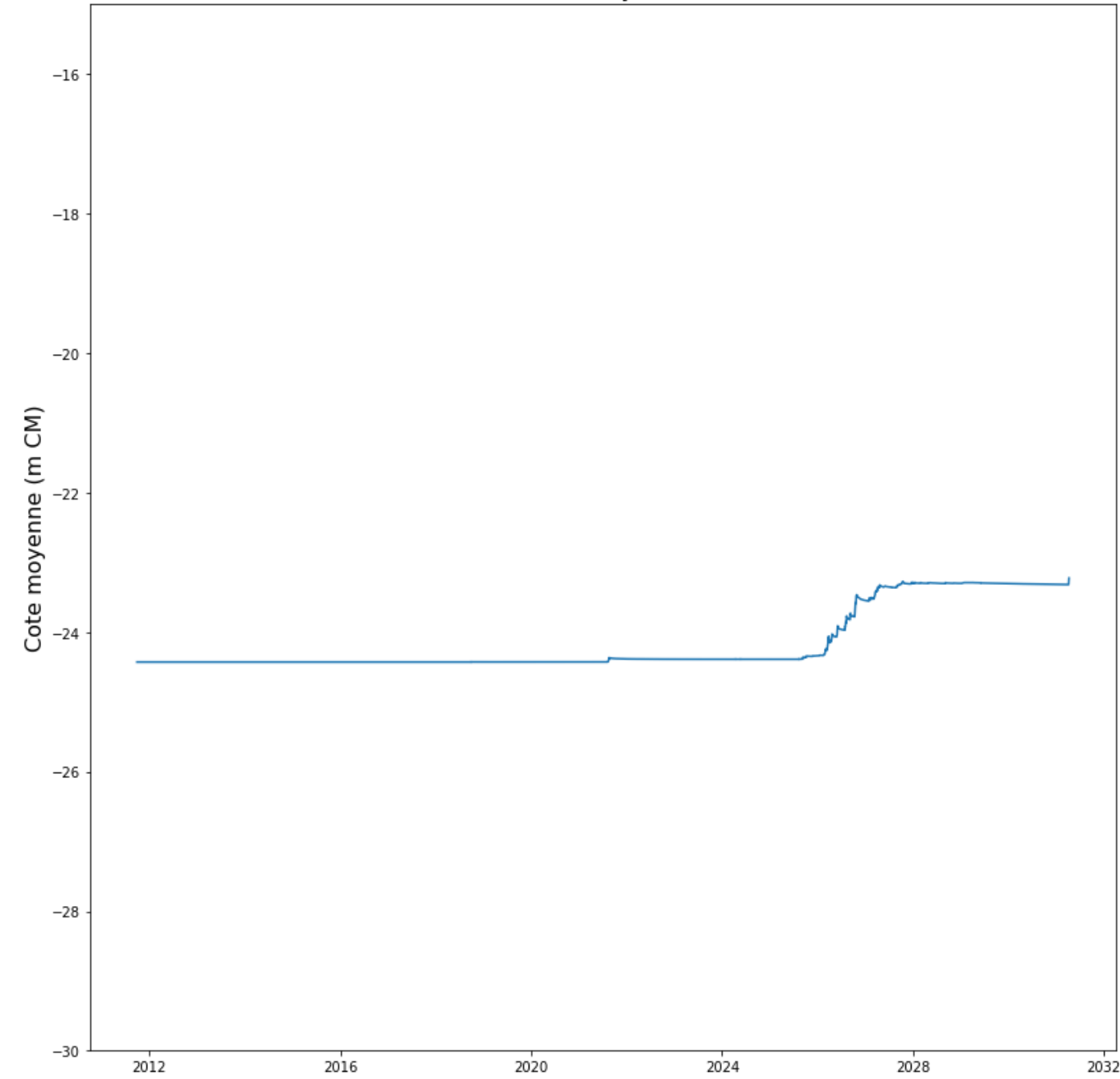
Evolution de la cote moyenne de la zone 27

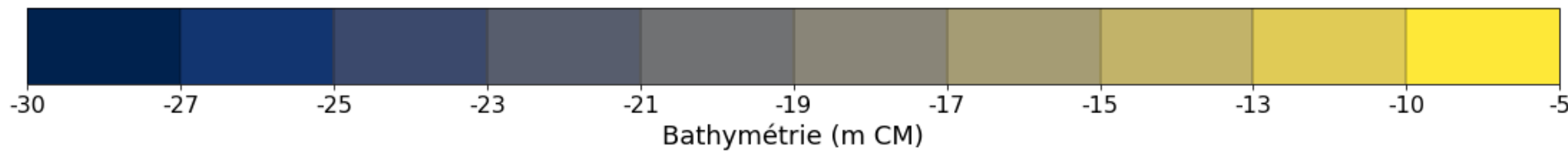
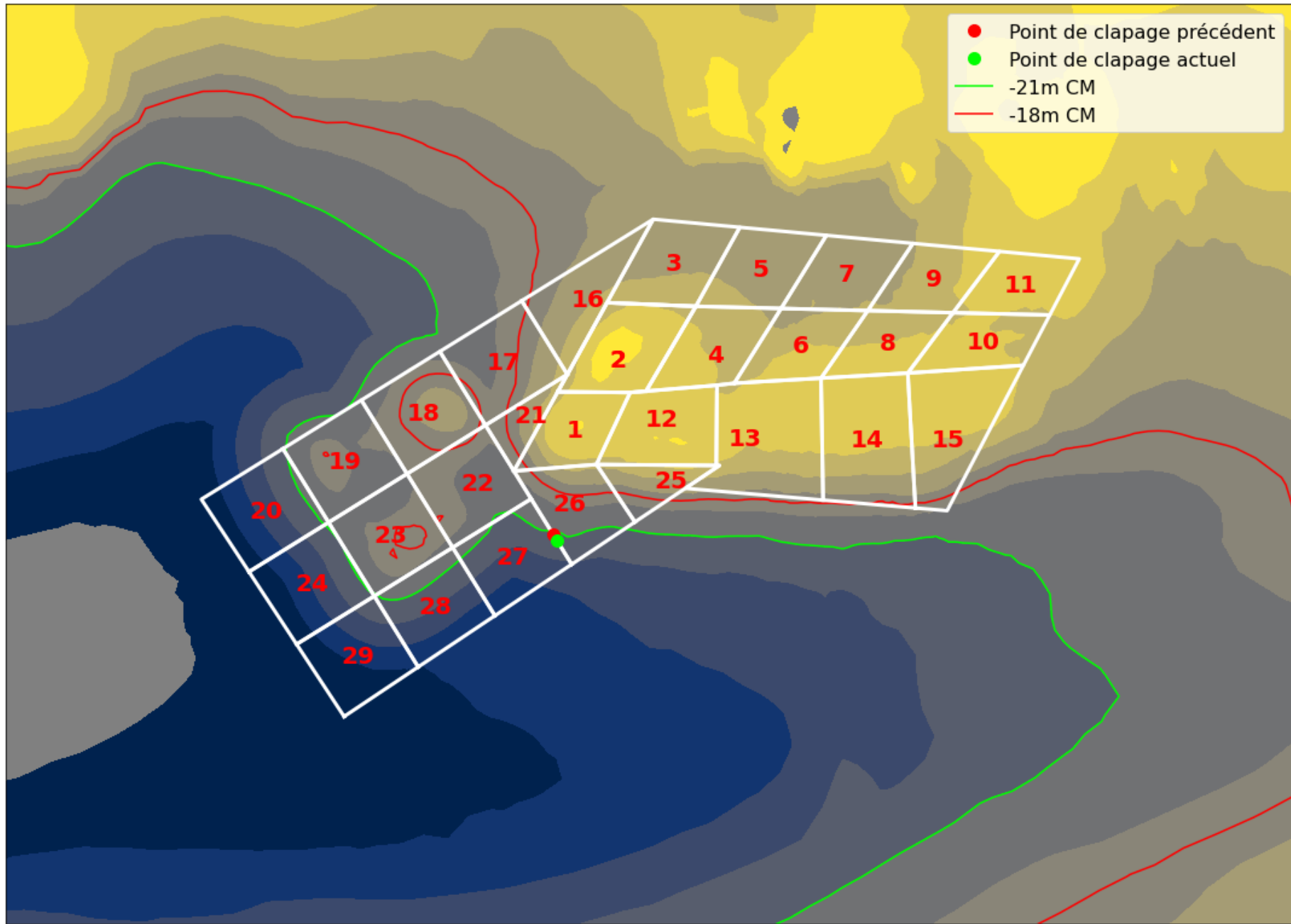




Date de changement de point : 09-04-2031

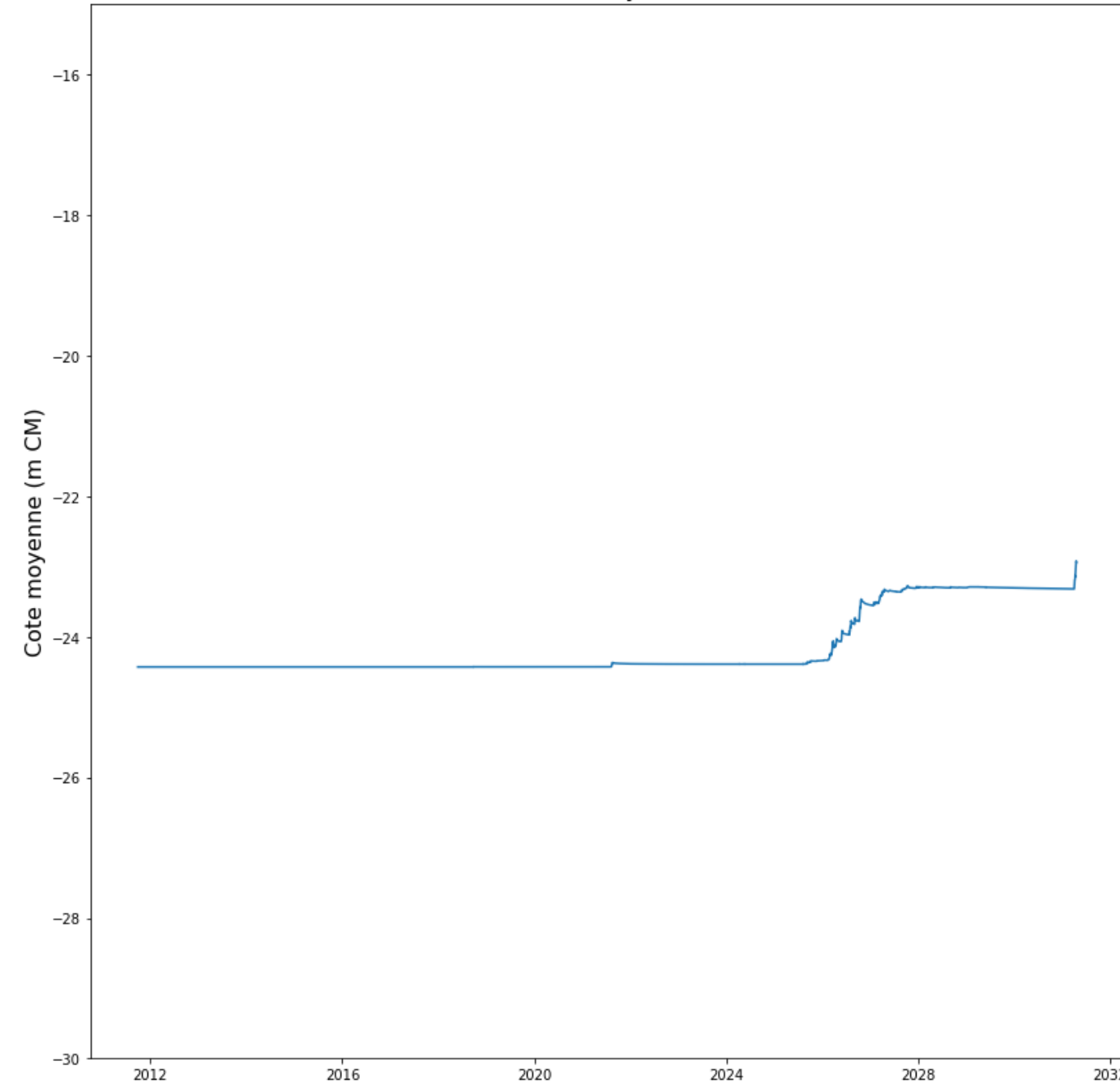
Evolution de la cote moyenne de la zone 27

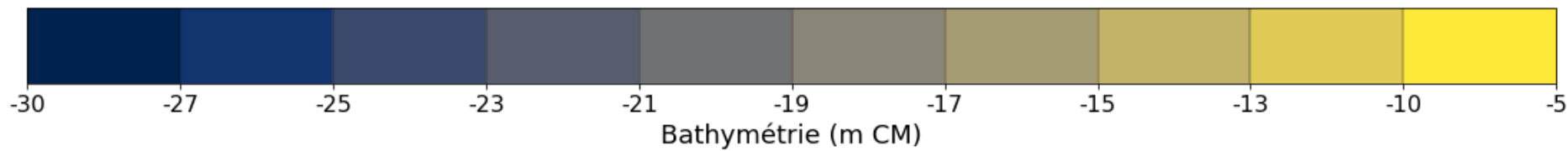
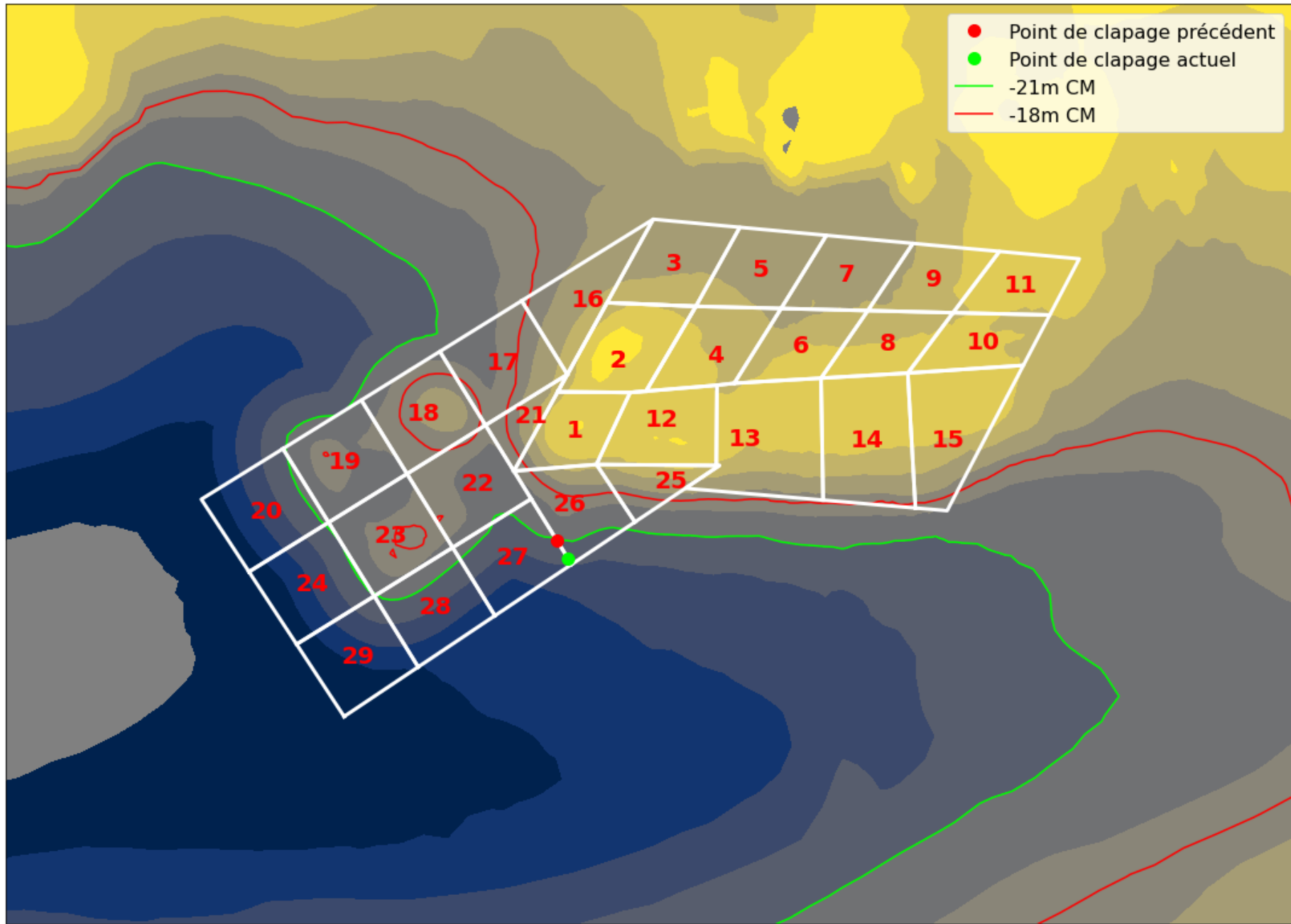




Date de changement de point : 24-04-2031

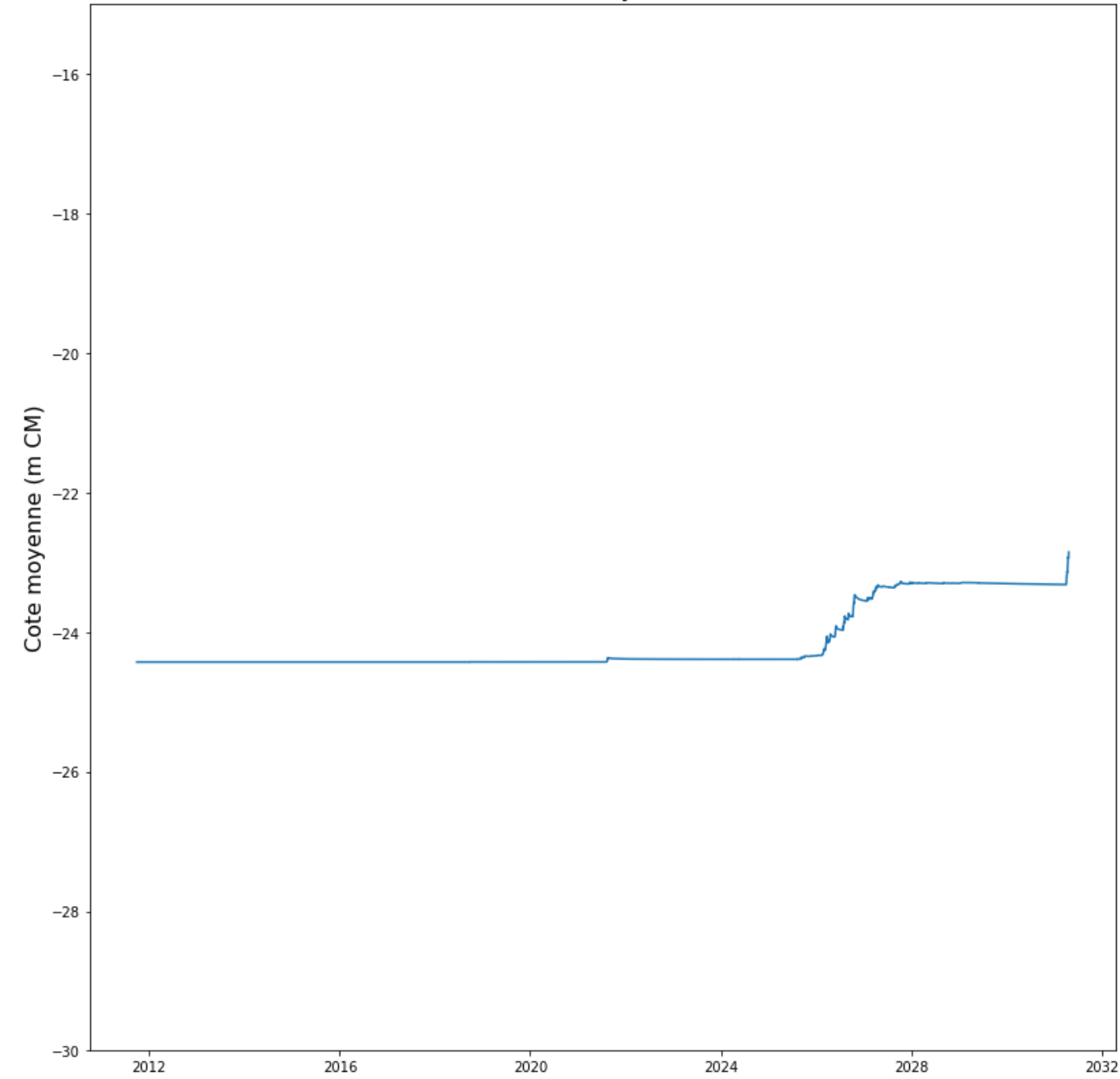
Evolution de la cote moyenne de la zone 27

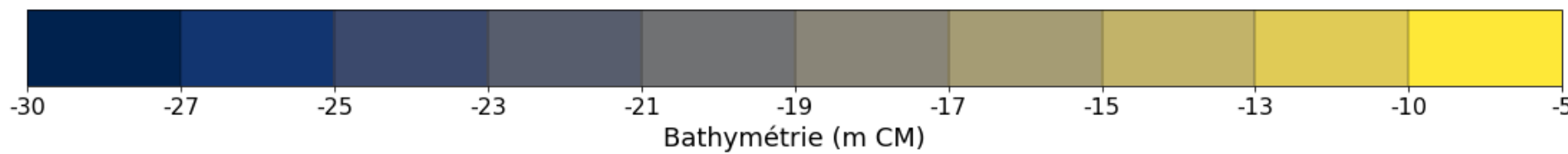
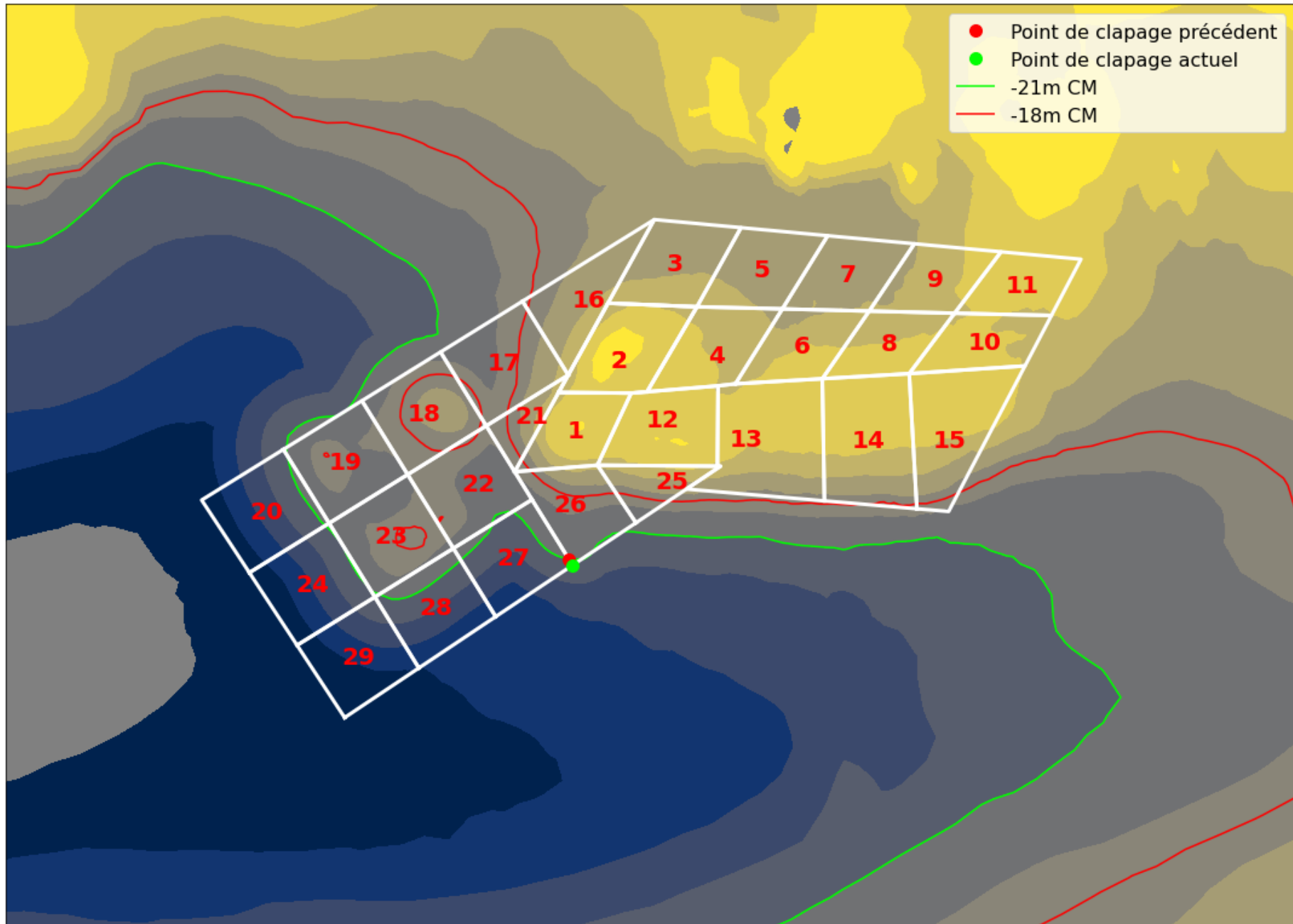




Date de changement de point : 26-04-2031

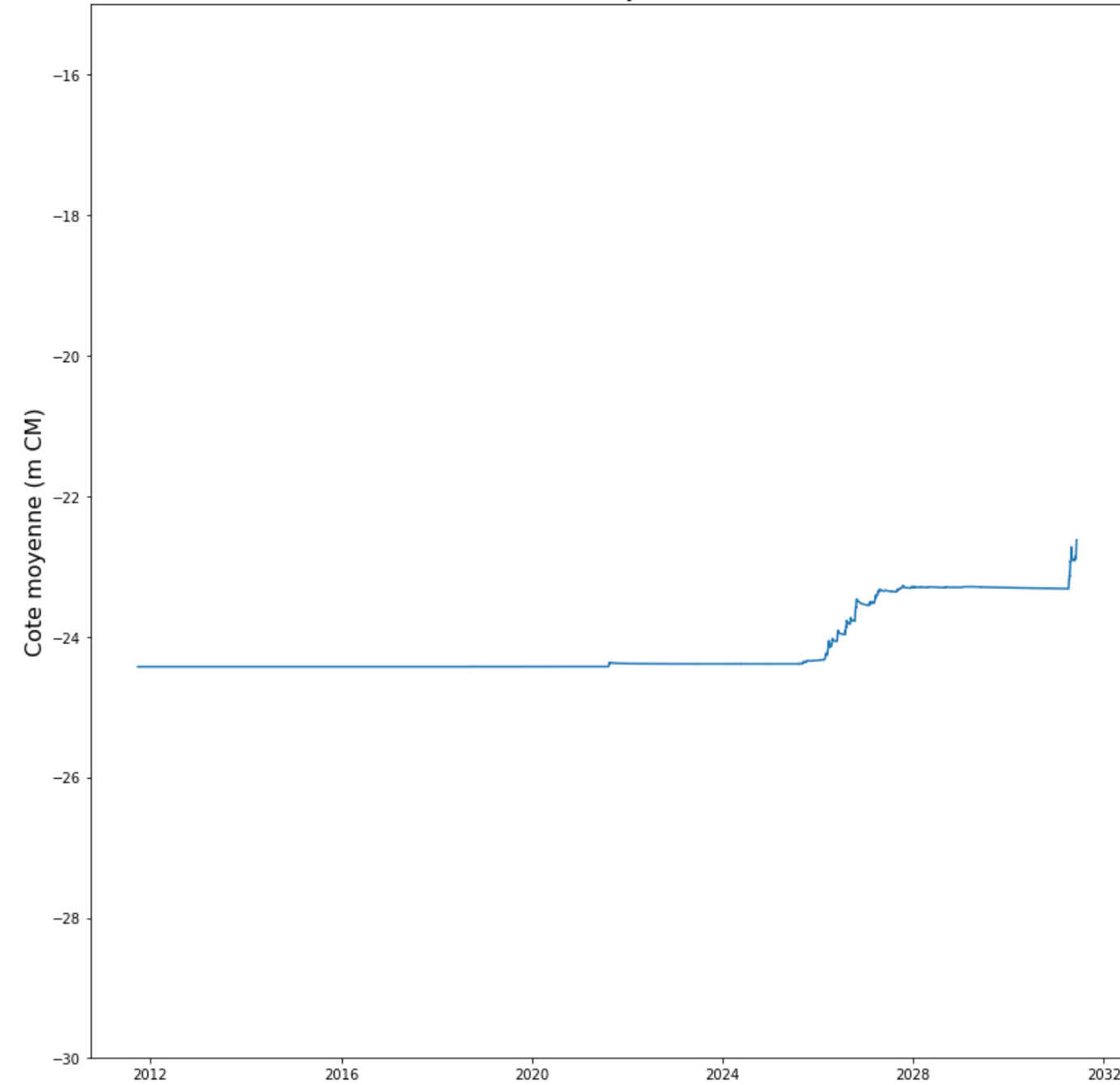
Evolution de la cote moyenne de la zone 27



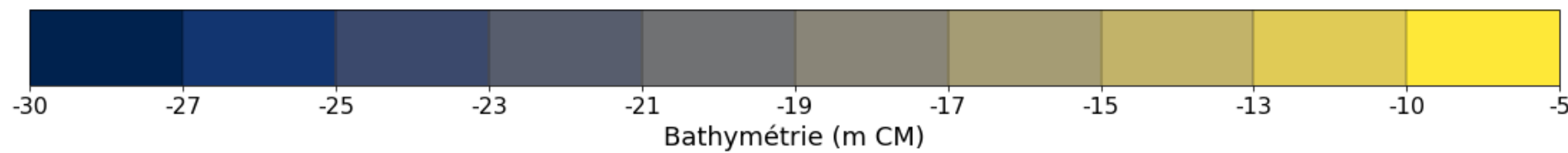
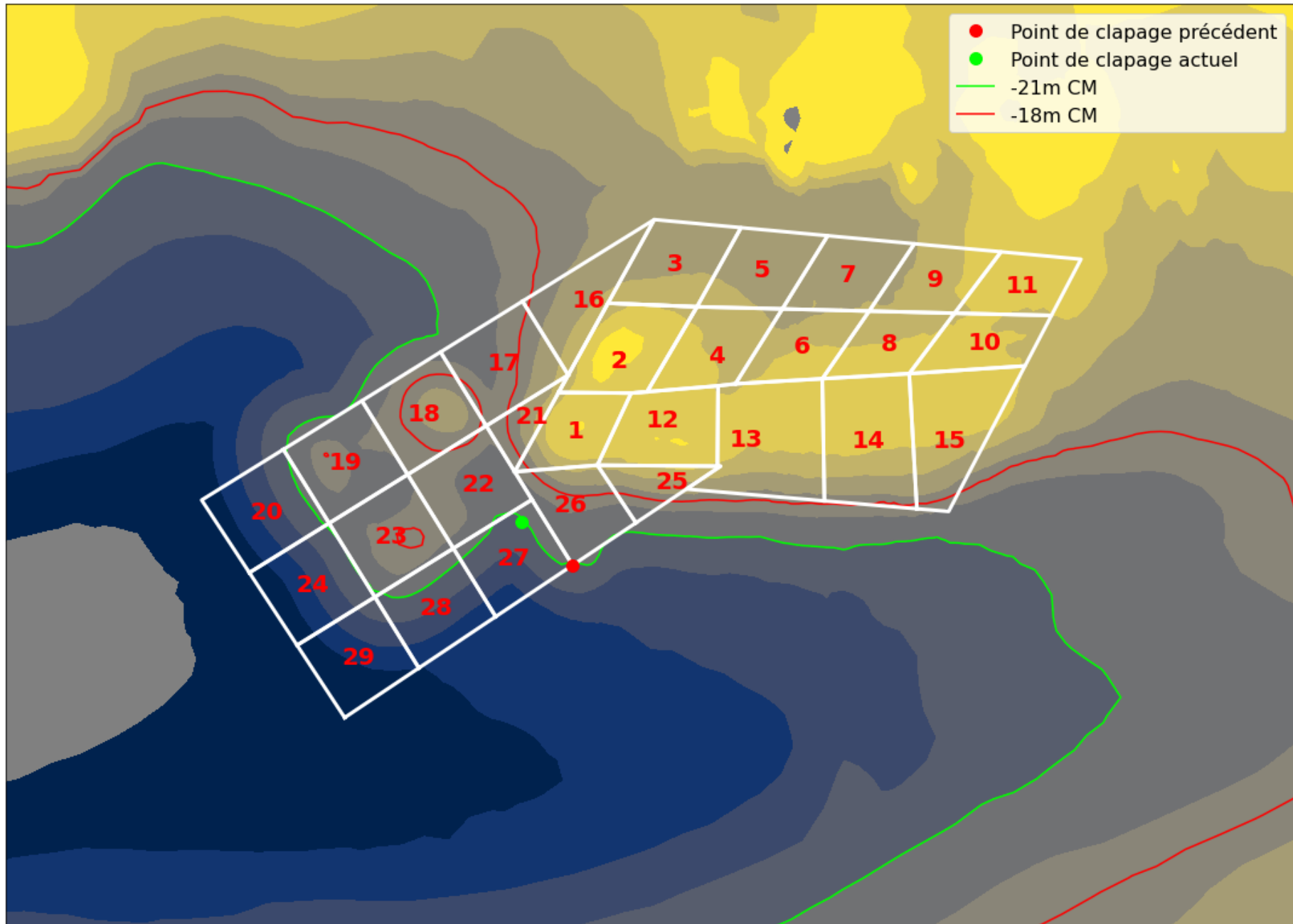


Date de changement de point : 07-06-2031

Evolution de la cote moyenne de la zone 27

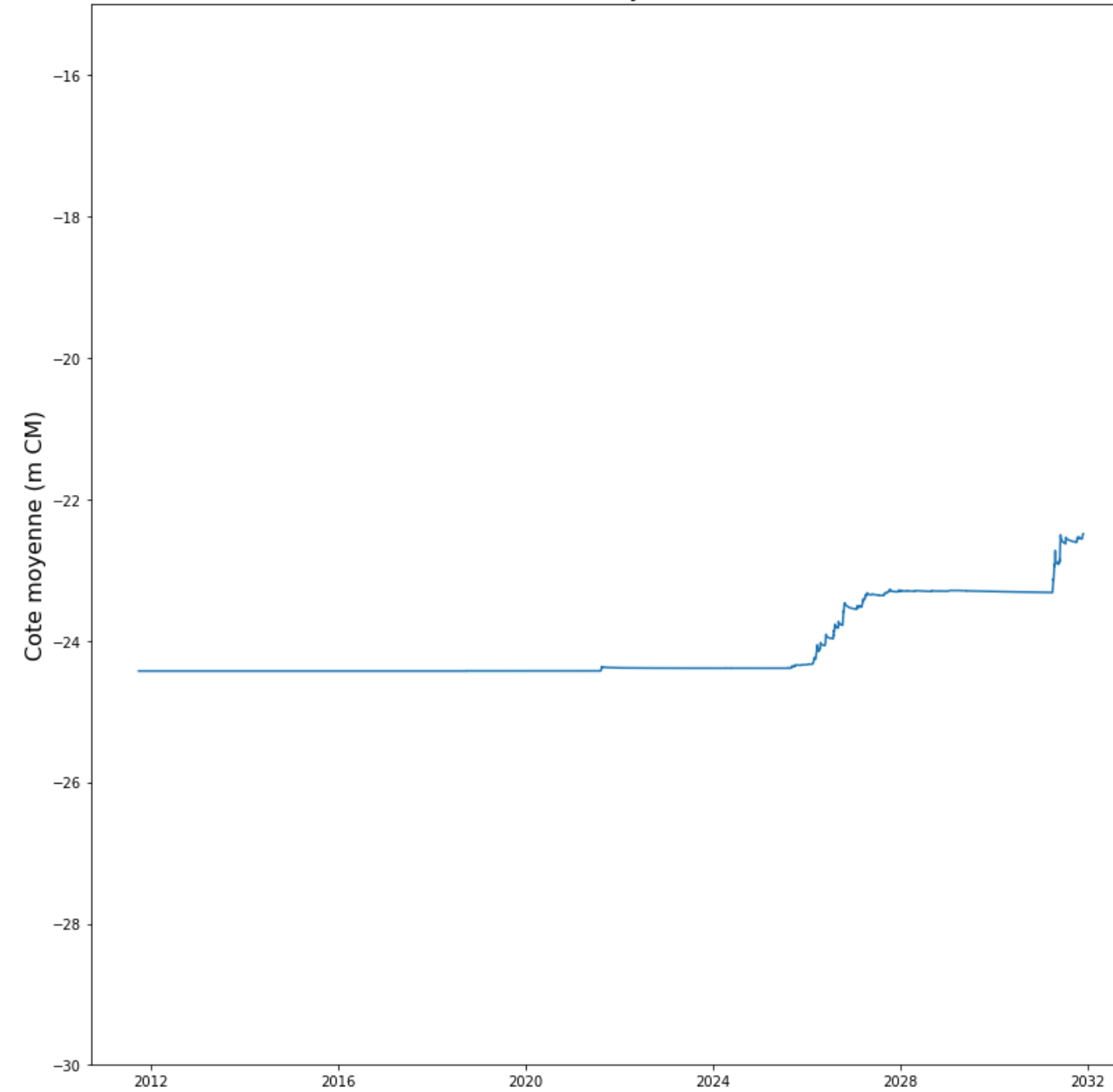


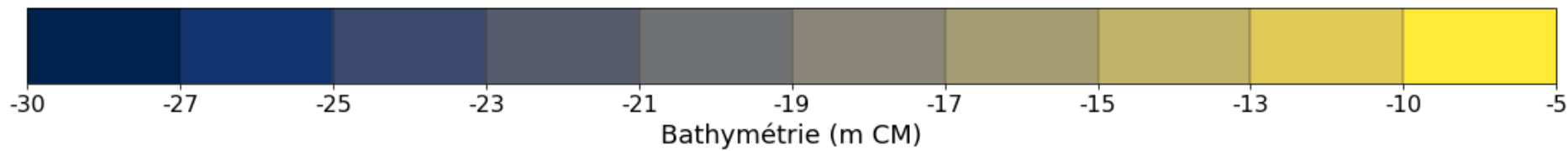
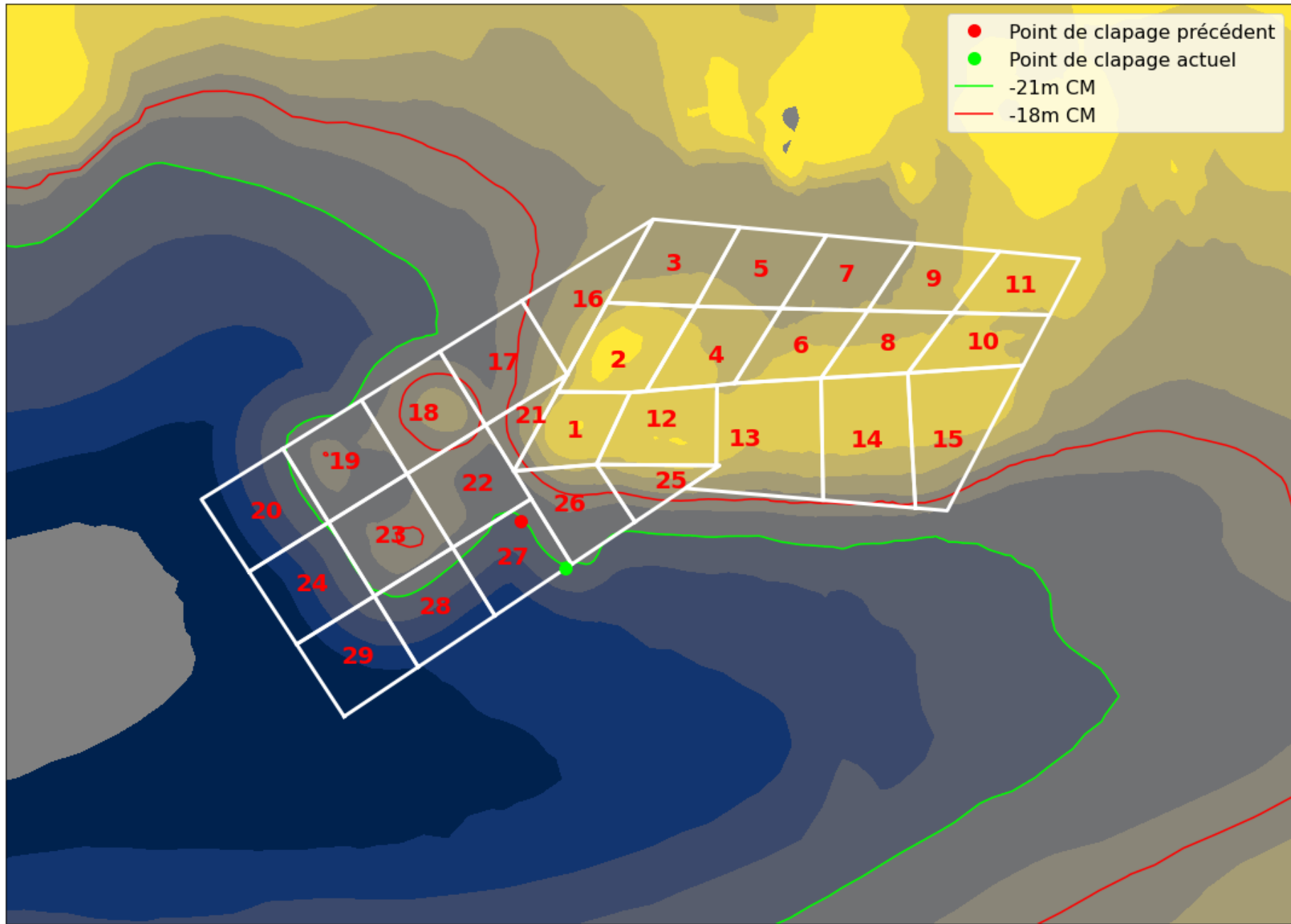




Date de changement de point : 01-12-2031

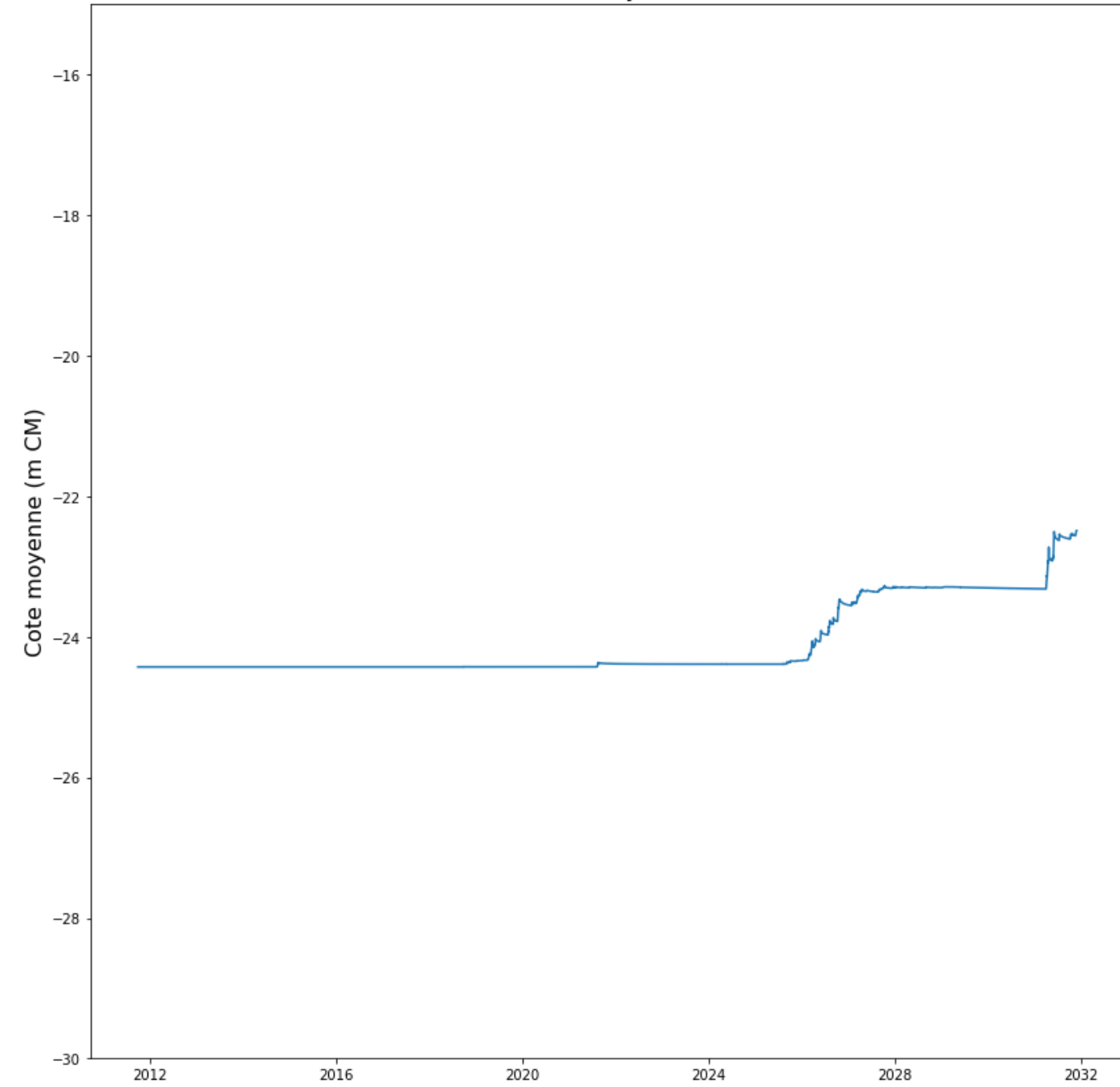
Evolution de la cote moyenne de la zone 27

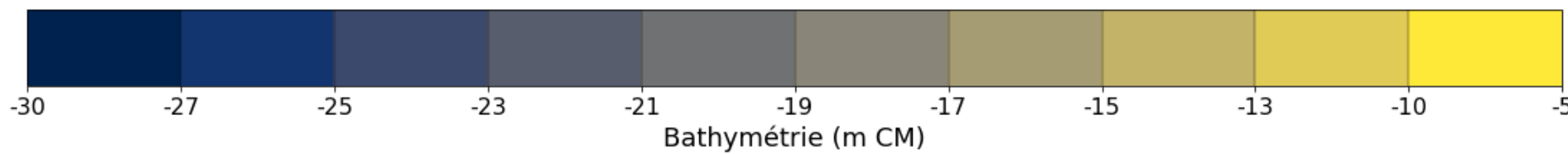
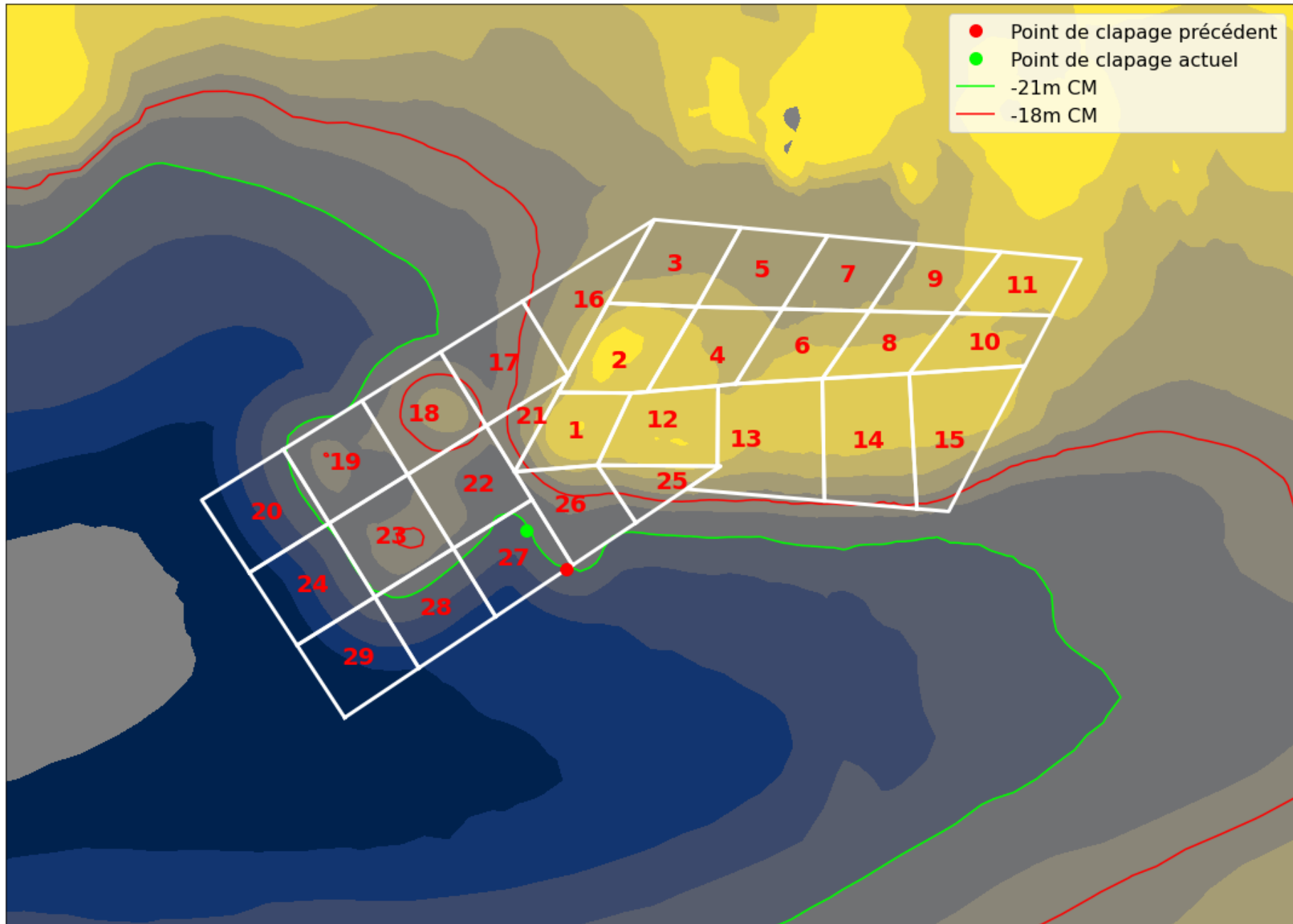




Date de changement de point : 02-12-2031

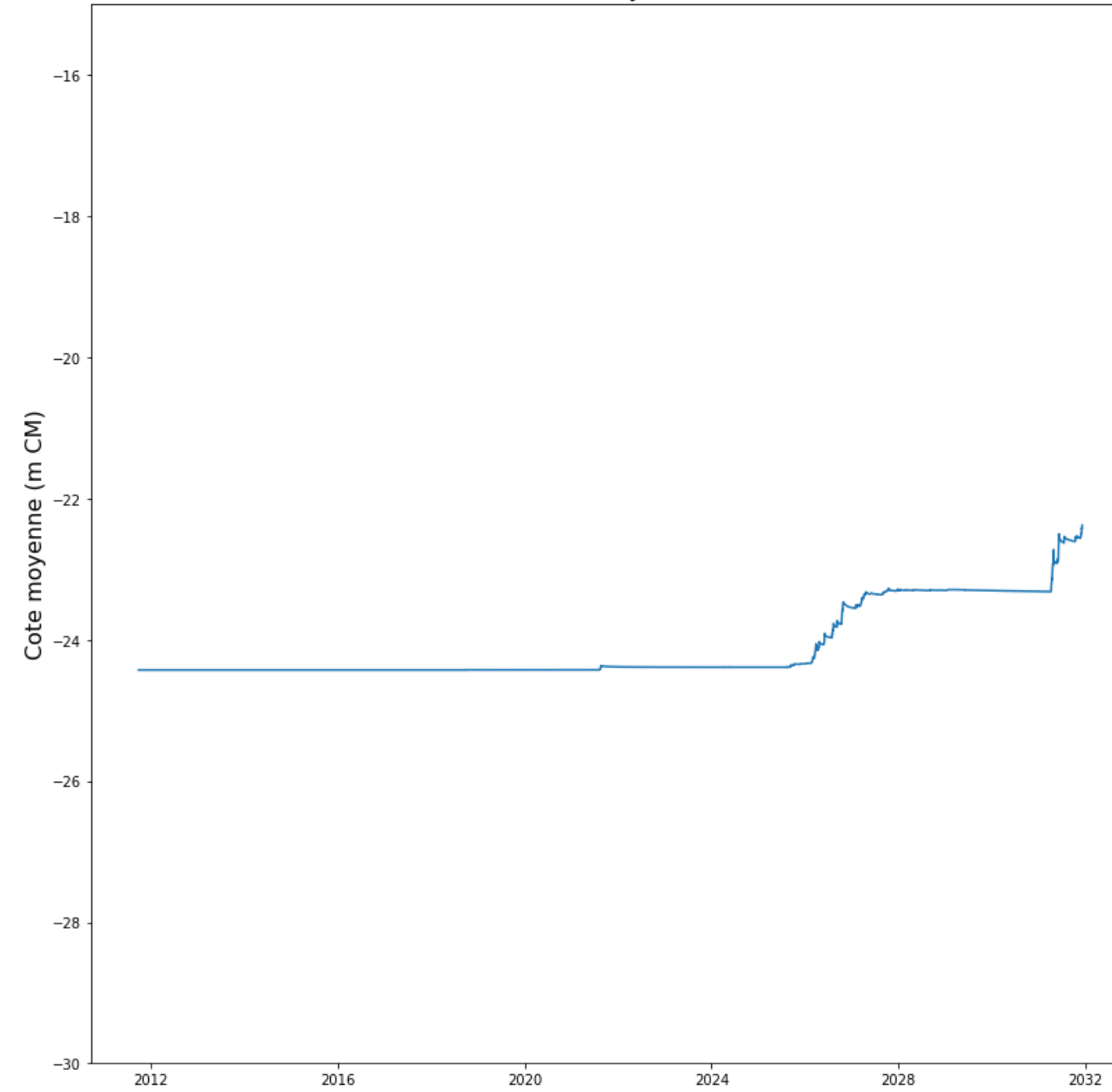
Evolution de la cote moyenne de la zone 27

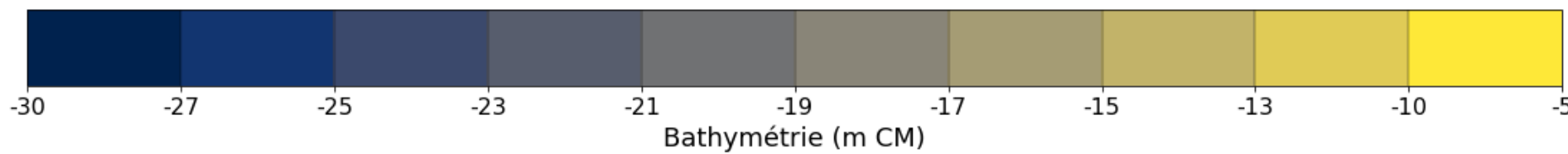
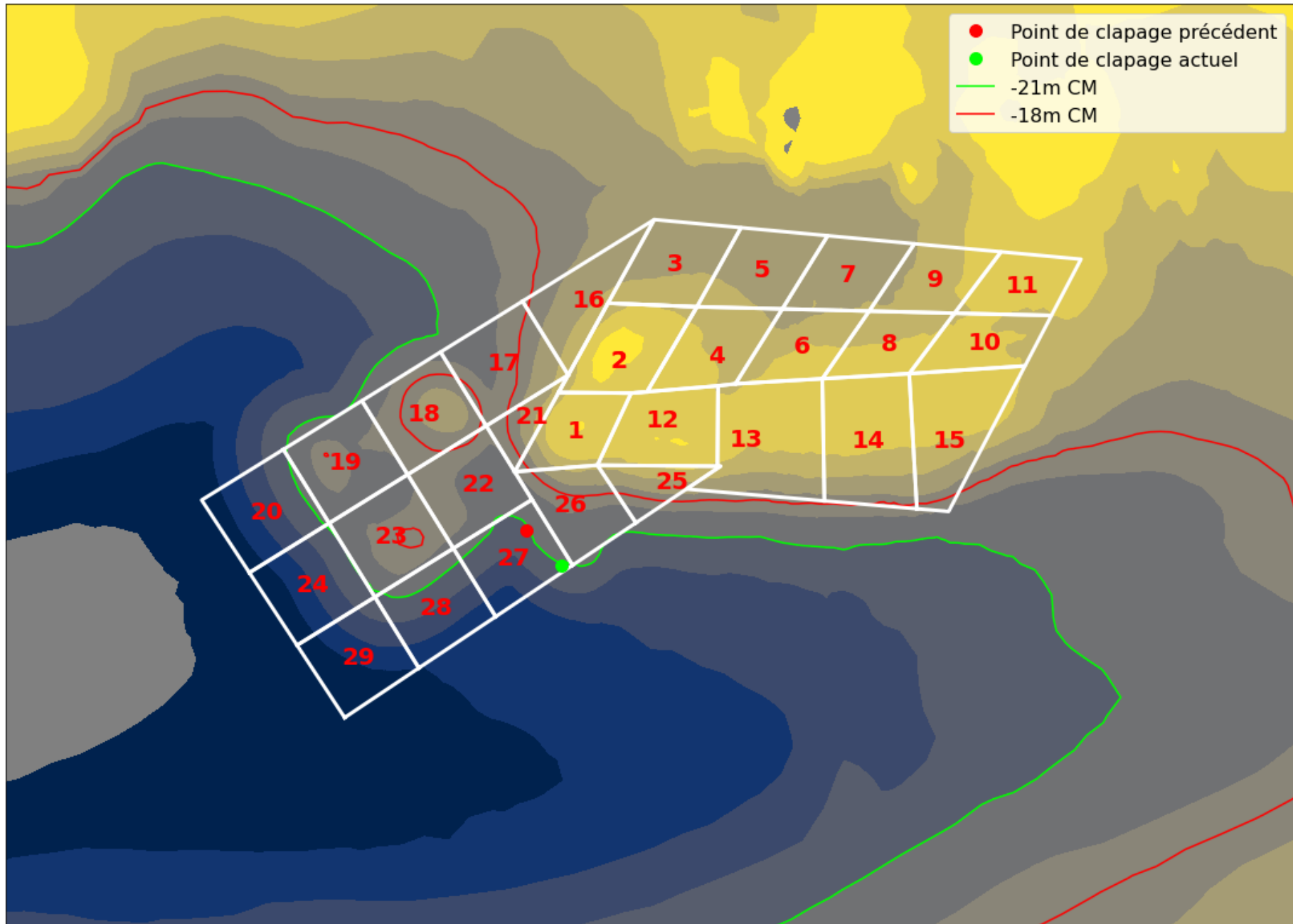




Date de changement de point : 06-12-2031

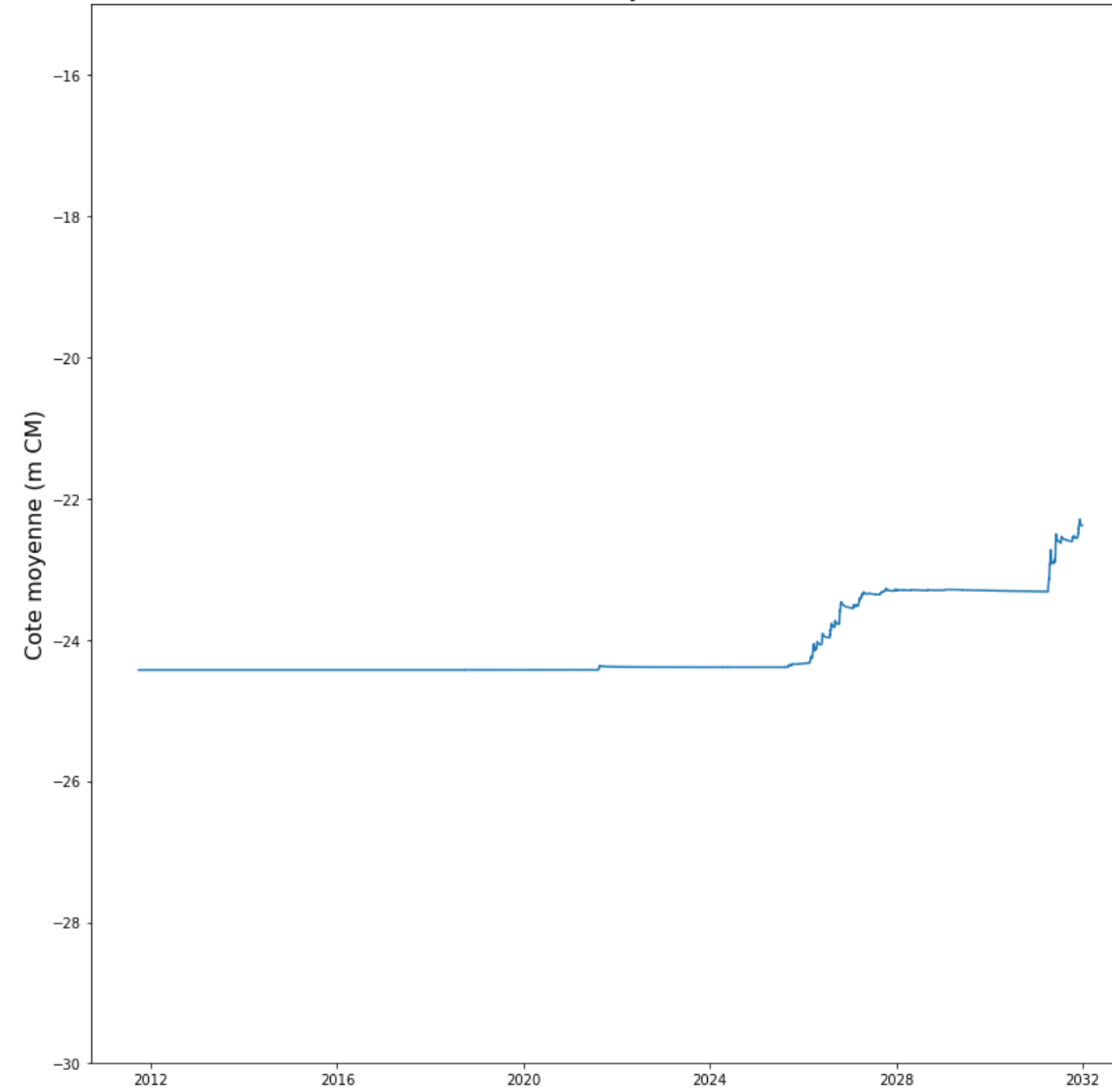
Evolution de la cote moyenne de la zone 27

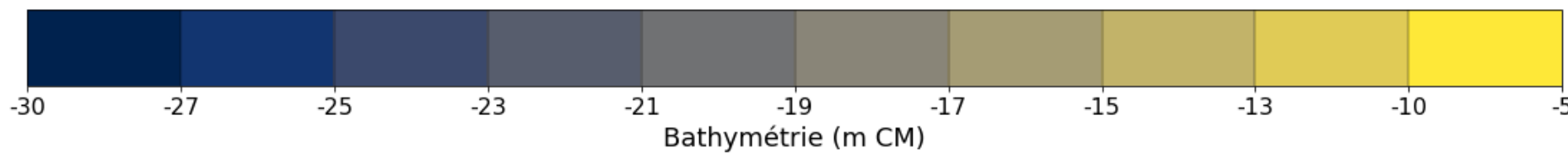
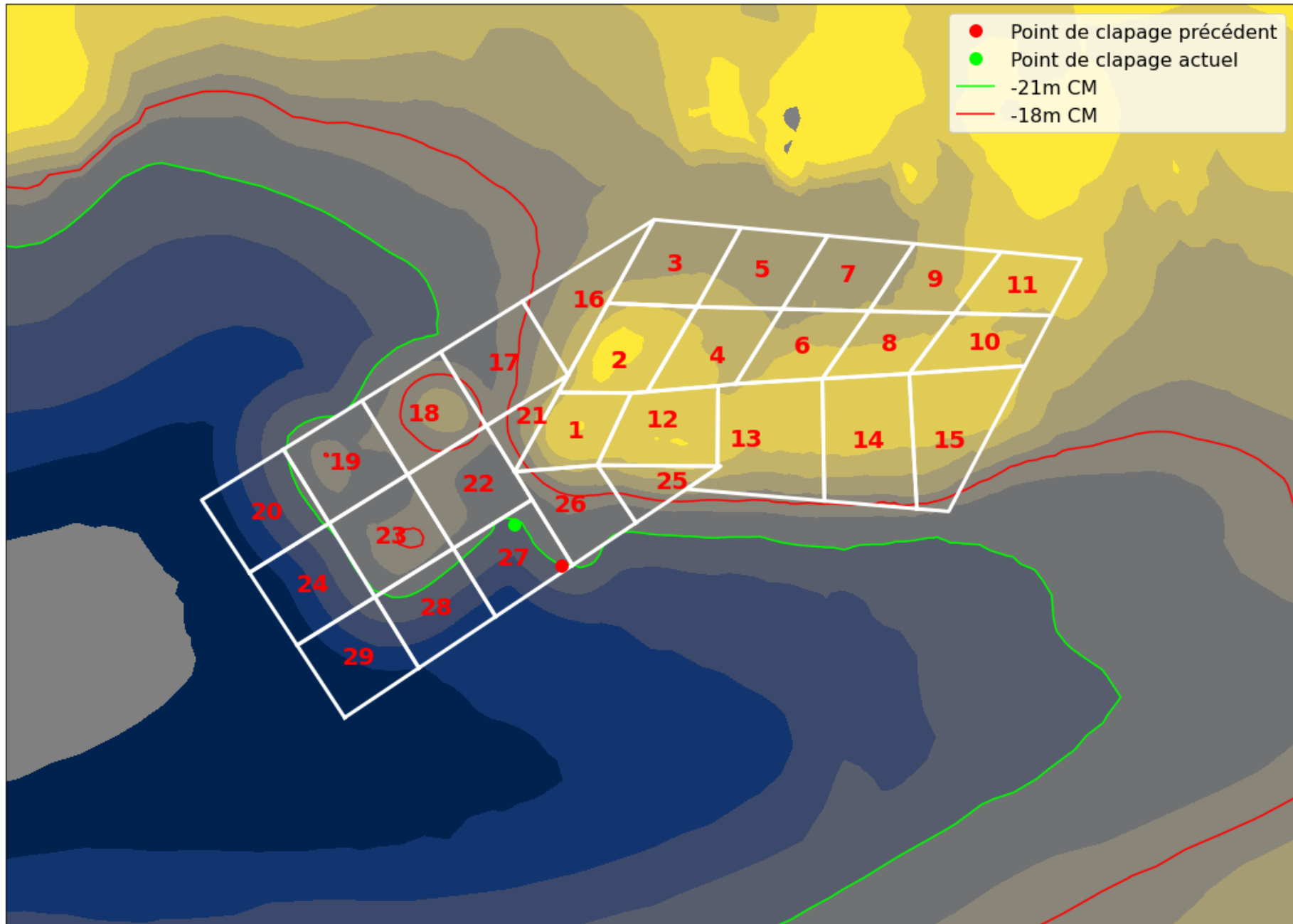




Date de changement de point : 31-12-2031

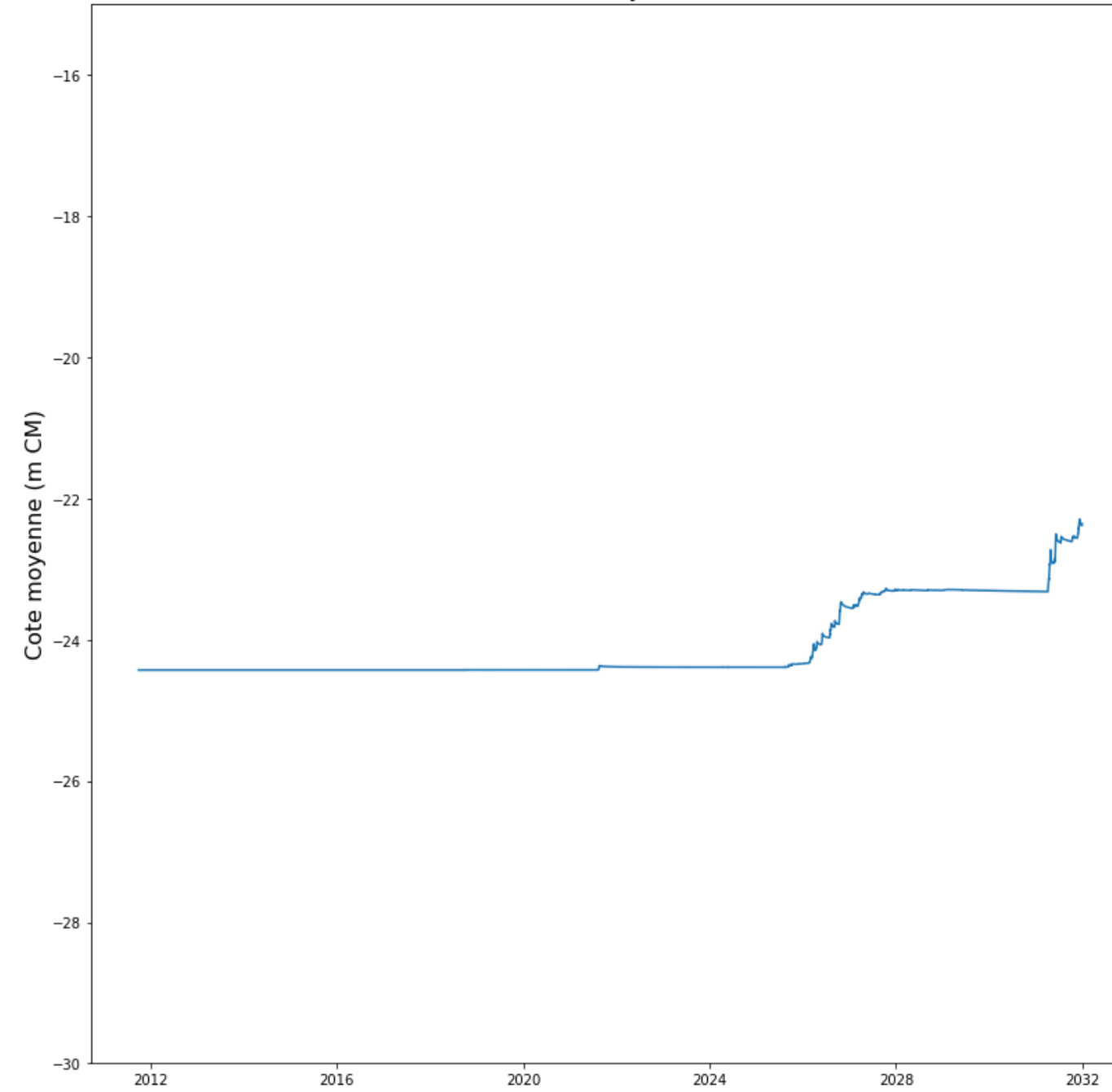
Evolution de la cote moyenne de la zone 27

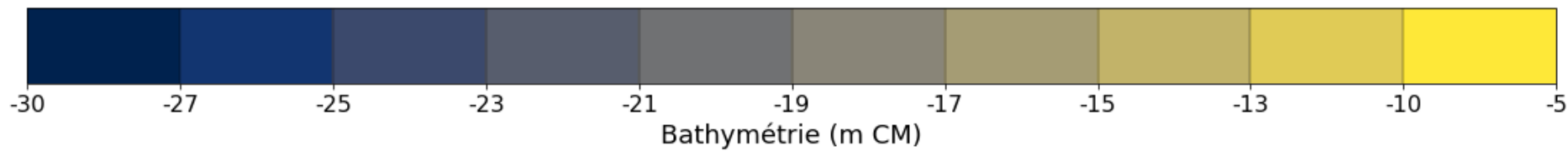
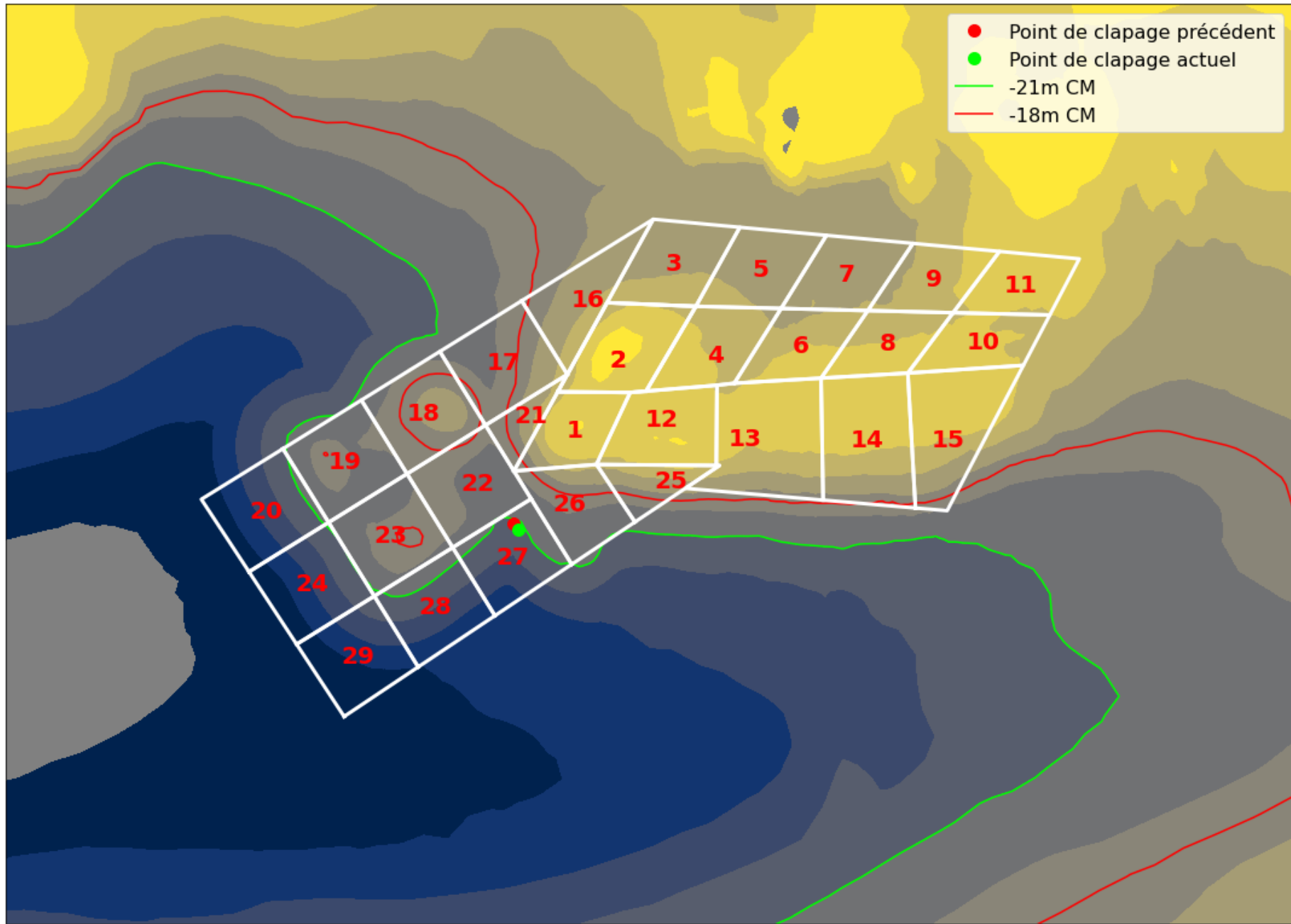




Date de changement de point : 31-12-2031

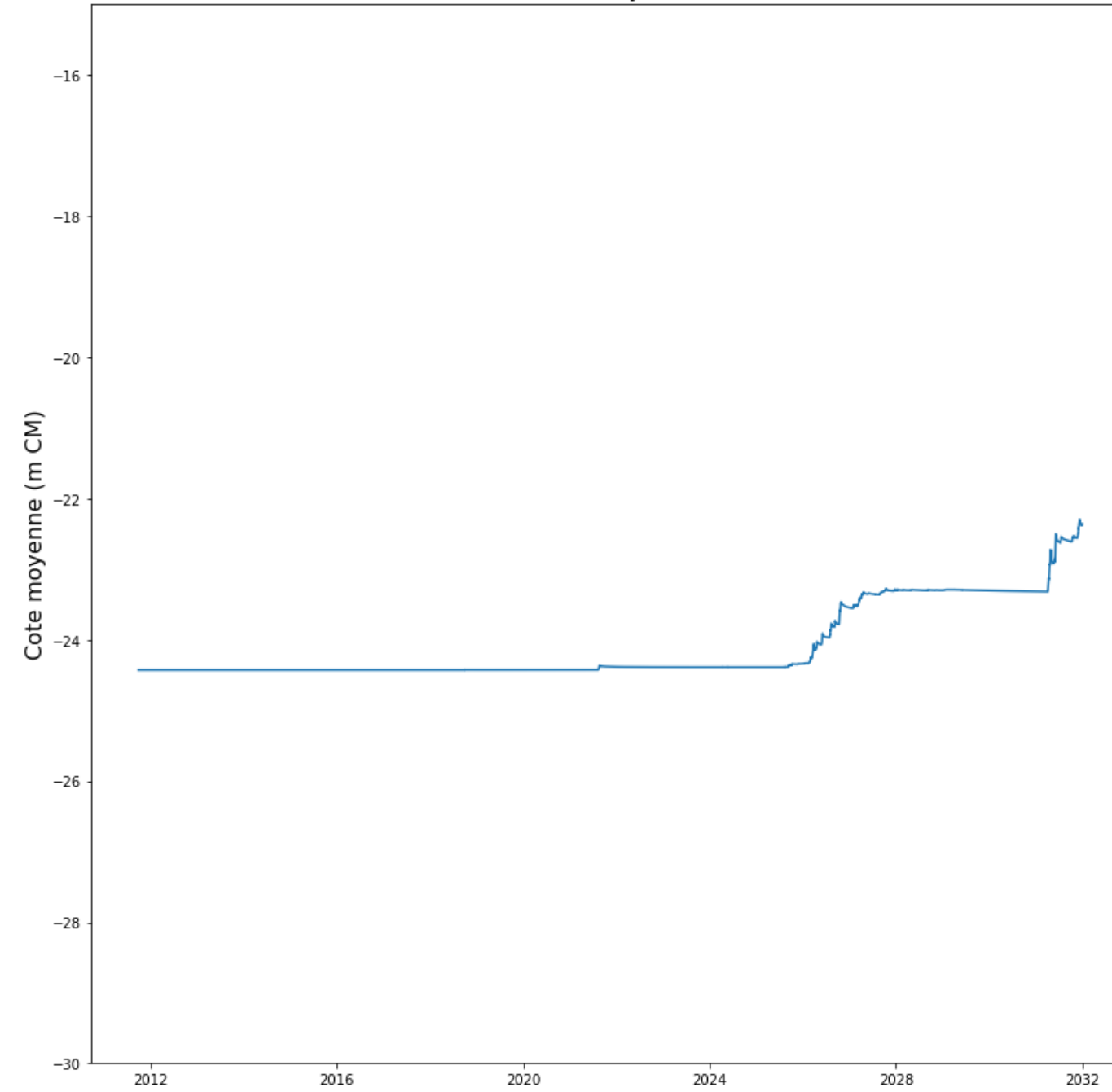
Evolution de la cote moyenne de la zone 27



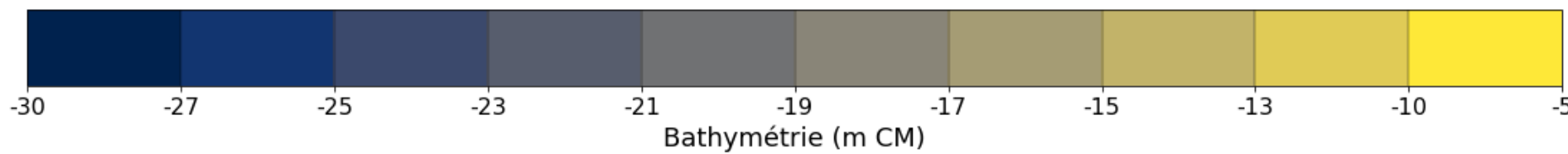
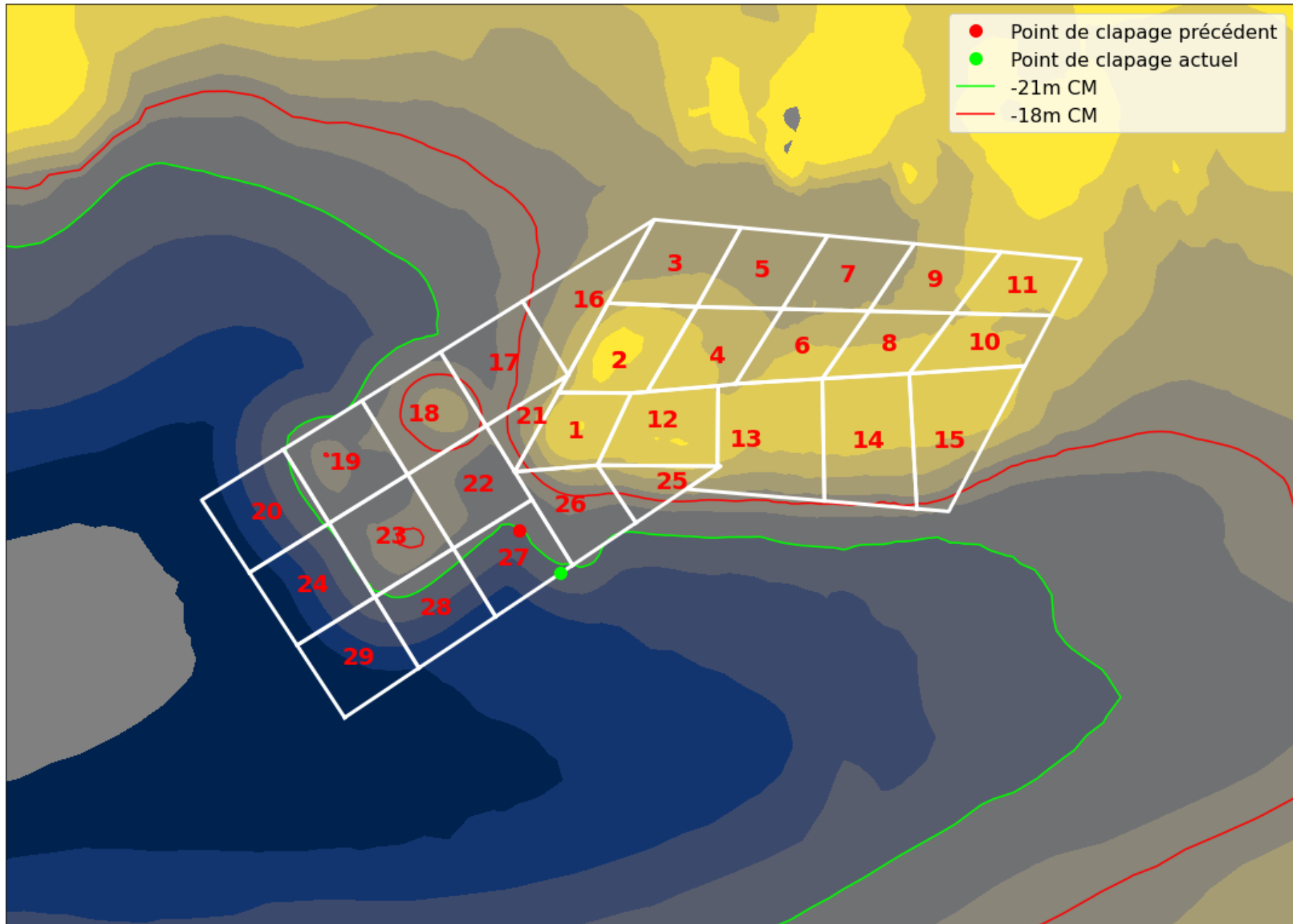


Date de changement de point : 01-01-2032

Evolution de la cote moyenne de la zone 27

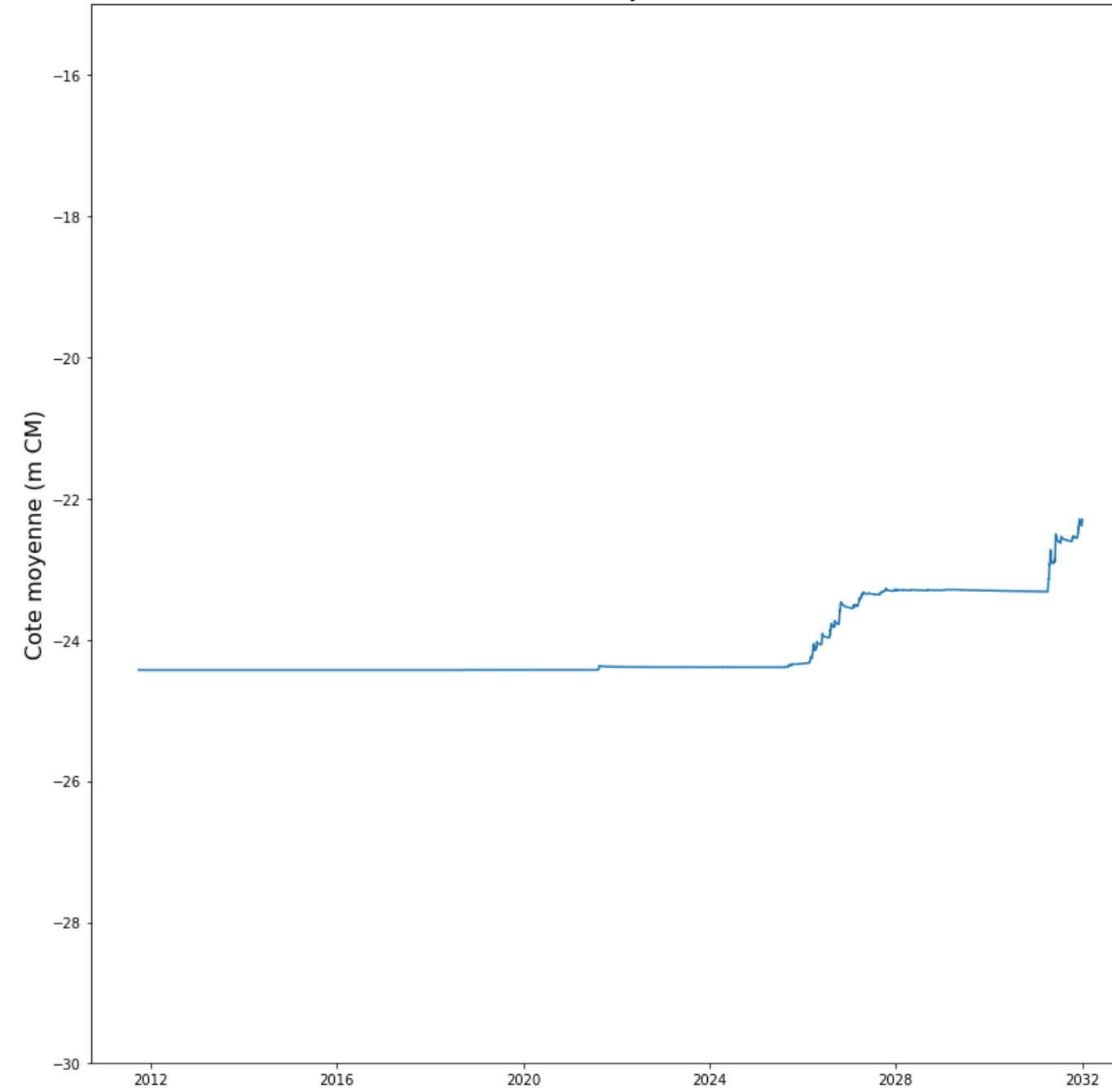


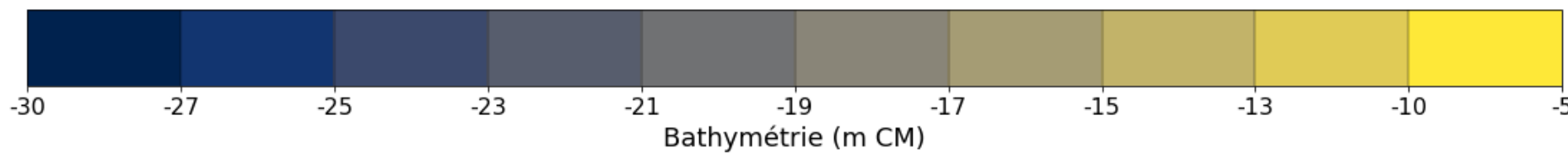
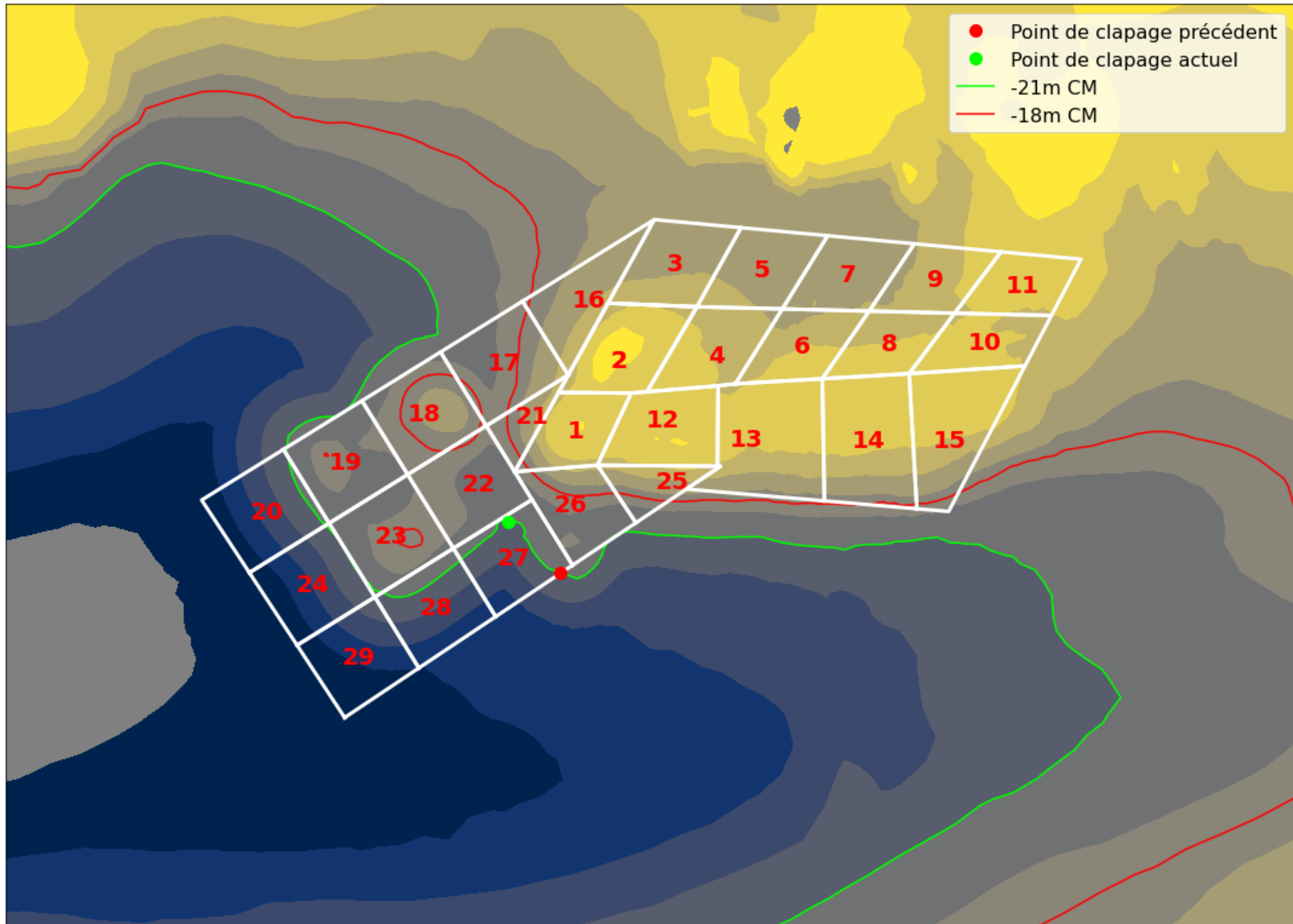




Date de changement de point : 02-01-2032

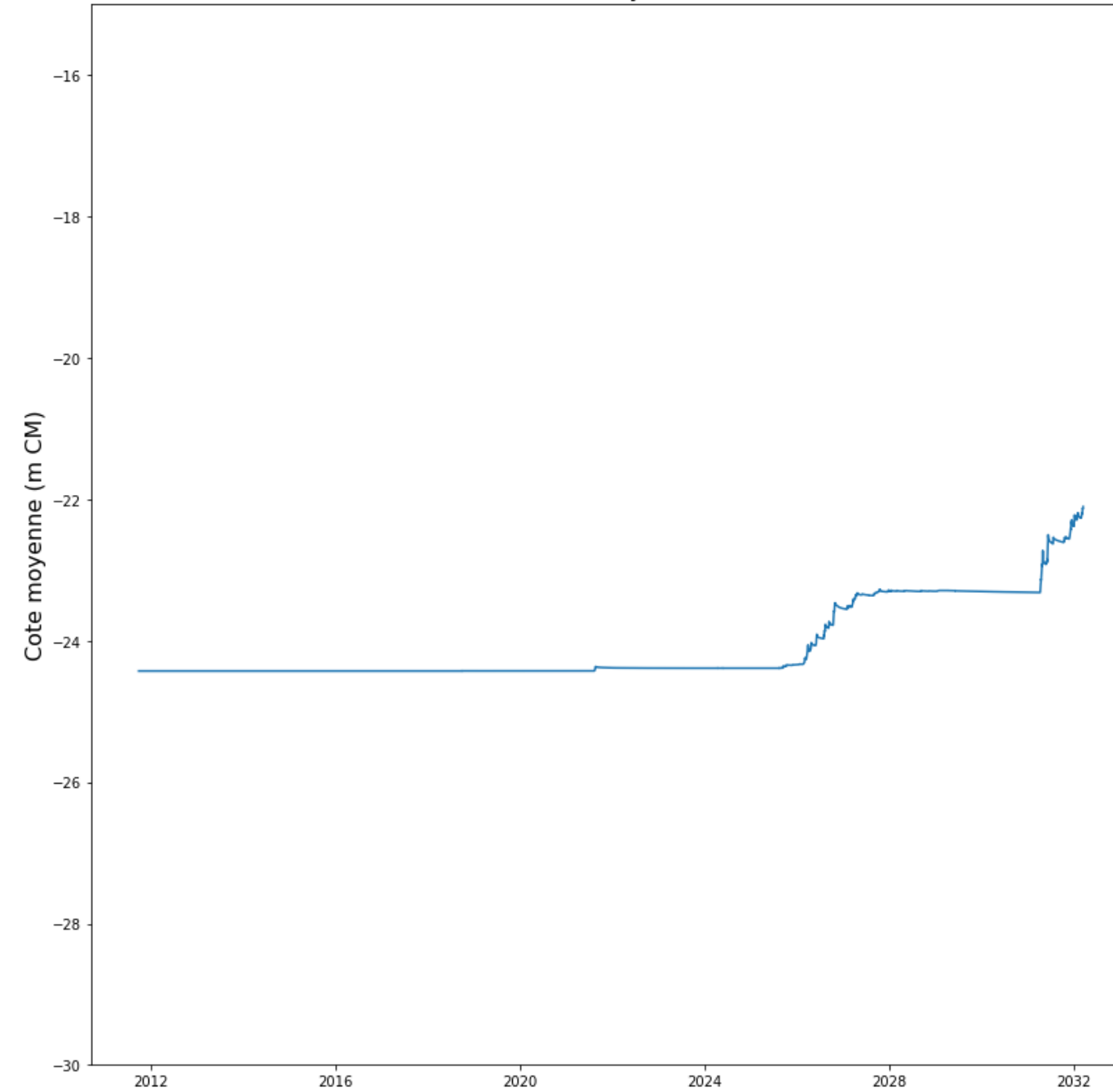
Evolution de la cote moyenne de la zone 27

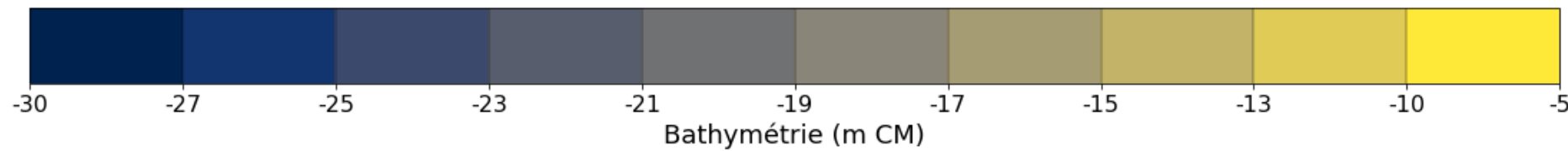
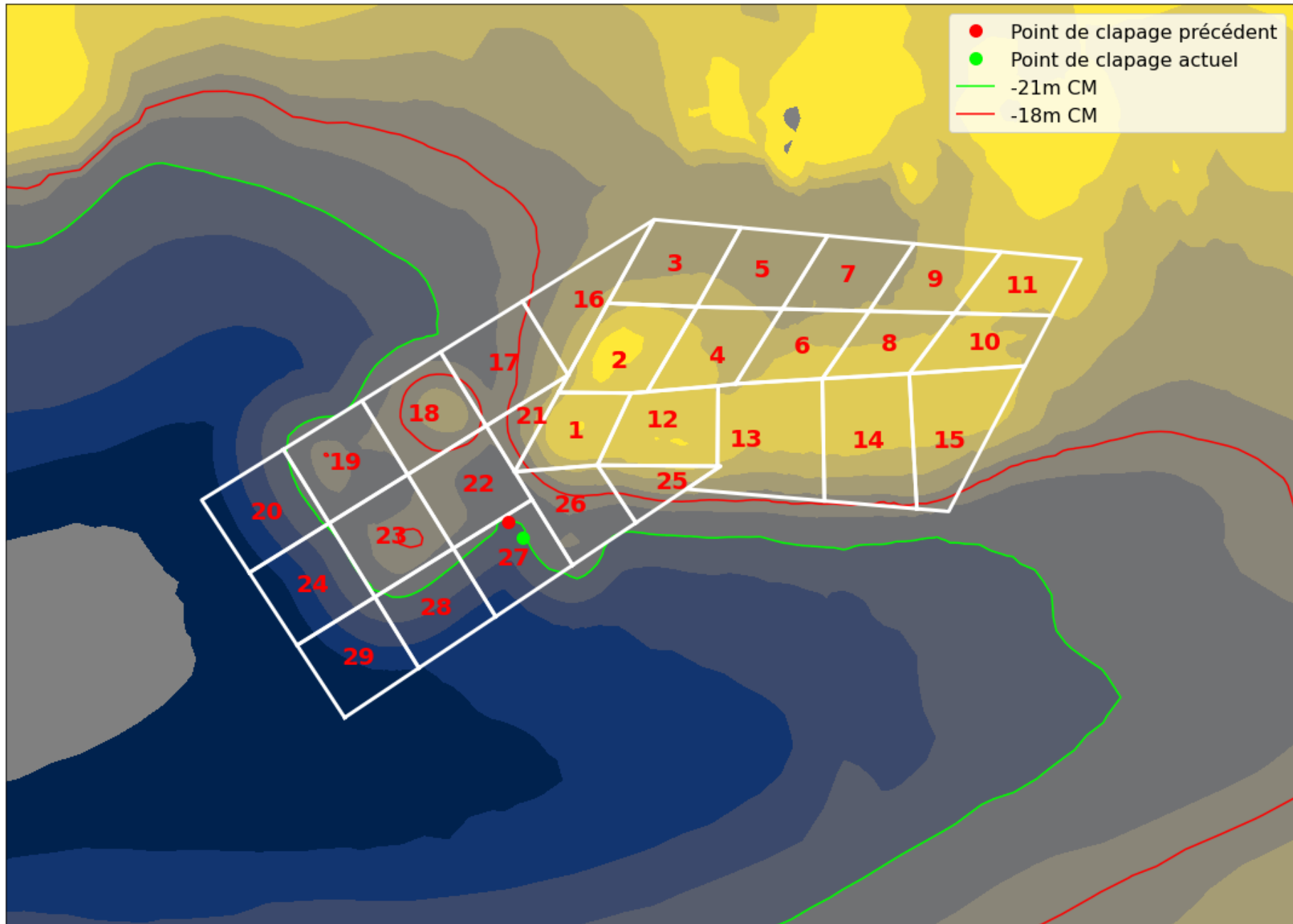




Date de changement de point : 11-03-2032

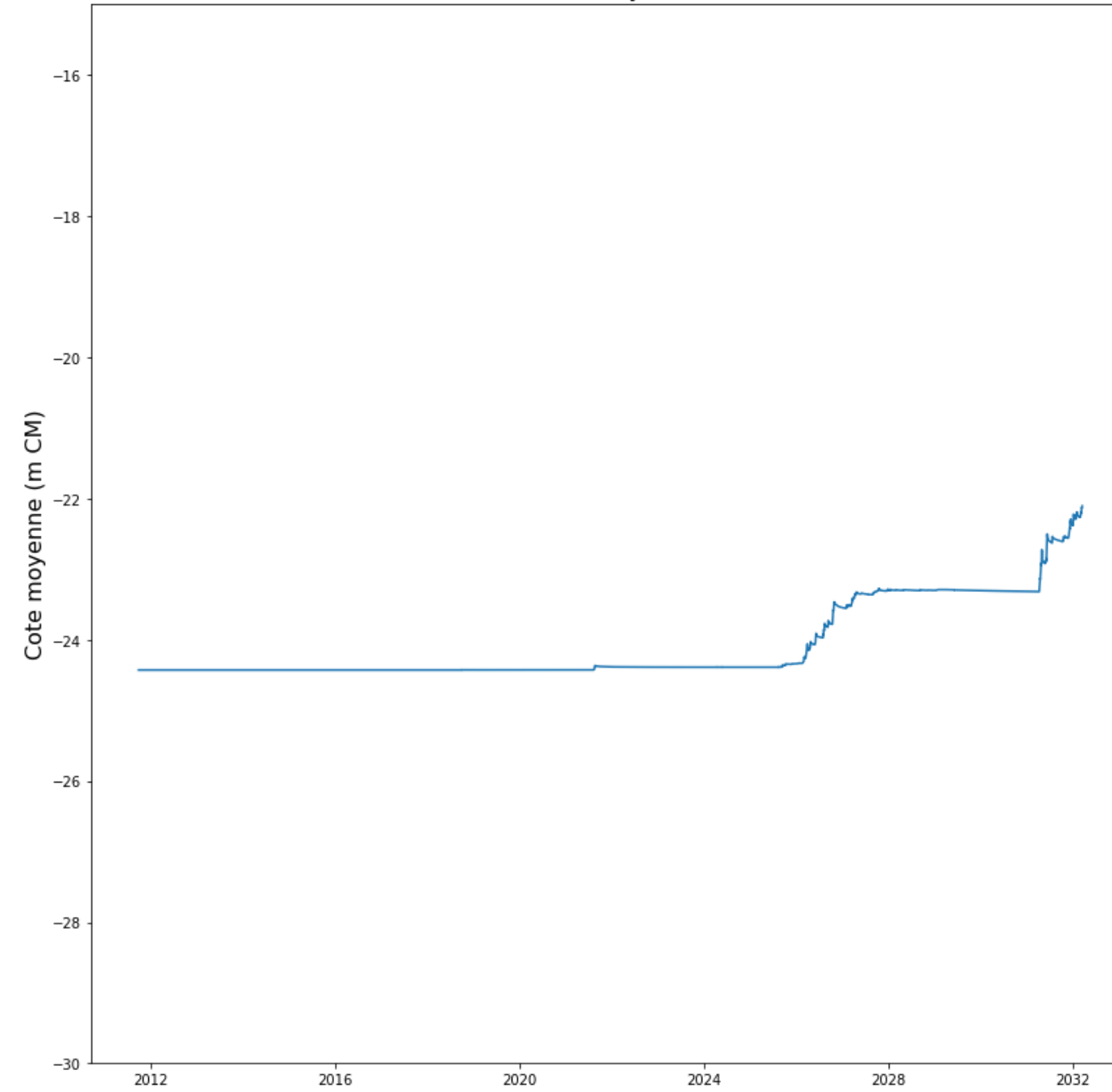
Evolution de la cote moyenne de la zone 27

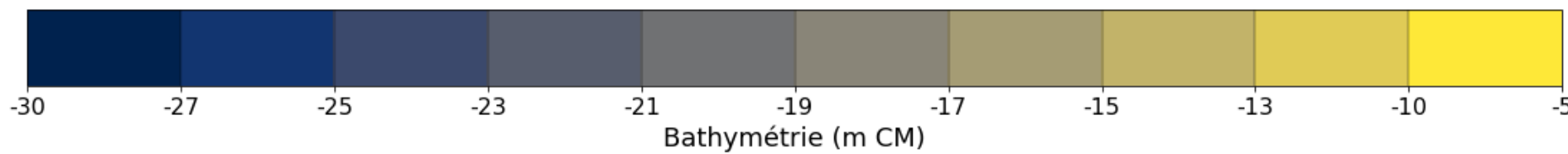
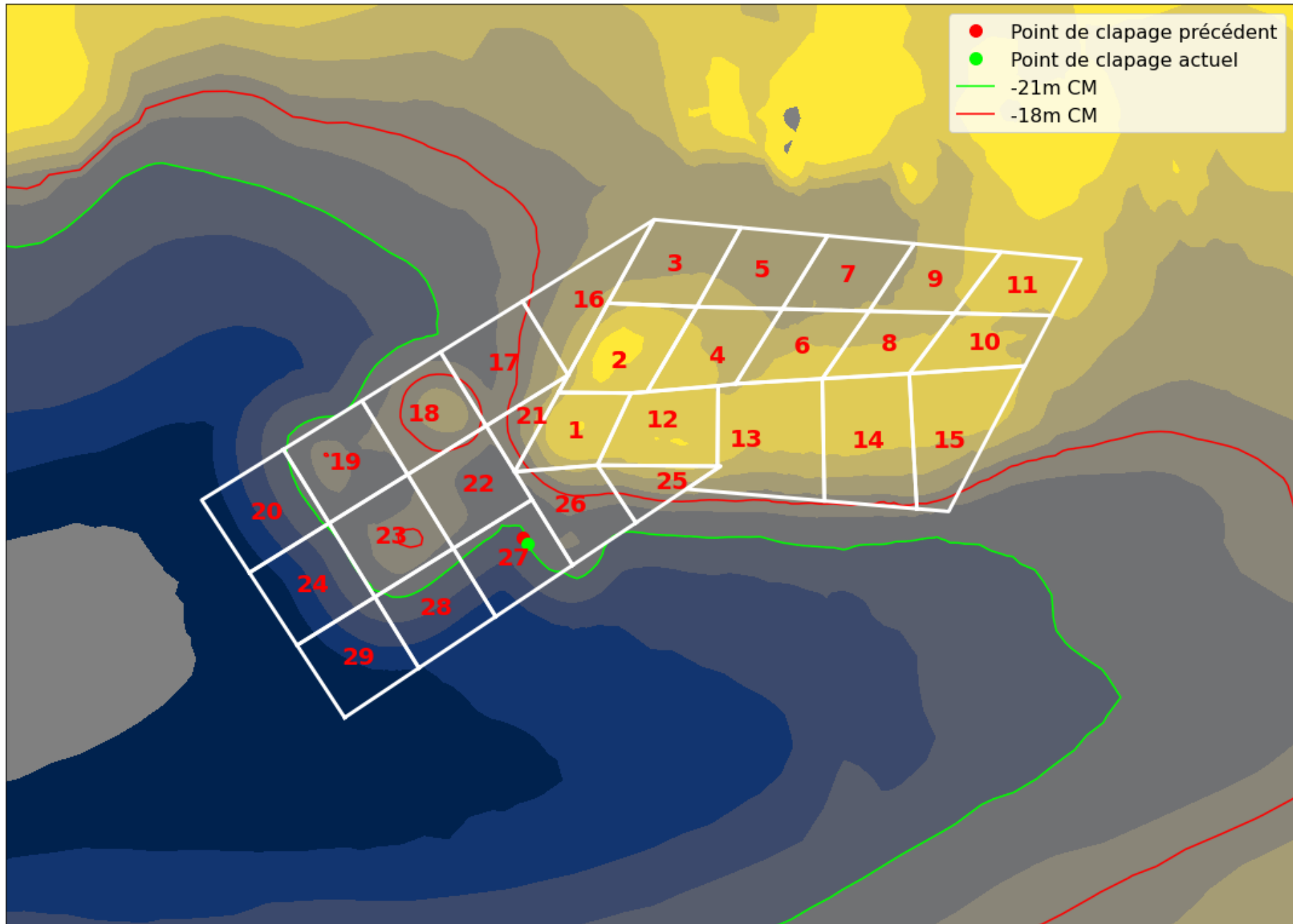




Date de changement de point : 11-03-2032

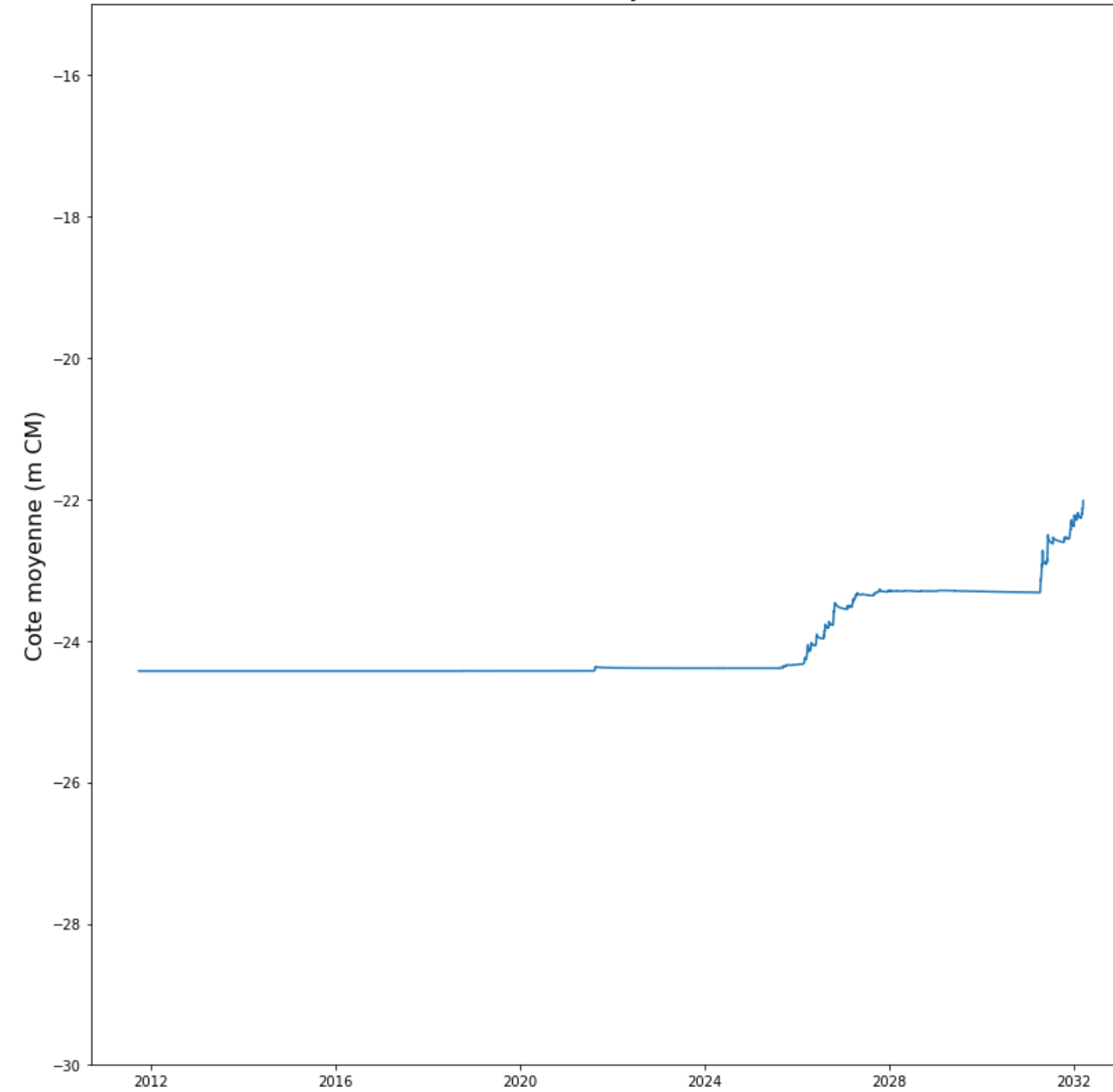
Evolution de la cote moyenne de la zone 27

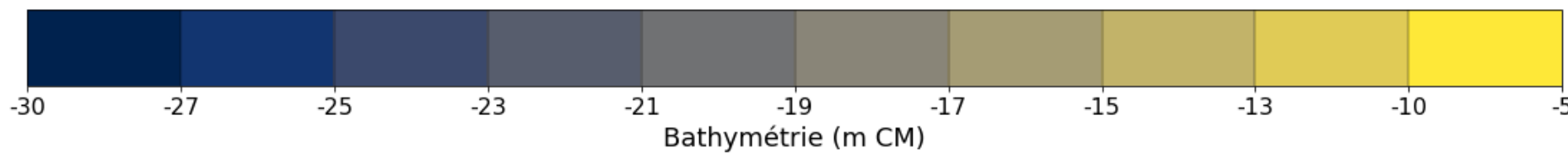
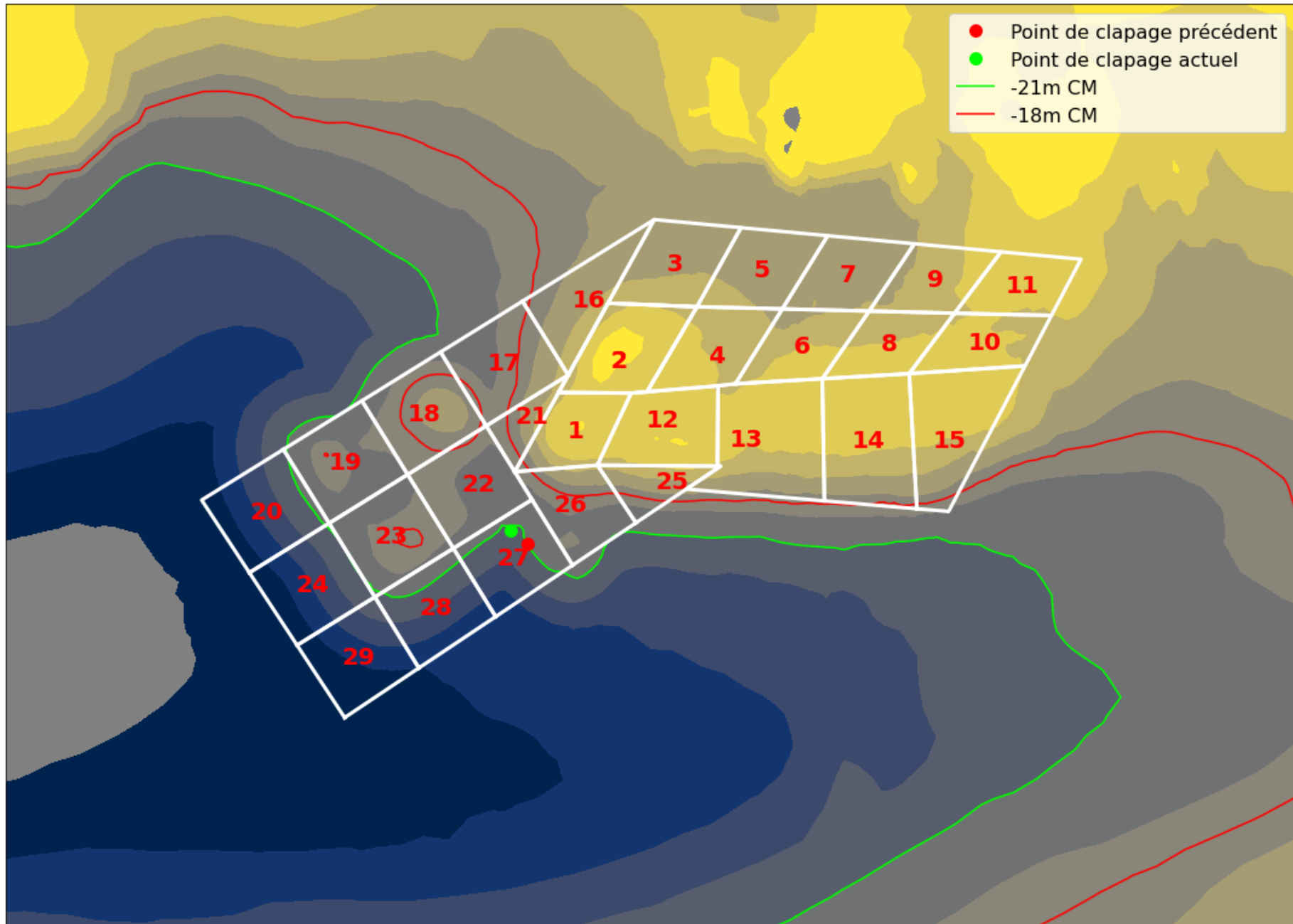




Date de changement de point : 13-03-2032

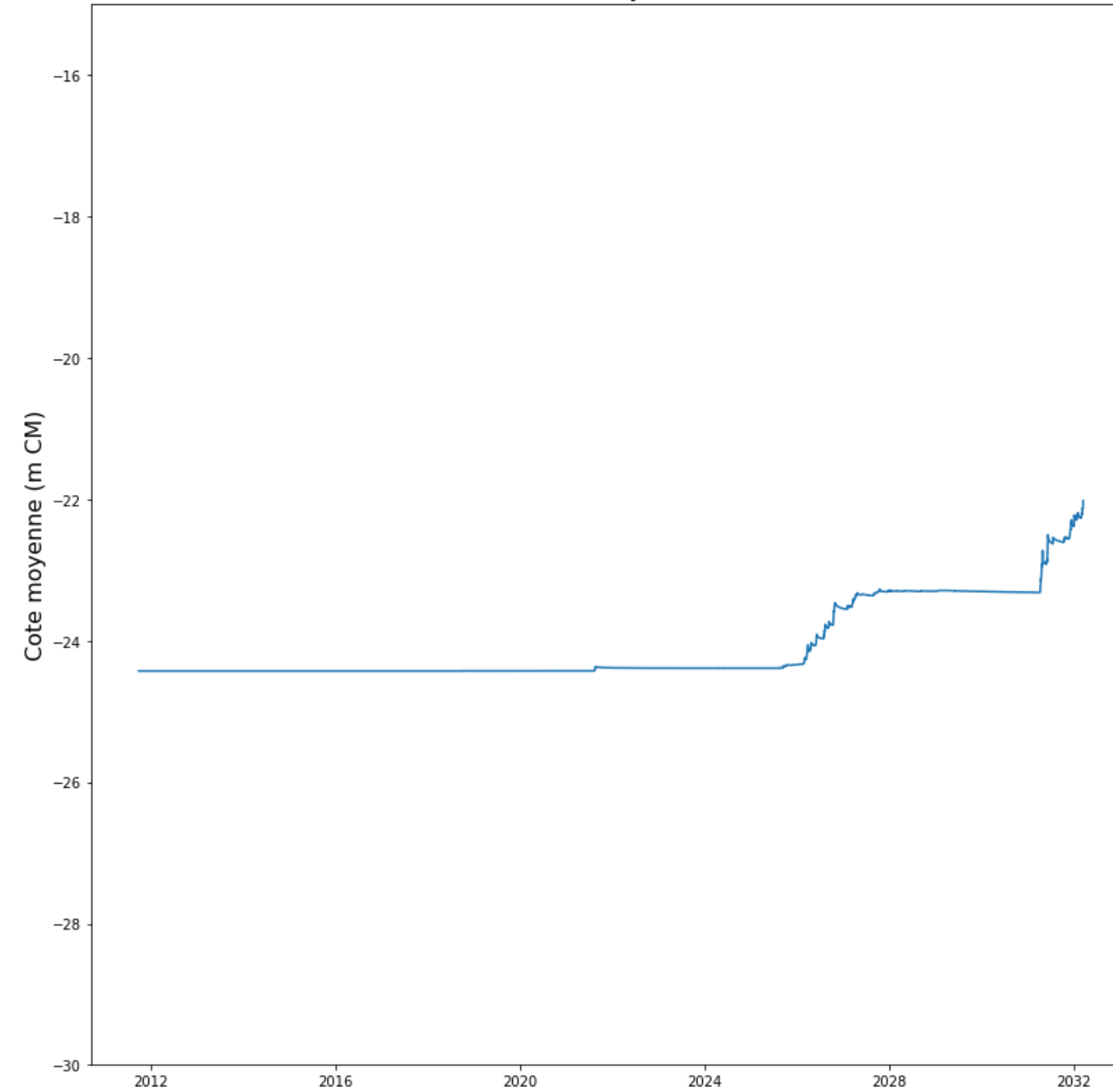
Evolution de la cote moyenne de la zone 27

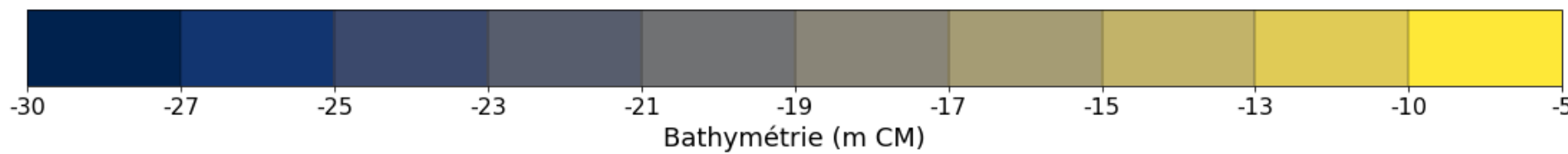
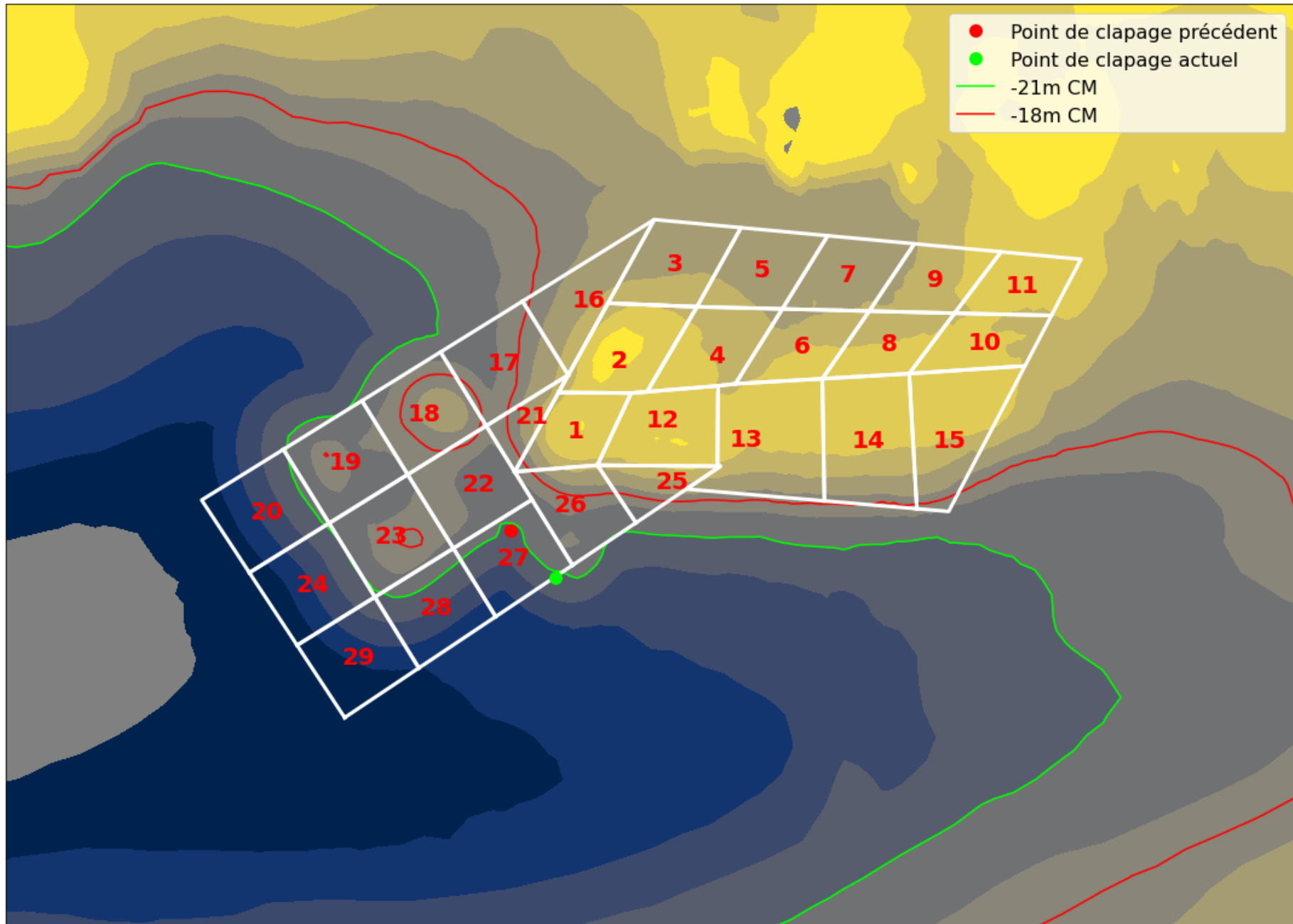




Date de changement de point : 13-03-2032

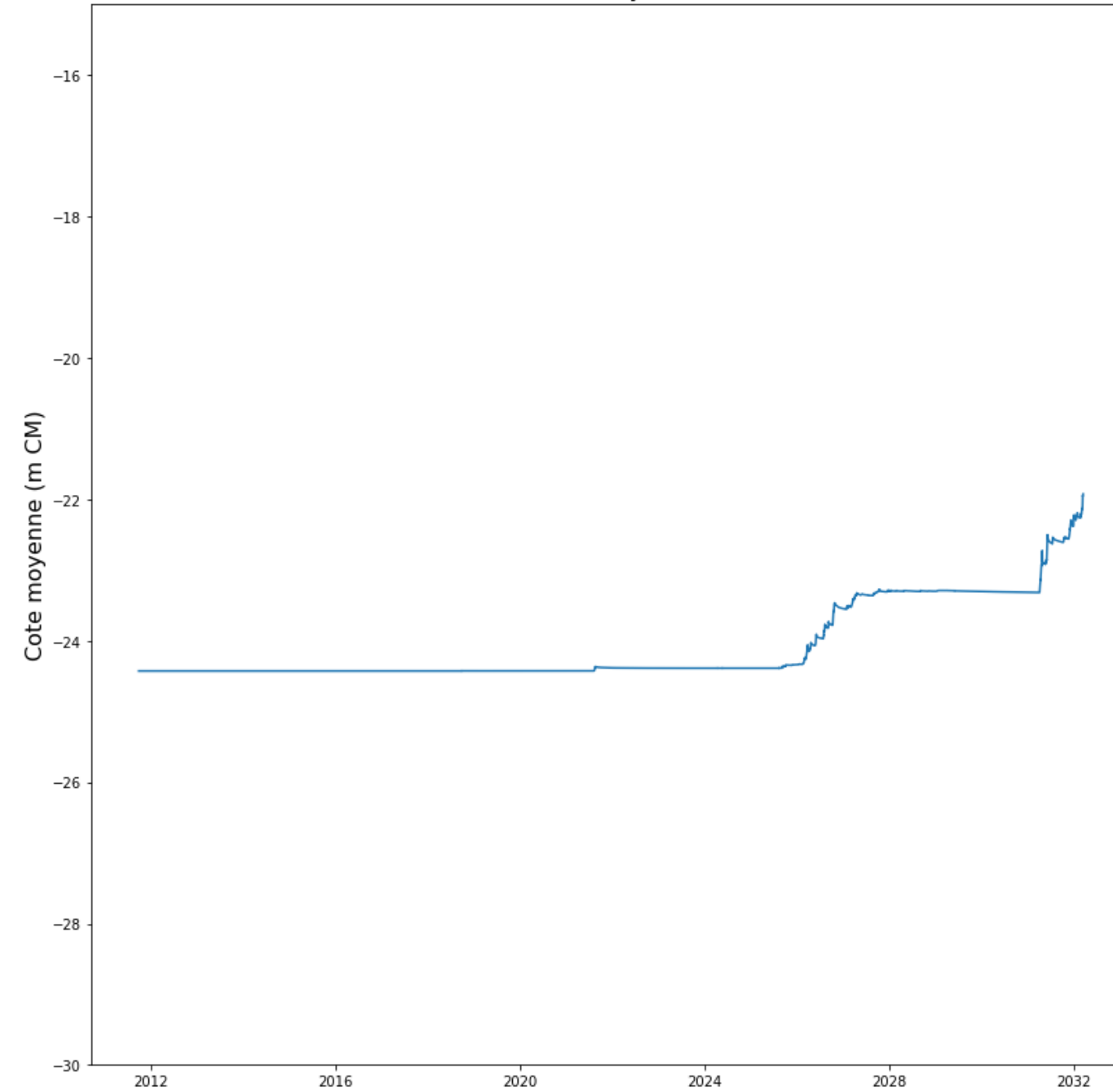
Evolution de la cote moyenne de la zone 27



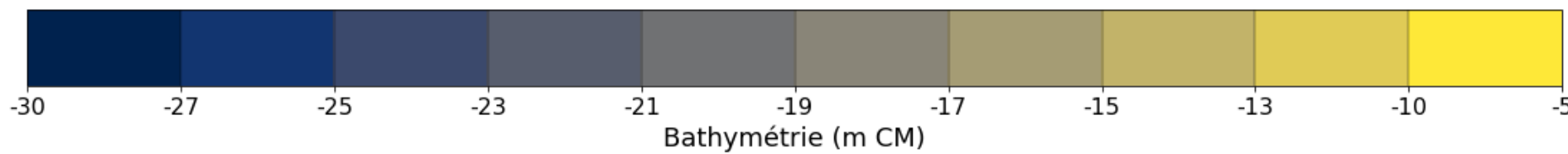
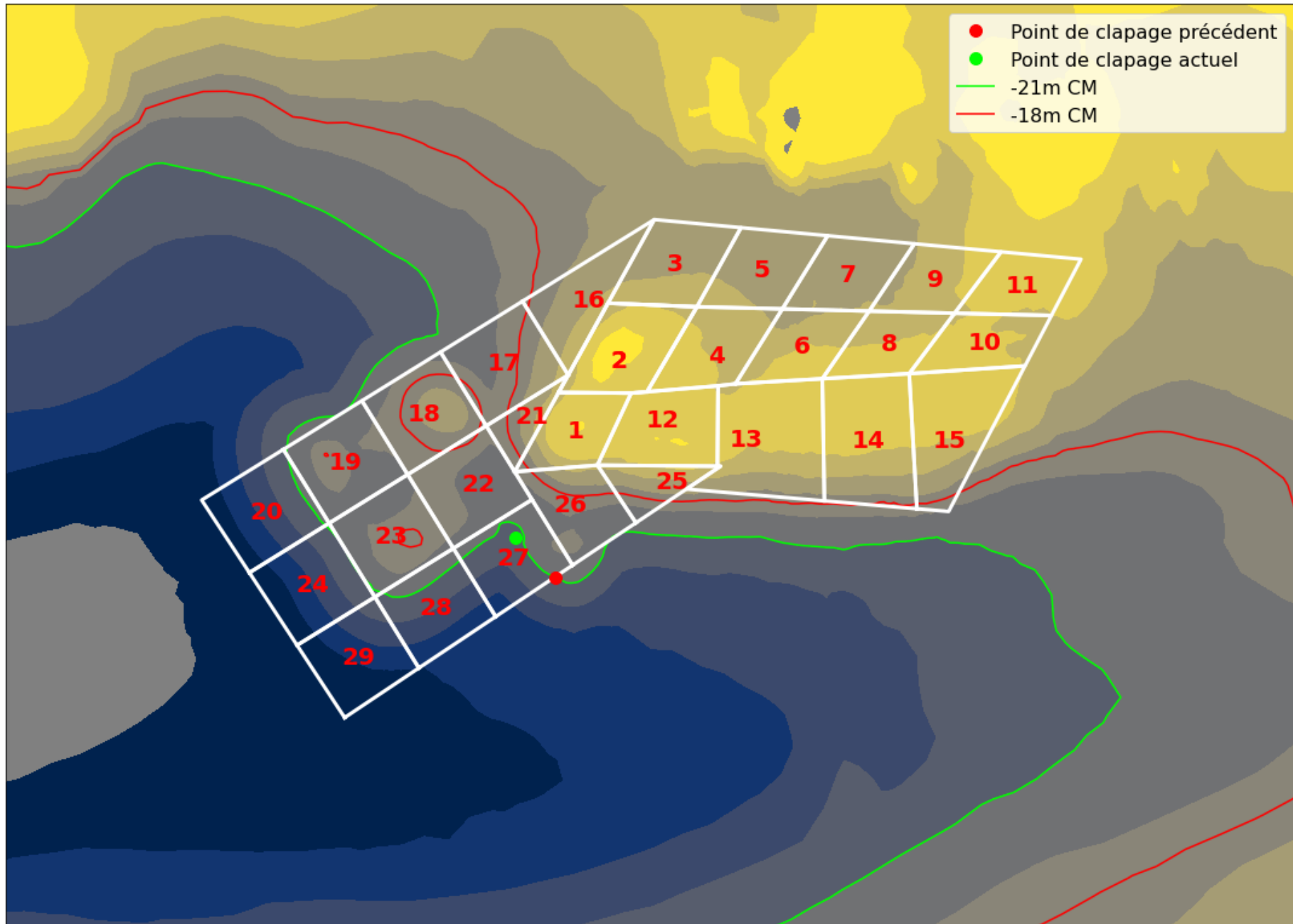


Date de changement de point : 16-03-2032

Evolution de la cote moyenne de la zone 27

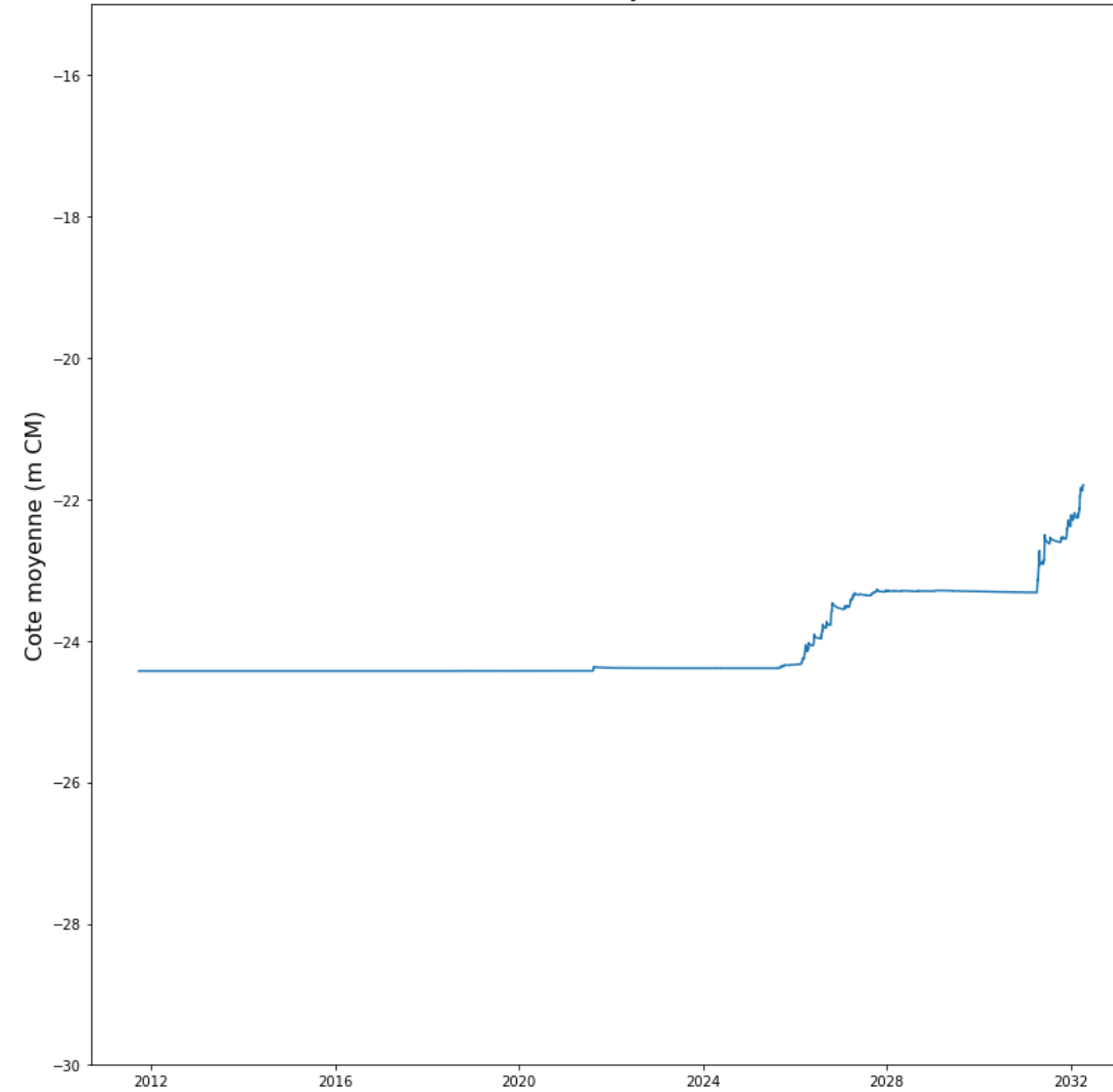


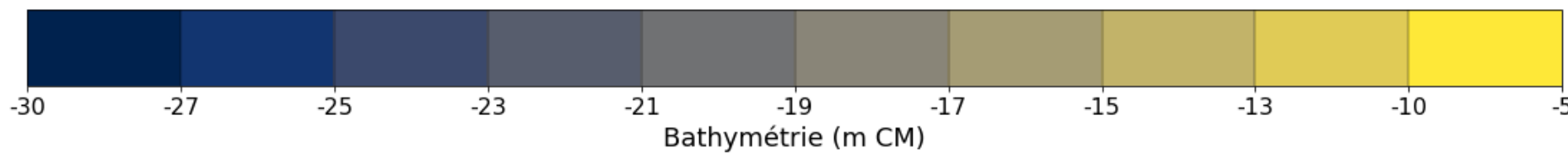
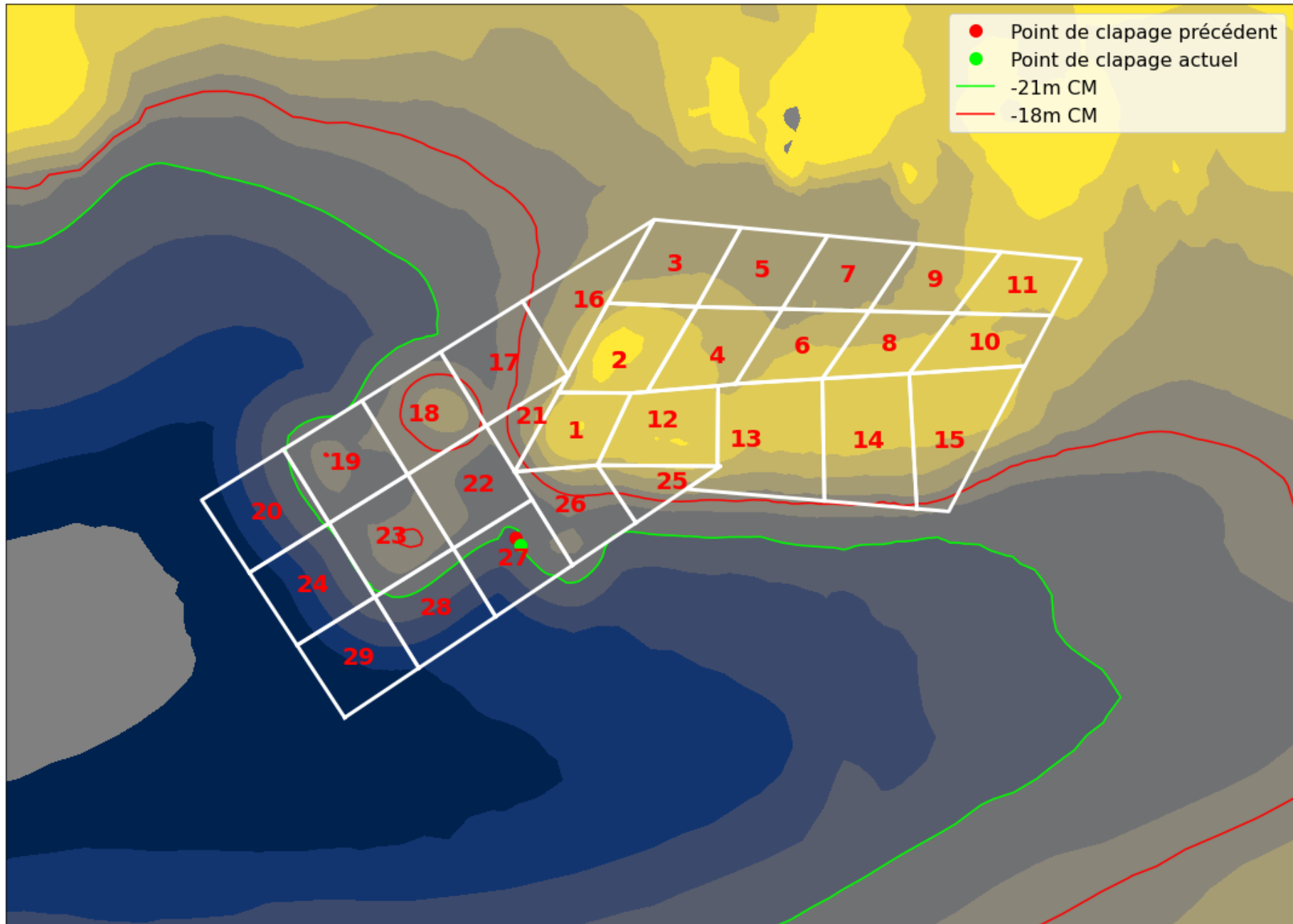




Date de changement de point : 08-04-2032

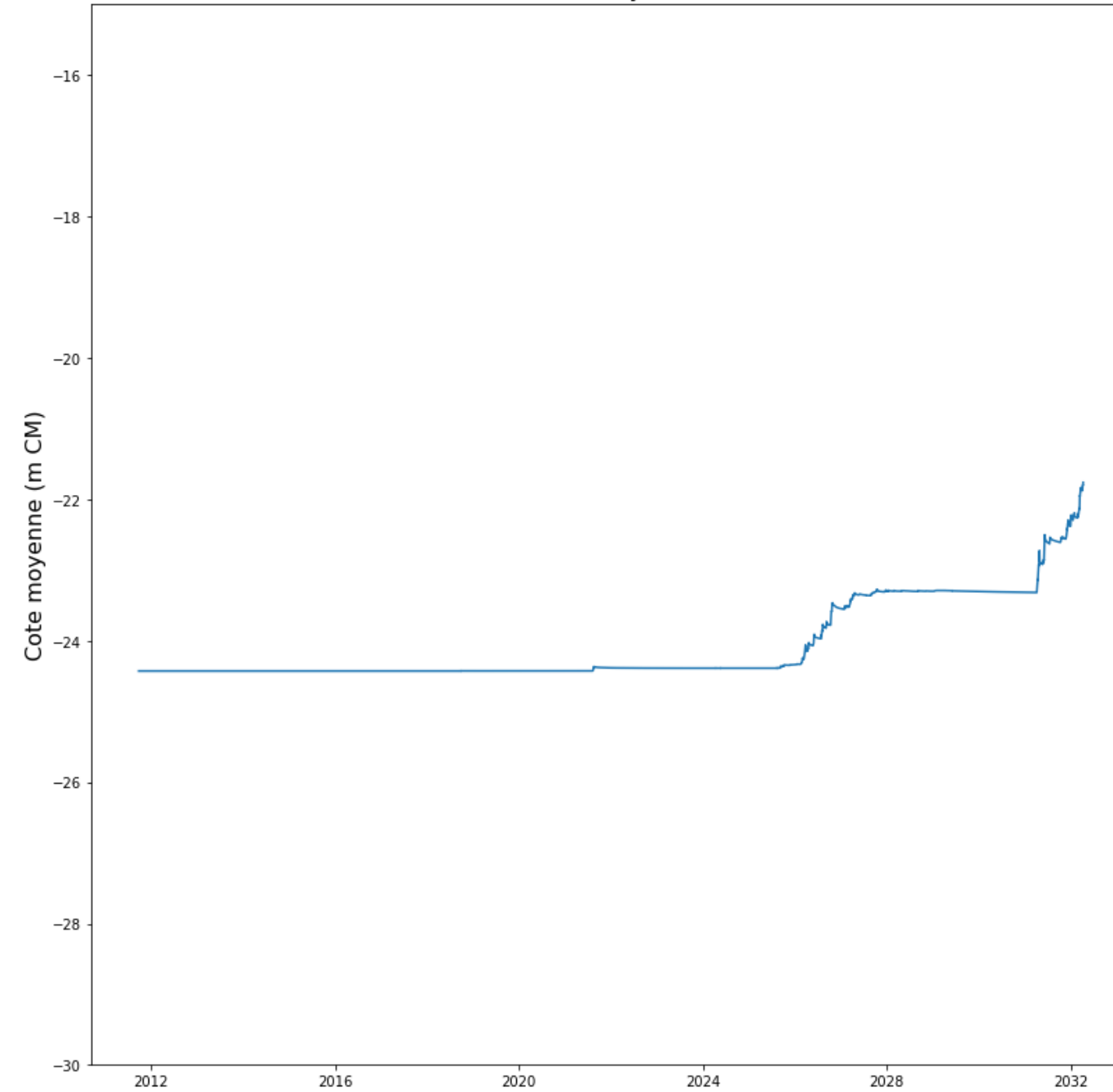
Evolution de la cote moyenne de la zone 27

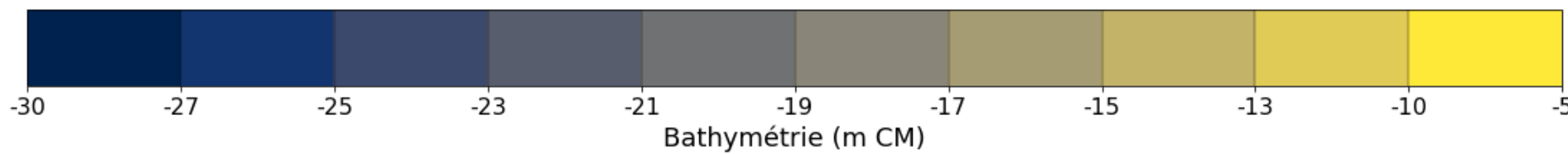
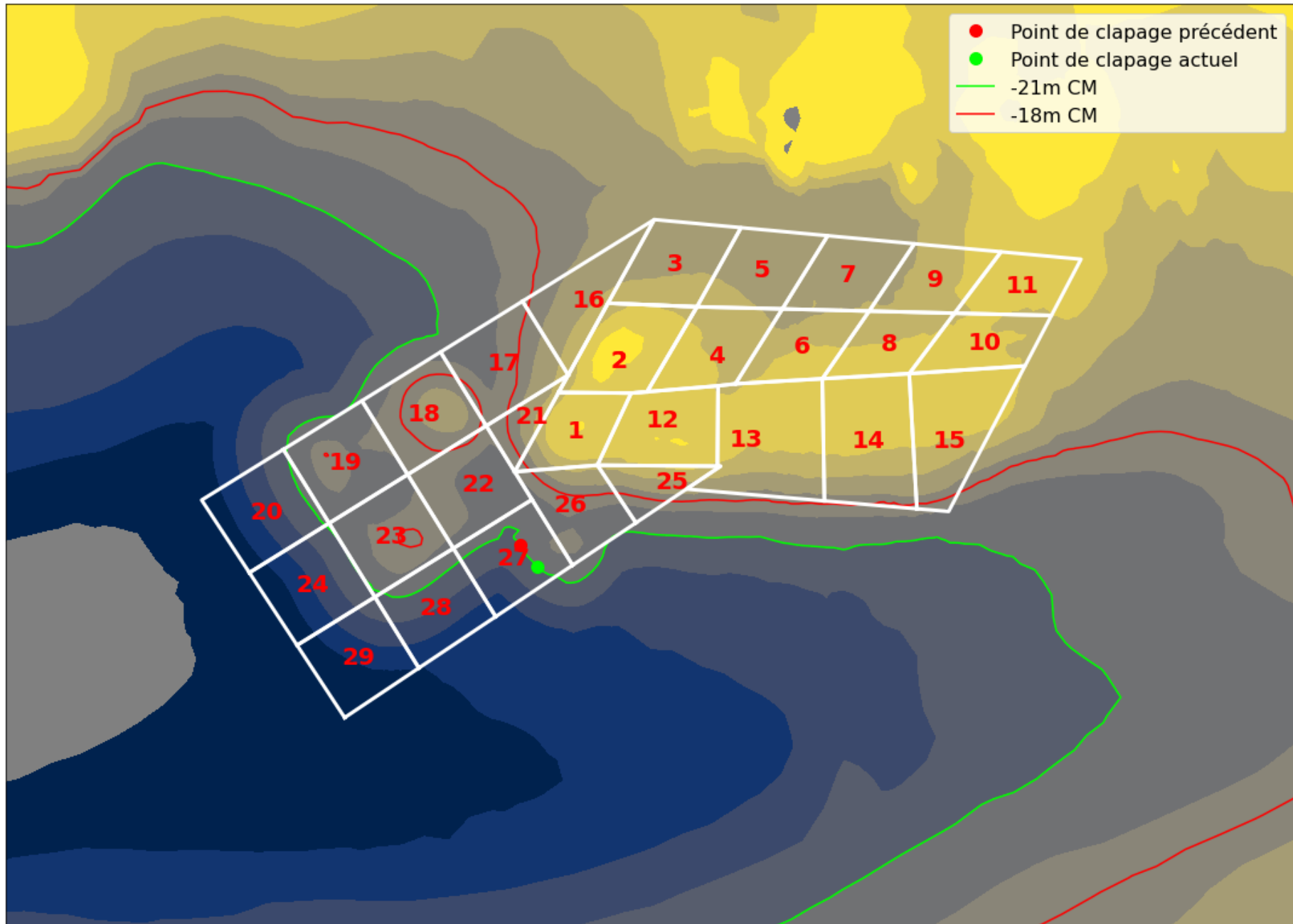




Date de changement de point : 09-04-2032

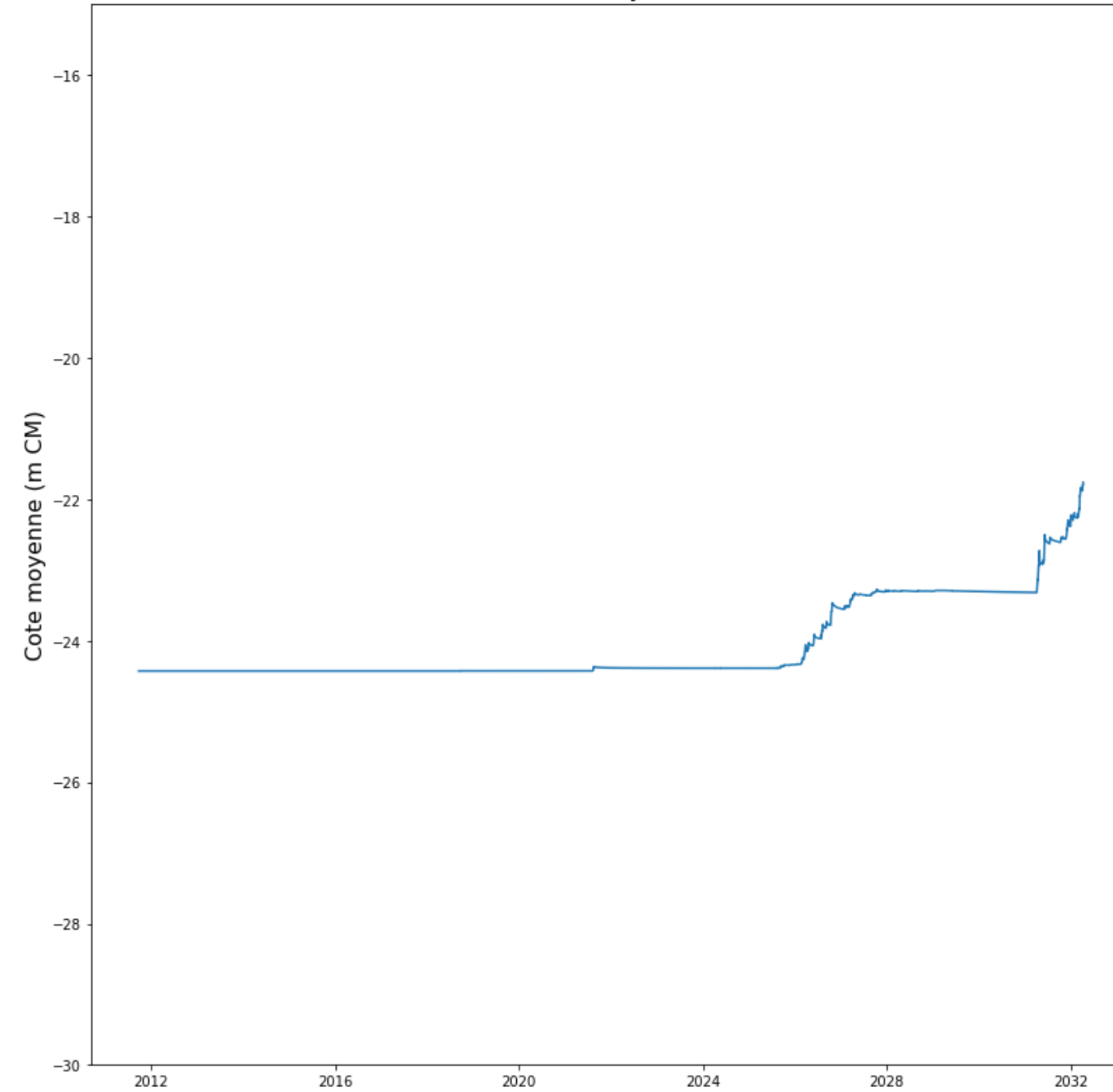
Evolution de la cote moyenne de la zone 27

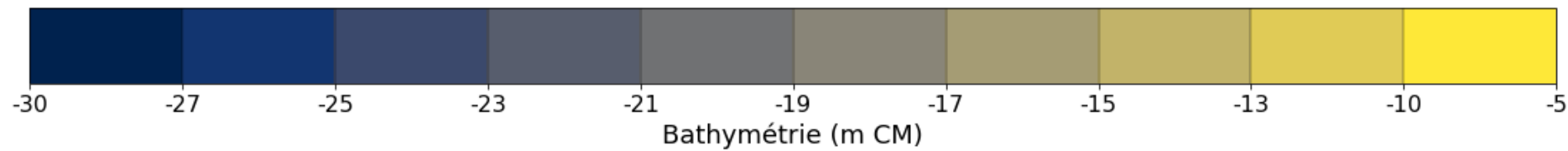
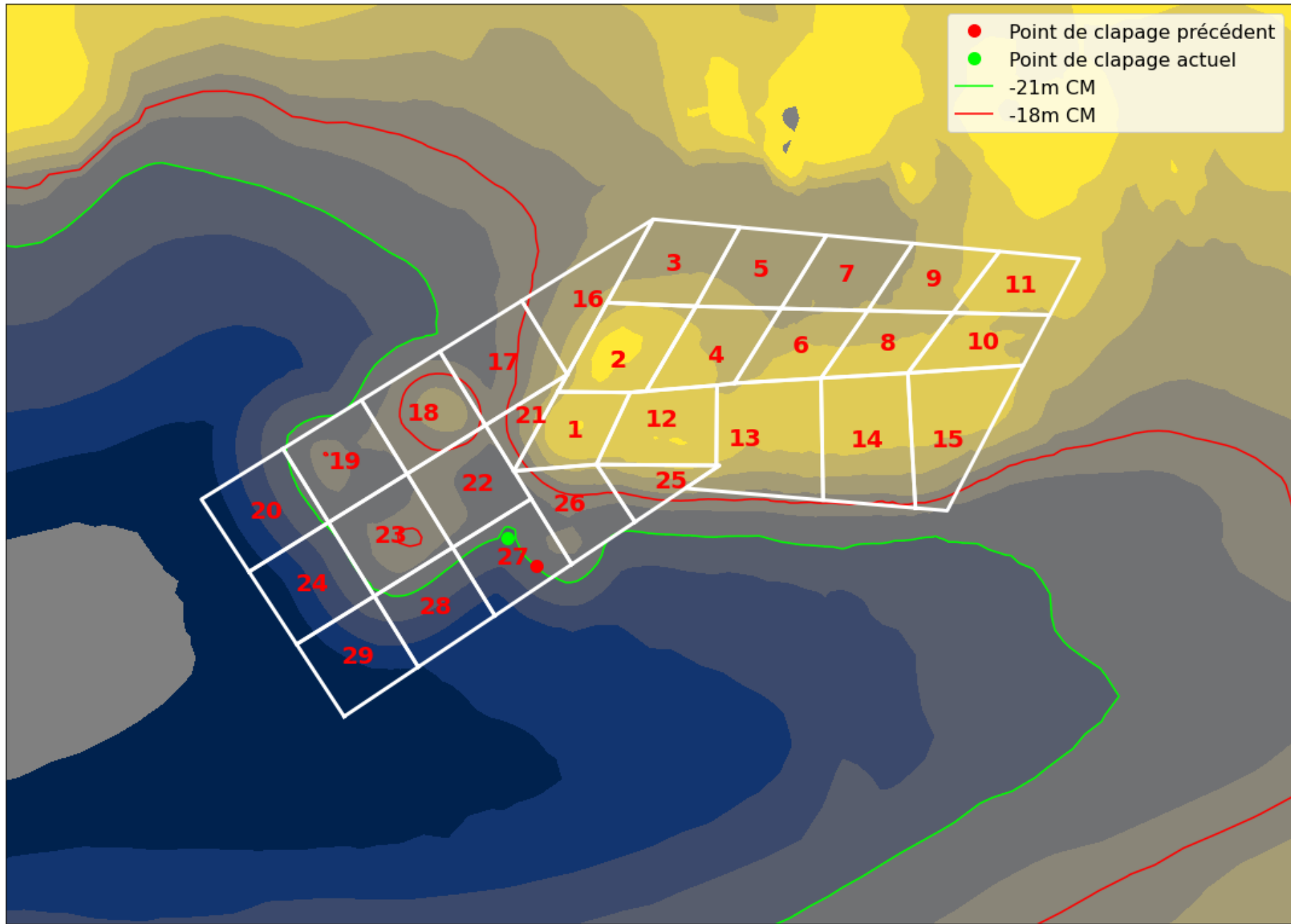




Date de changement de point : 09-04-2032

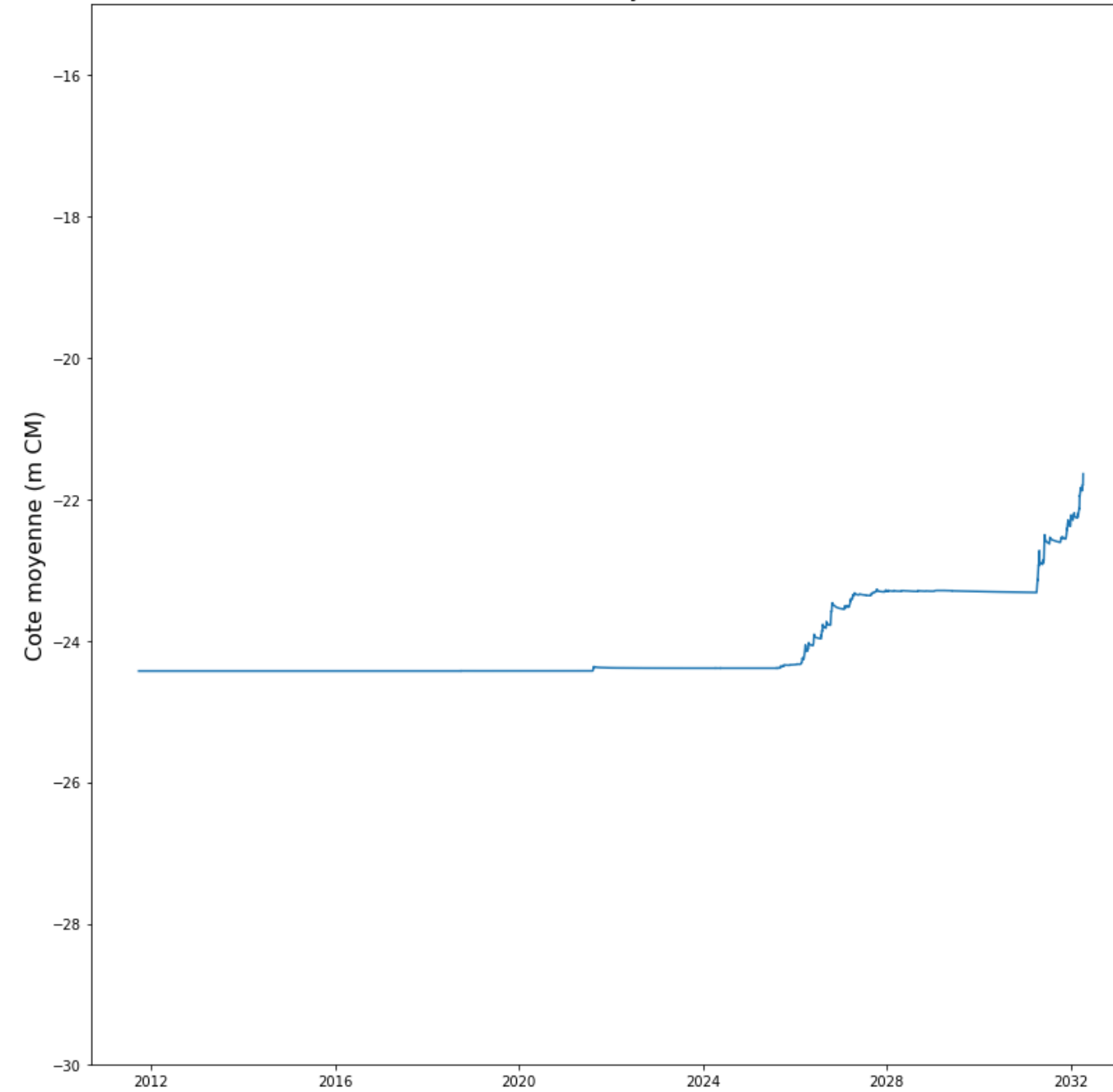
Evolution de la cote moyenne de la zone 27

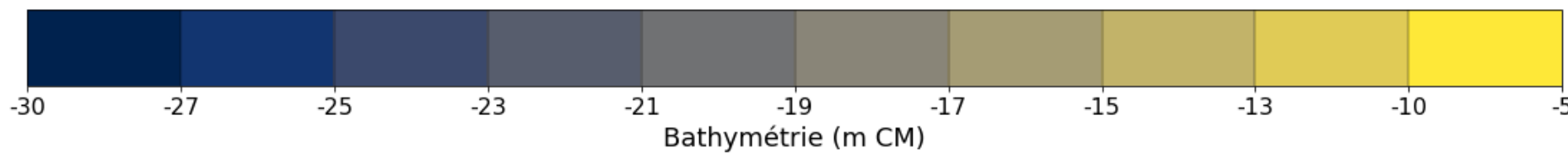
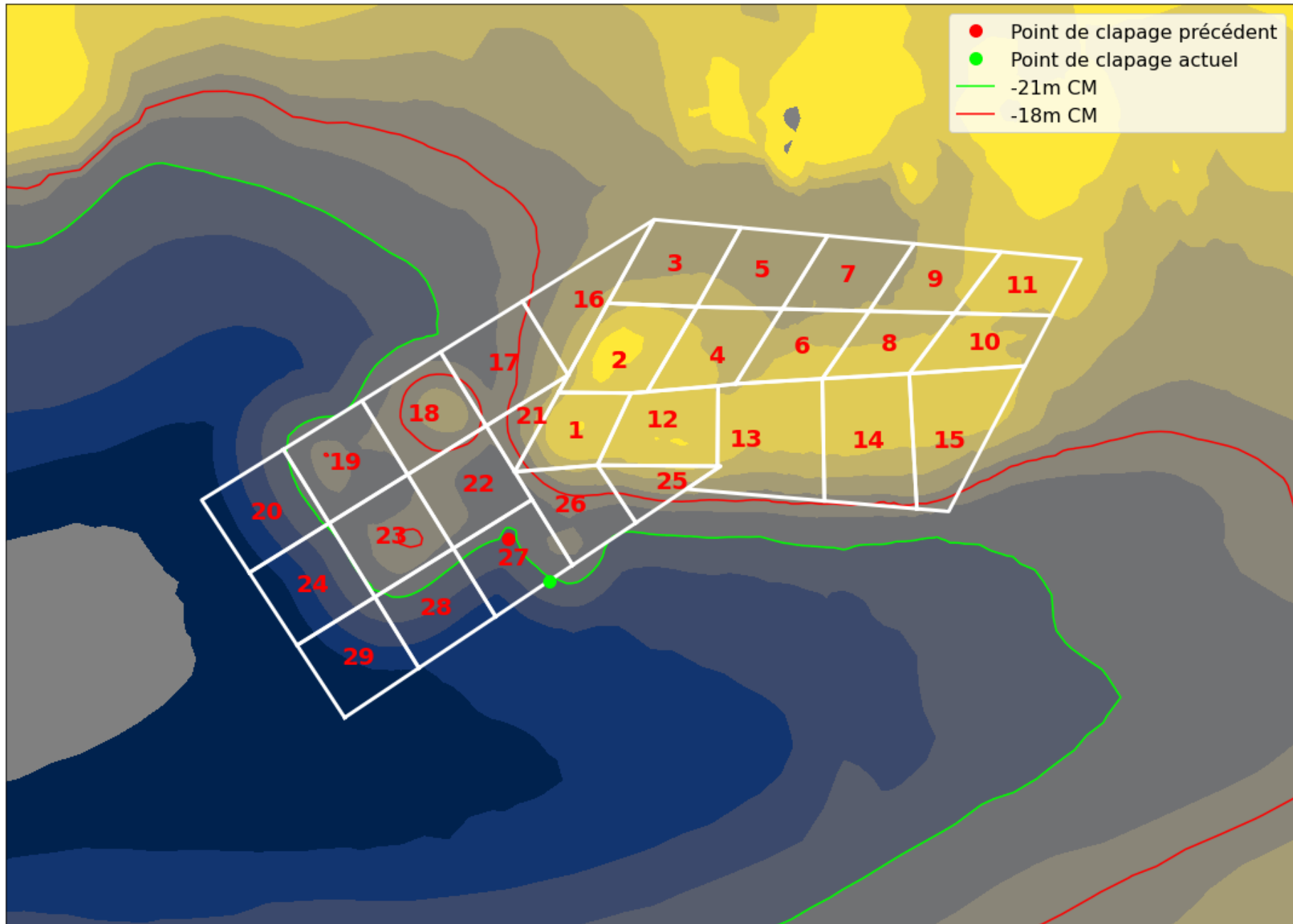




Date de changement de point : 10-04-2032

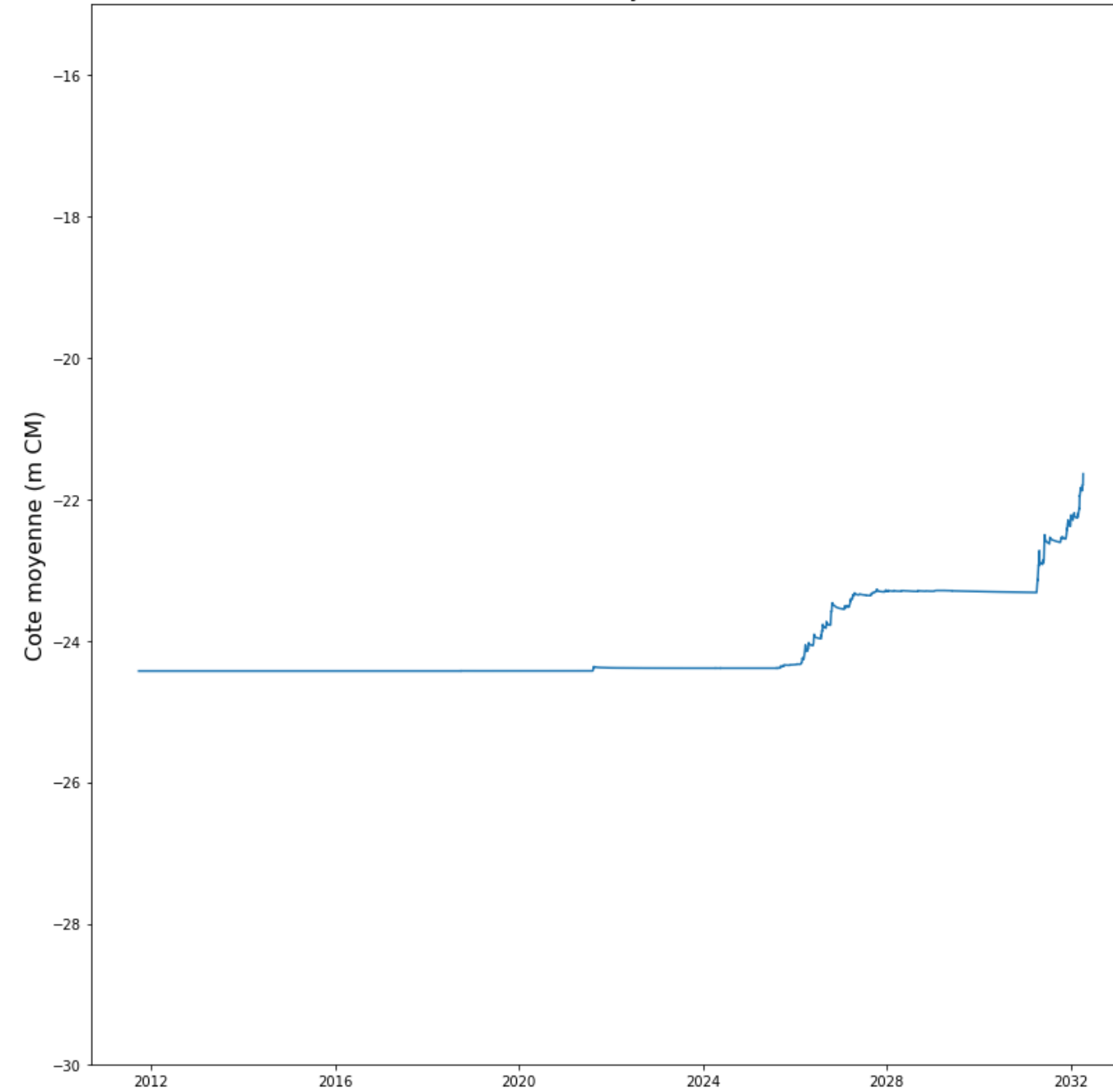
Evolution de la cote moyenne de la zone 27

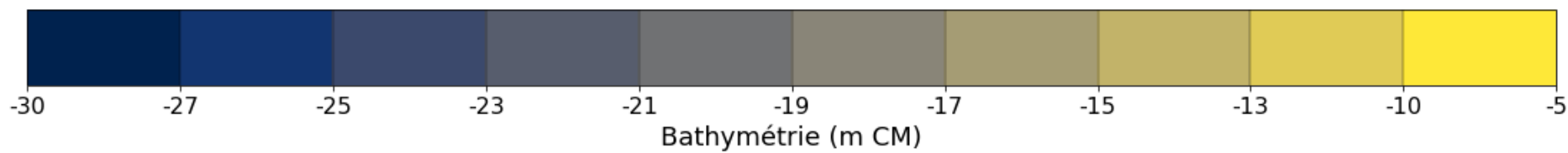
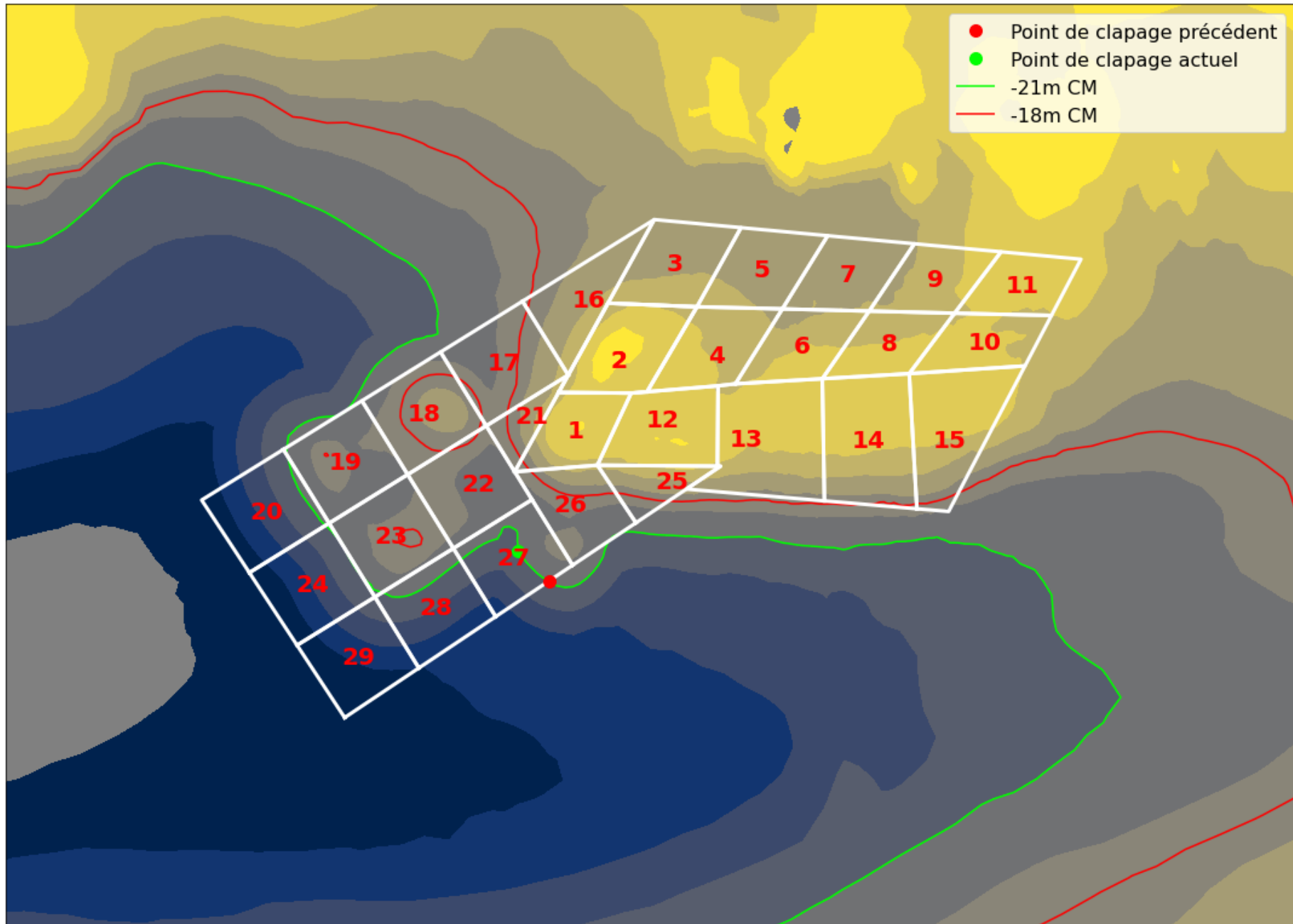




Date de changement de point : 10-04-2032

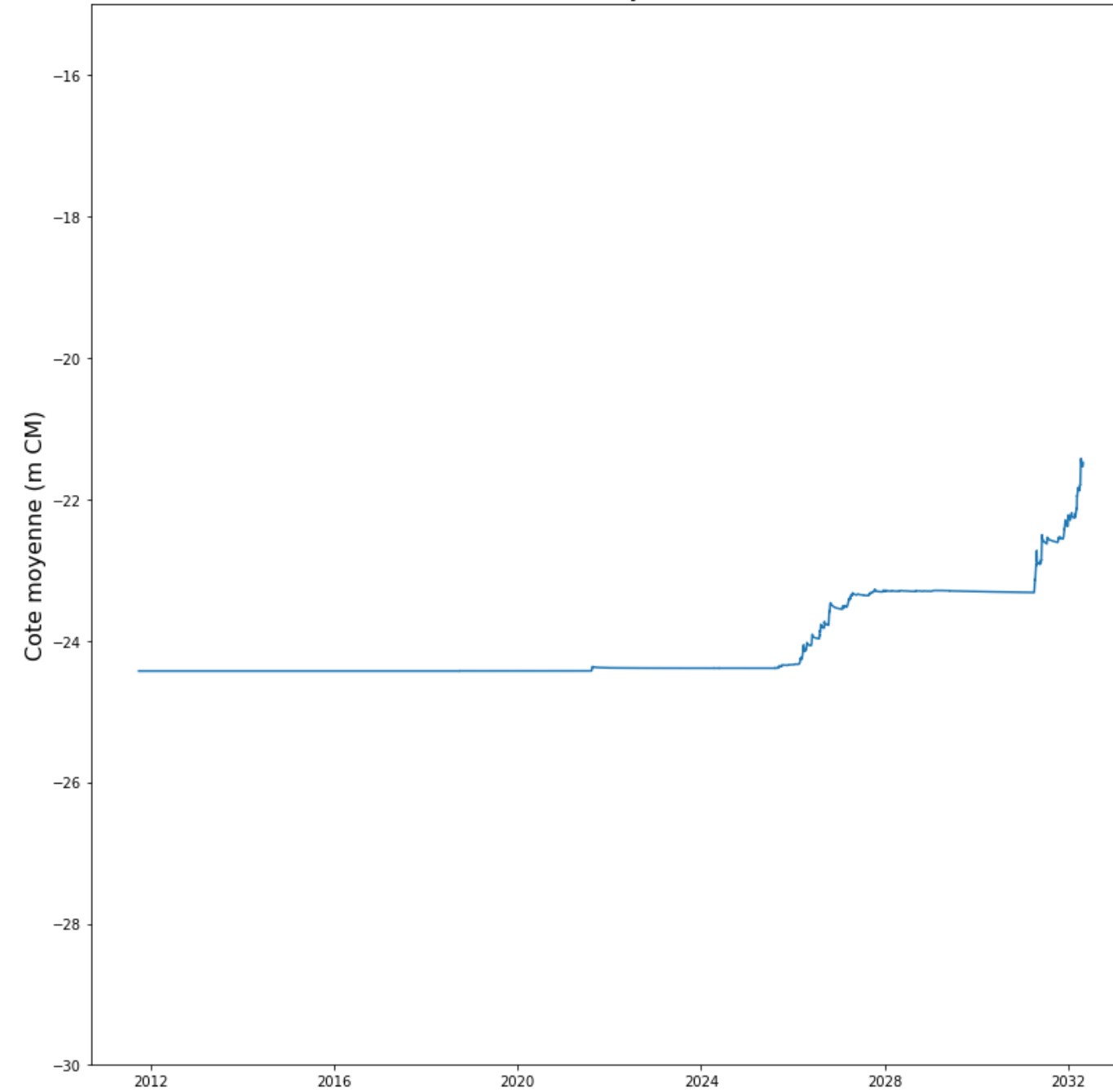
Evolution de la cote moyenne de la zone 27



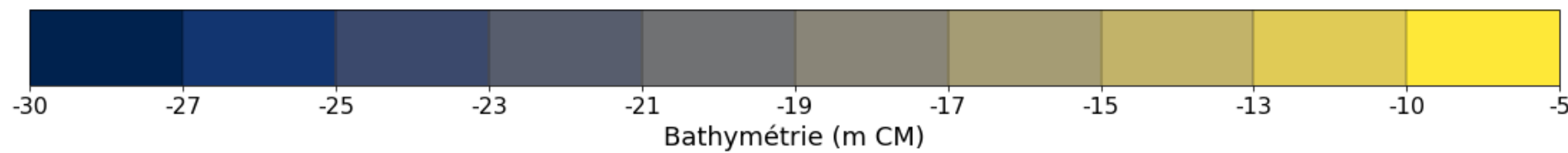
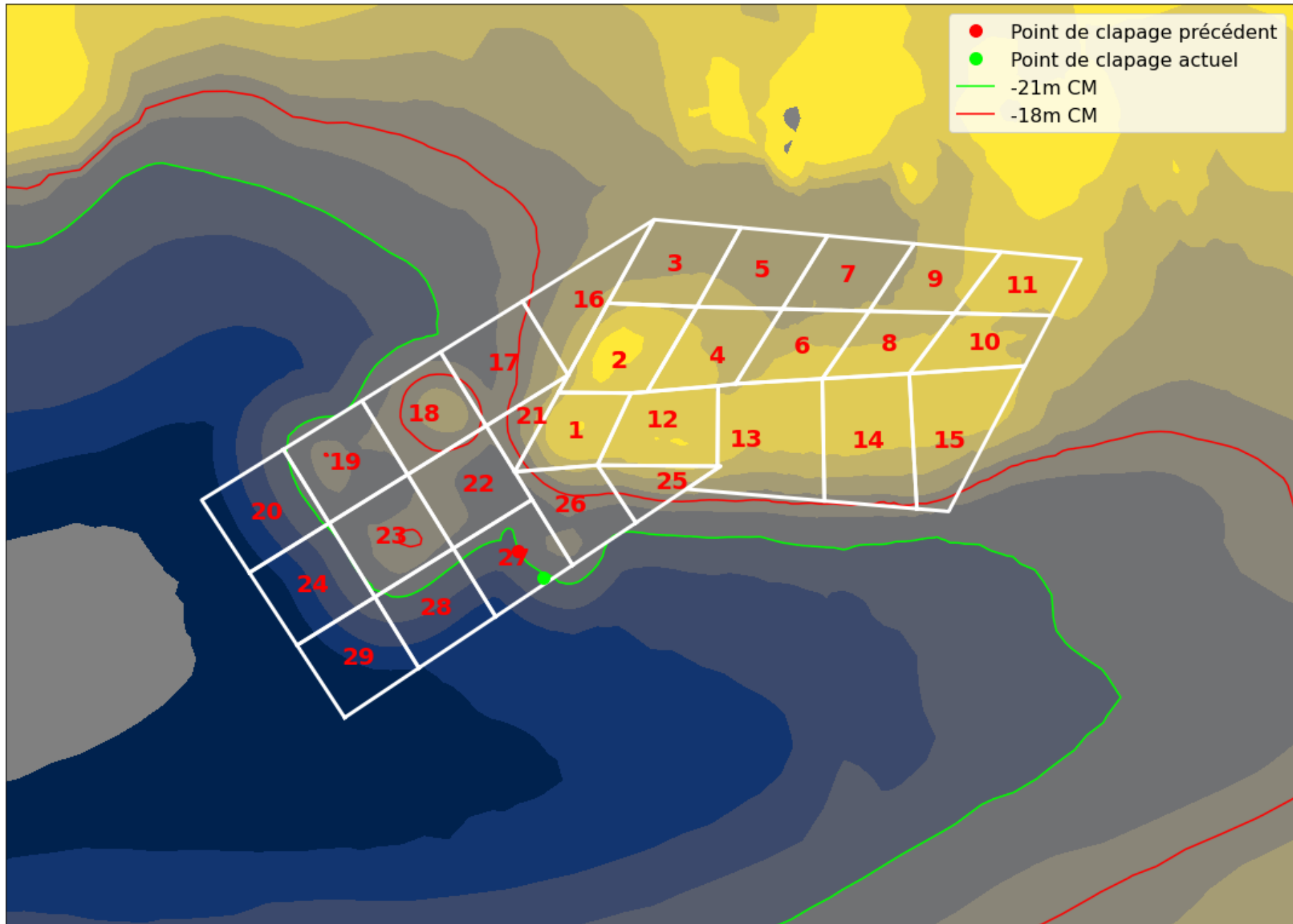


Date de changement de point : 01-05-2032

Evolution de la cote moyenne de la zone 27

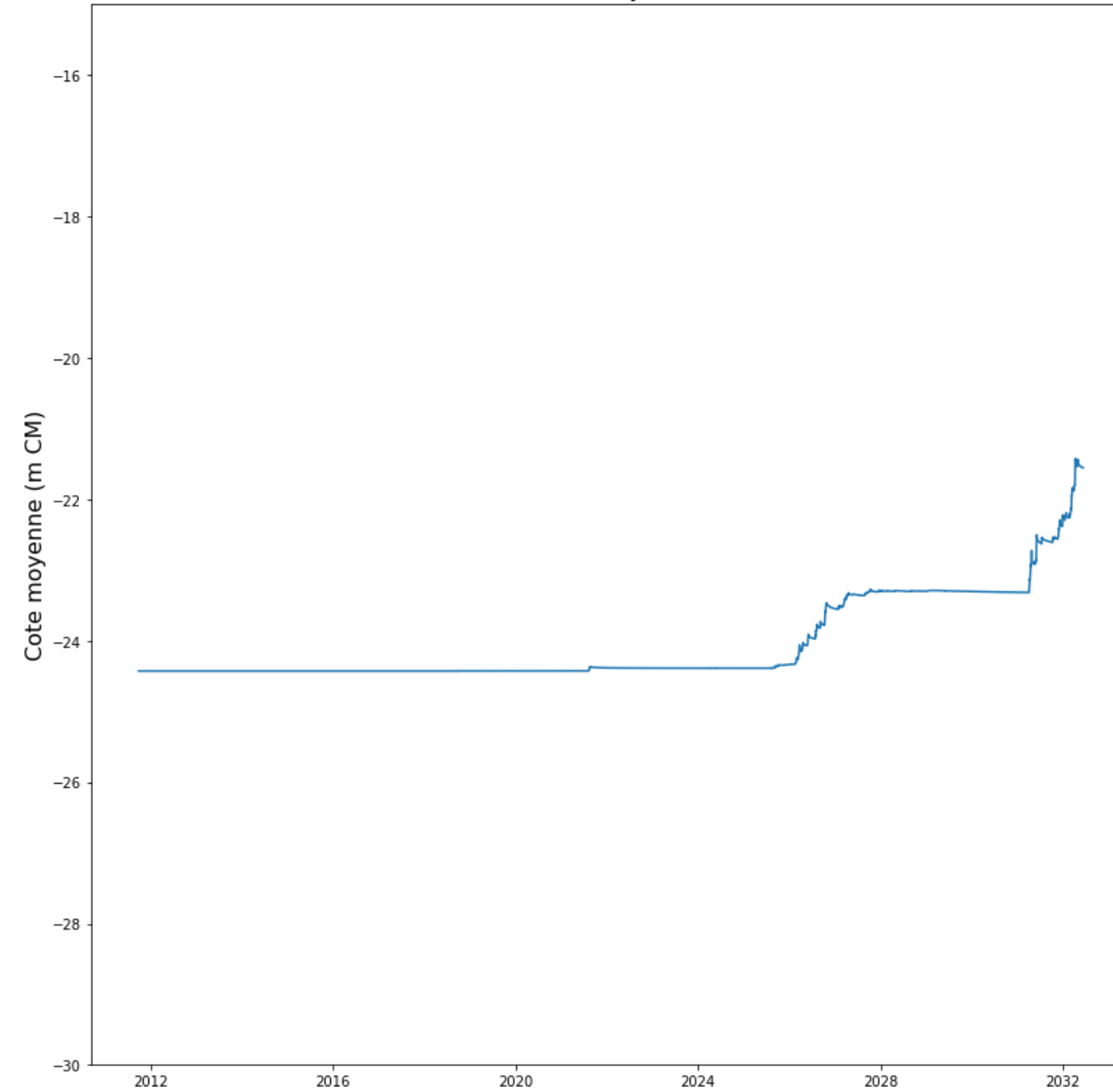


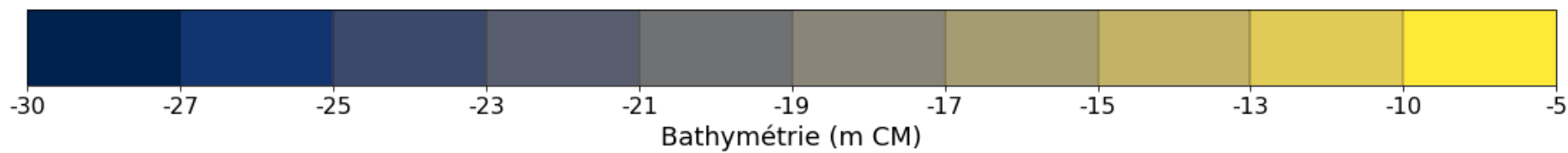
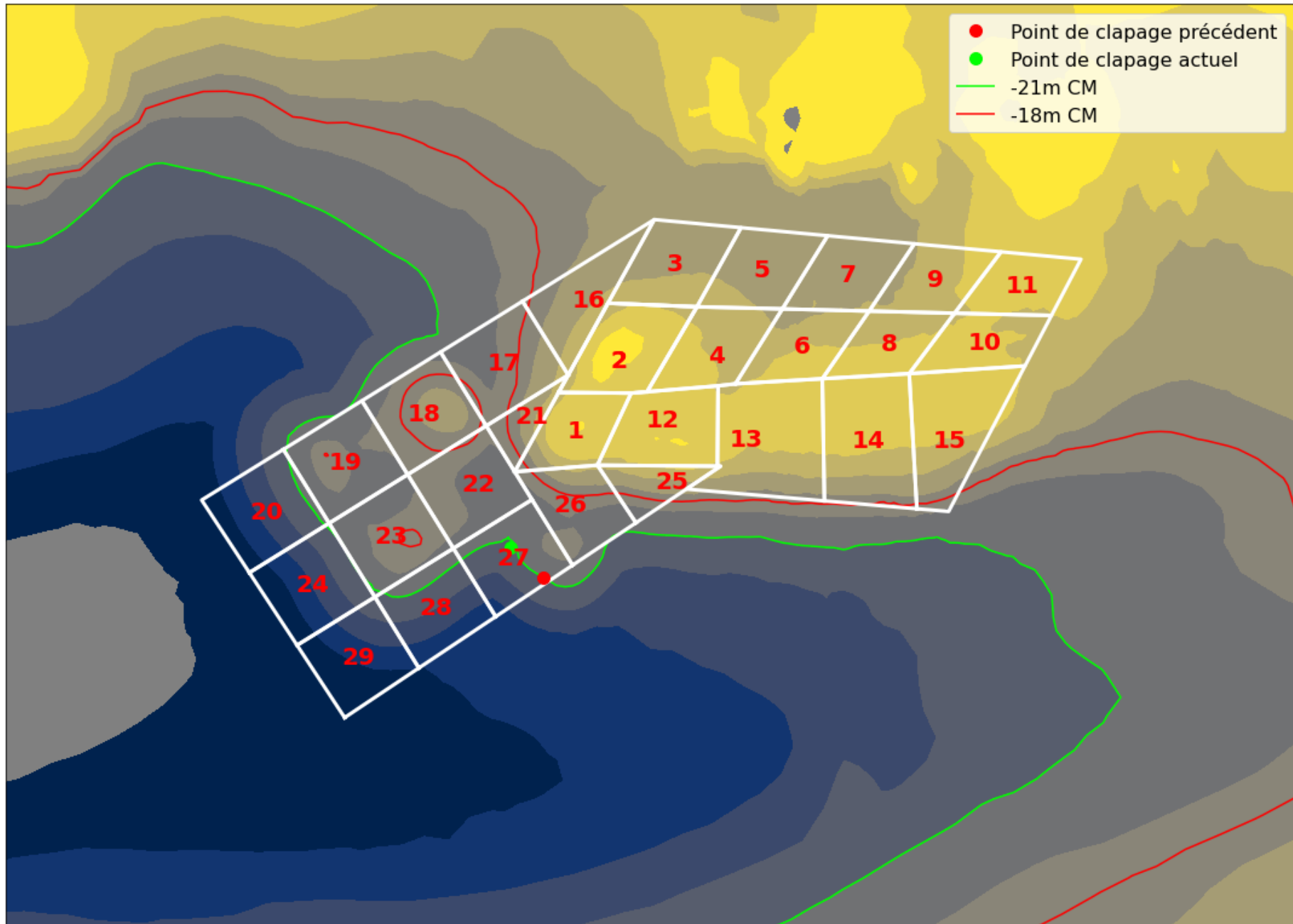




Date de changement de point : 14-06-2032

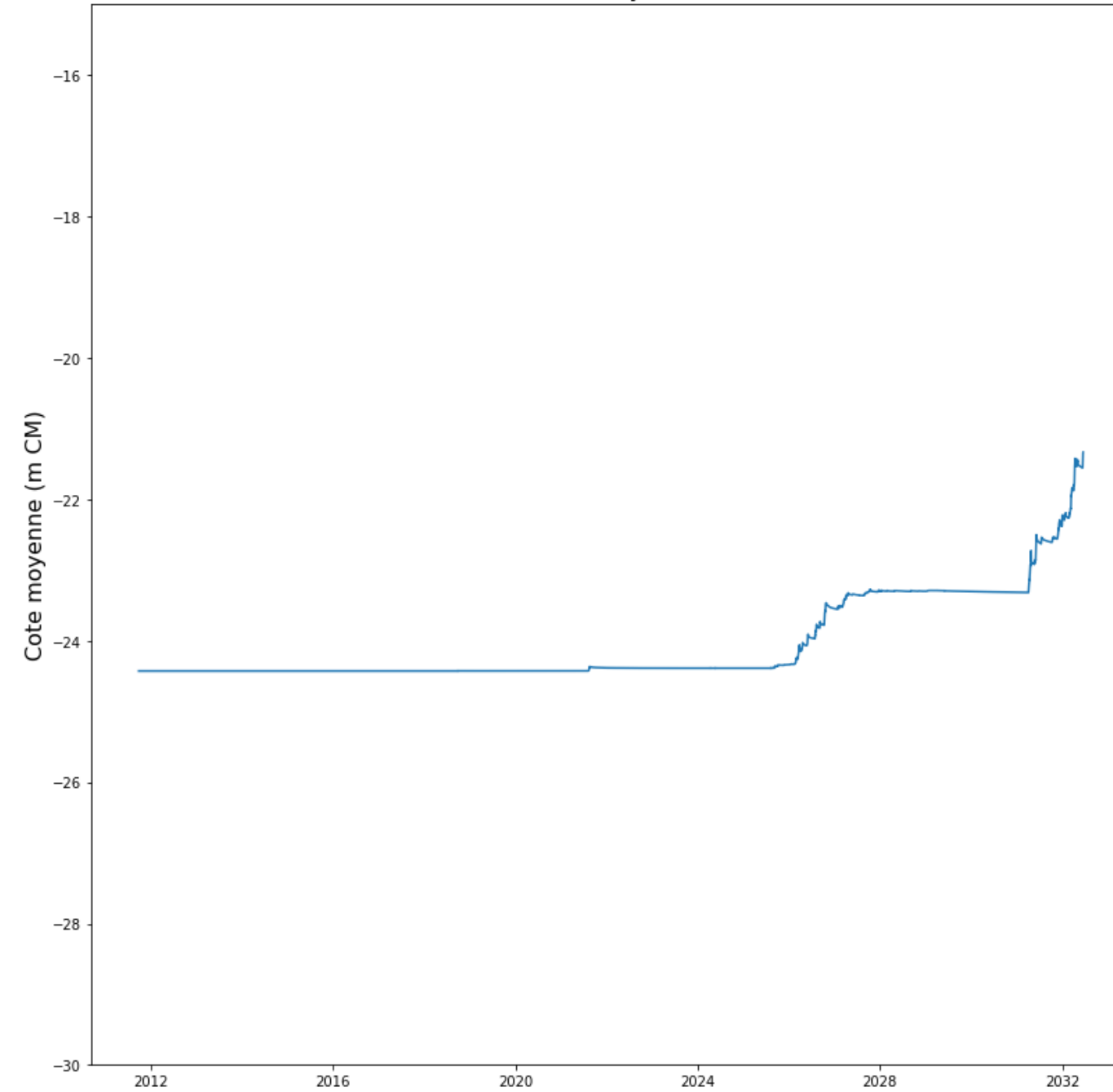
Evolution de la cote moyenne de la zone 27

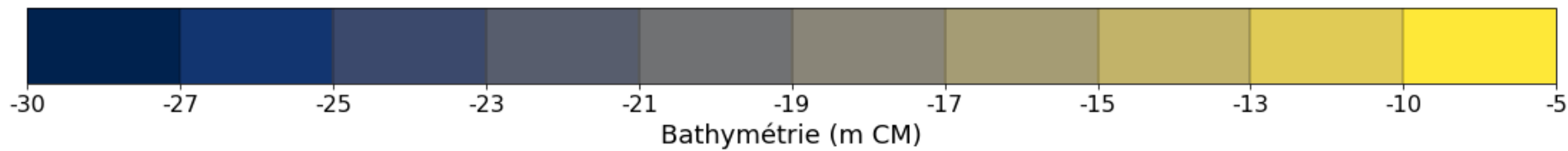
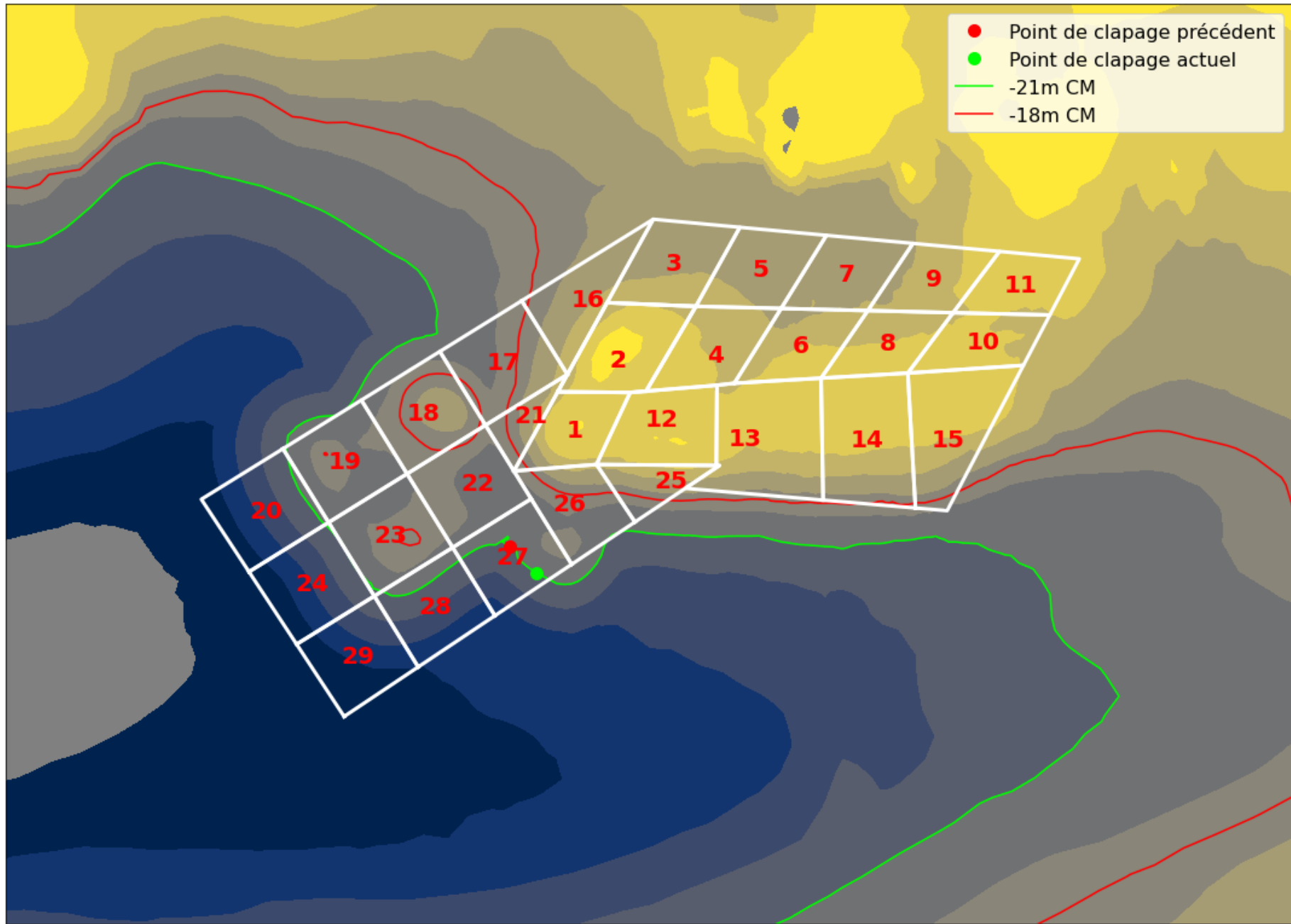




Date de changement de point : 17-06-2032

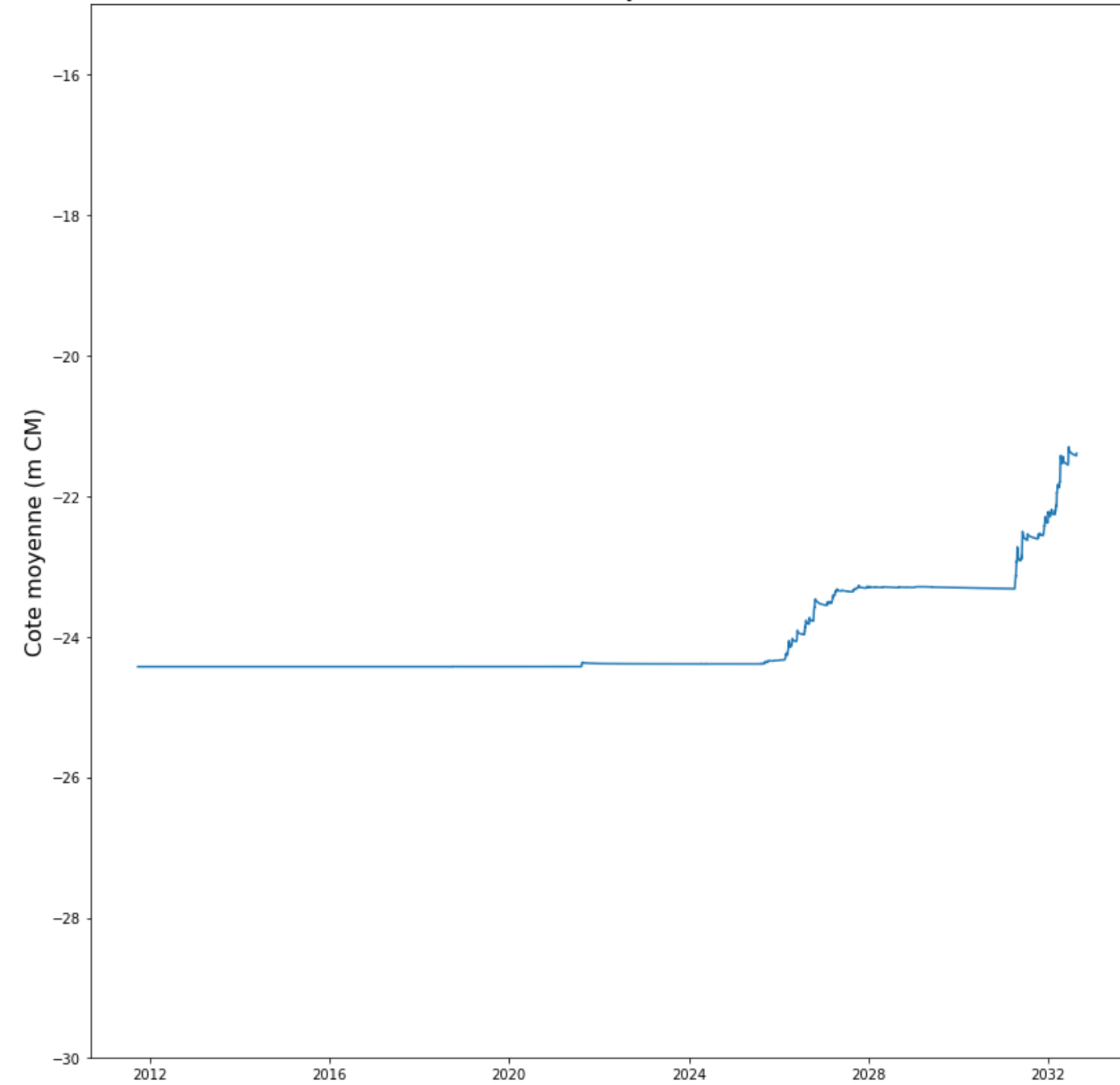
Evolution de la cote moyenne de la zone 27

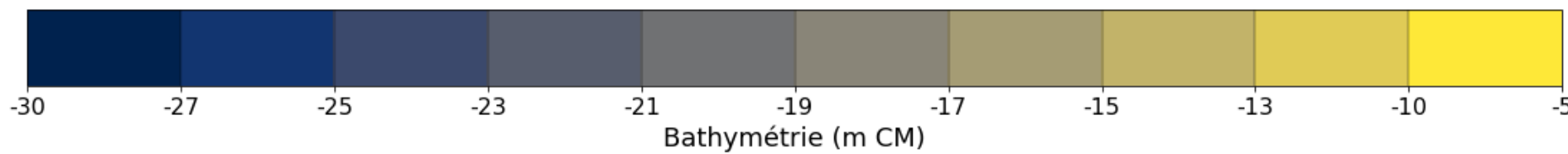
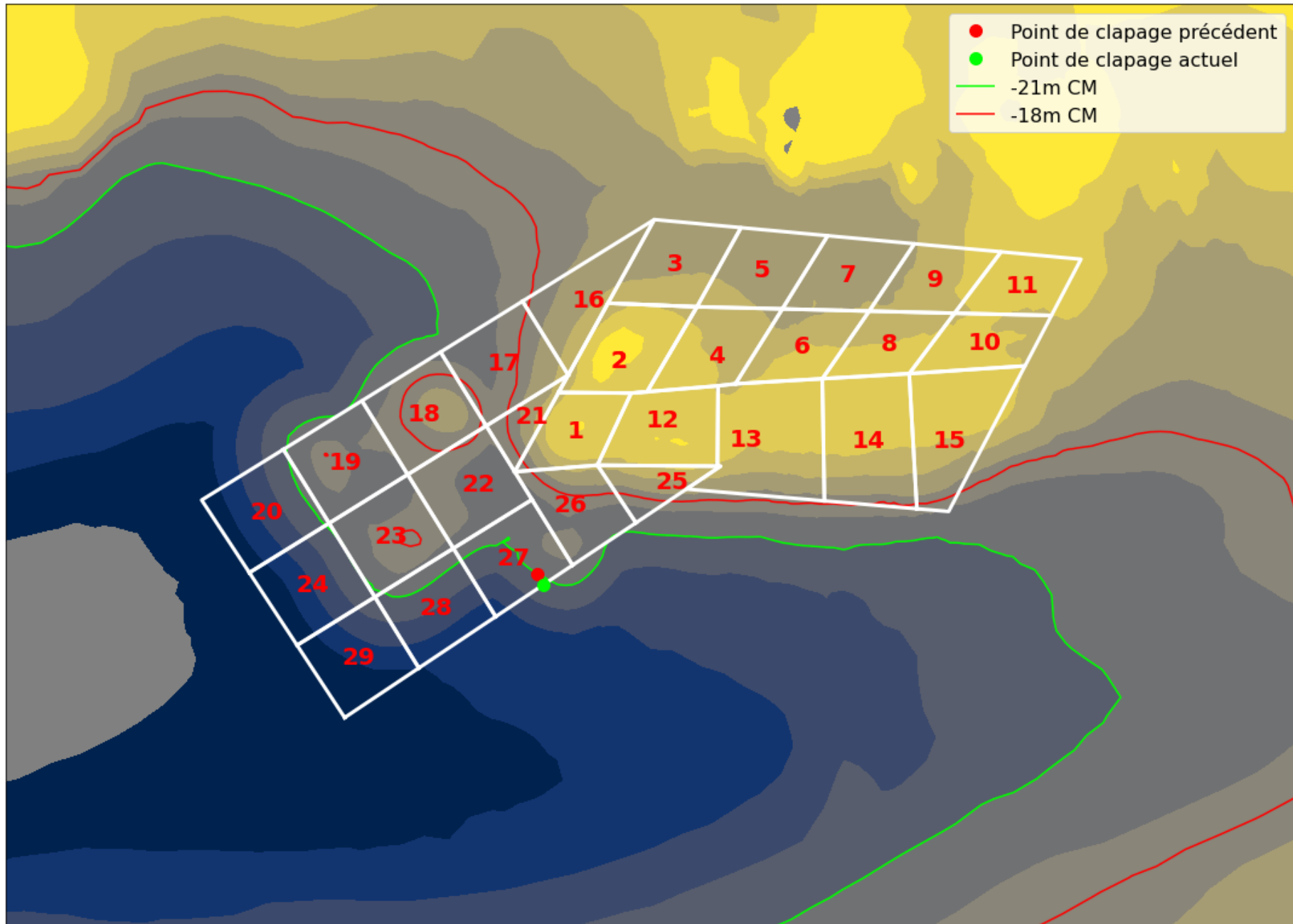




Date de changement de point : 20-08-2032

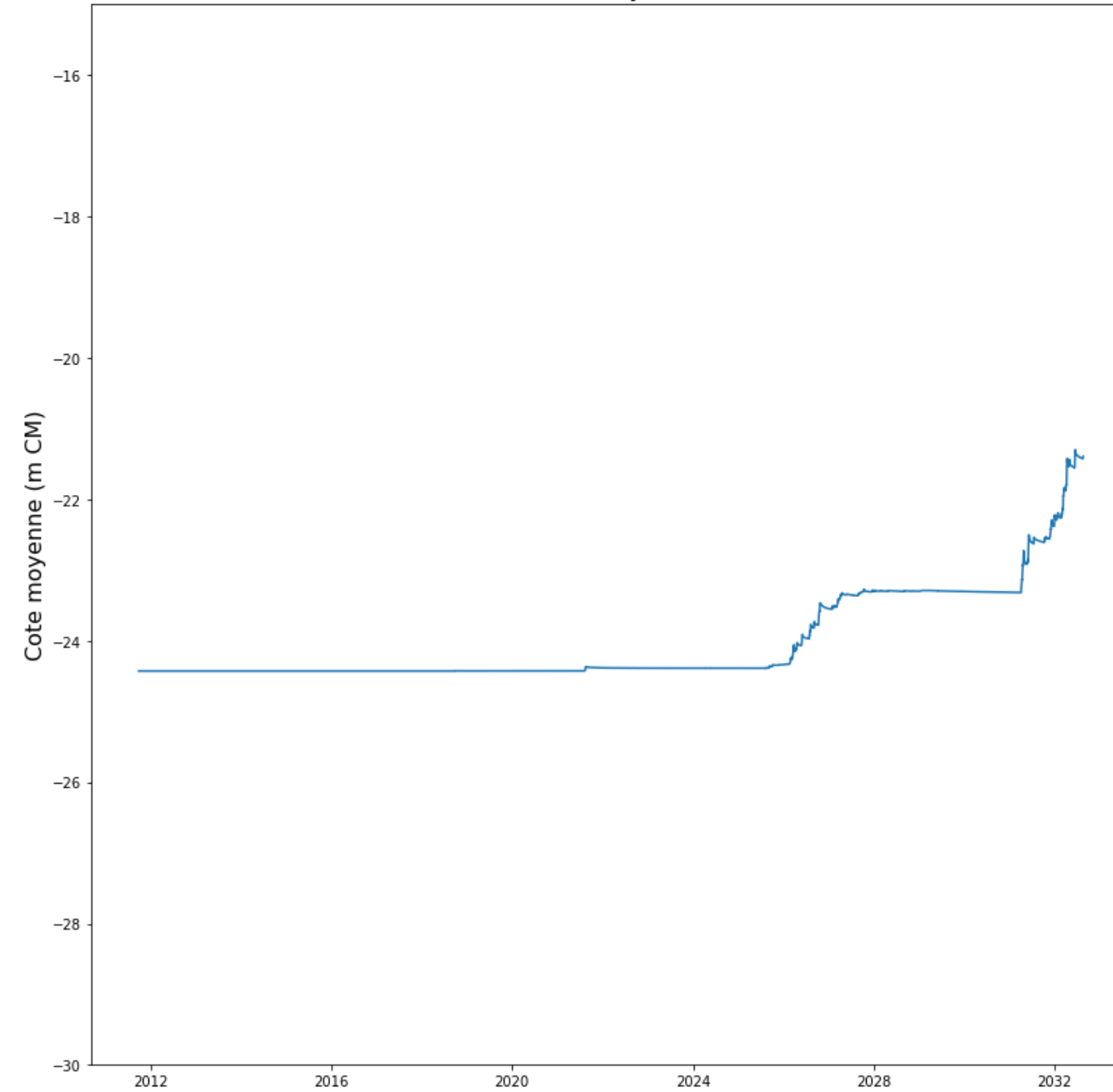
Evolution de la cote moyenne de la zone 27

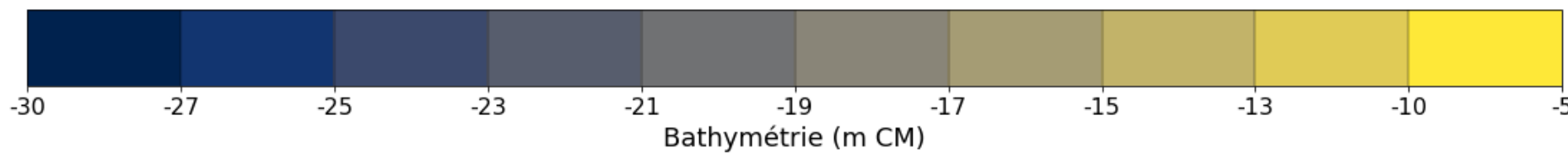
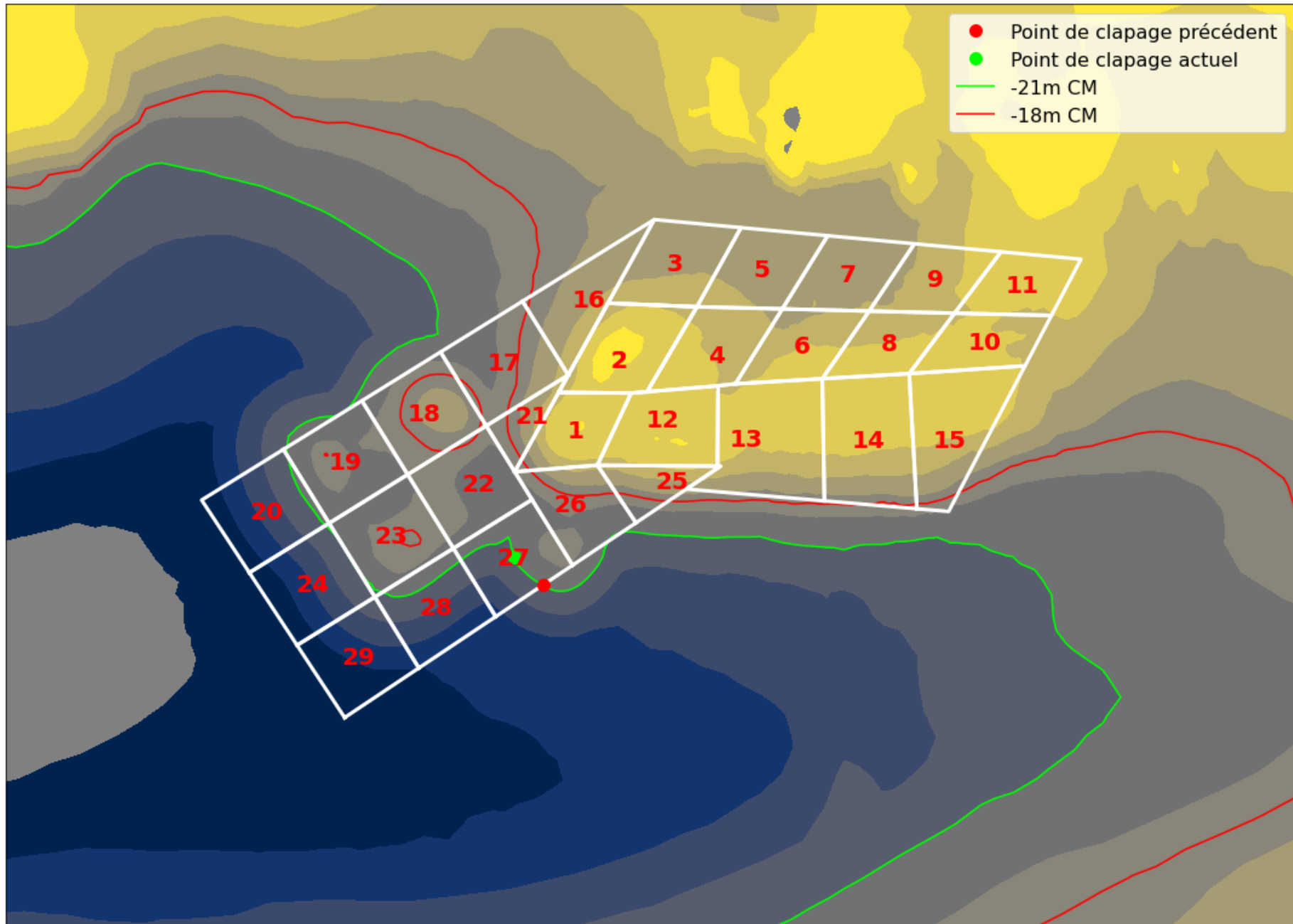




Date de changement de point : 21-08-2032

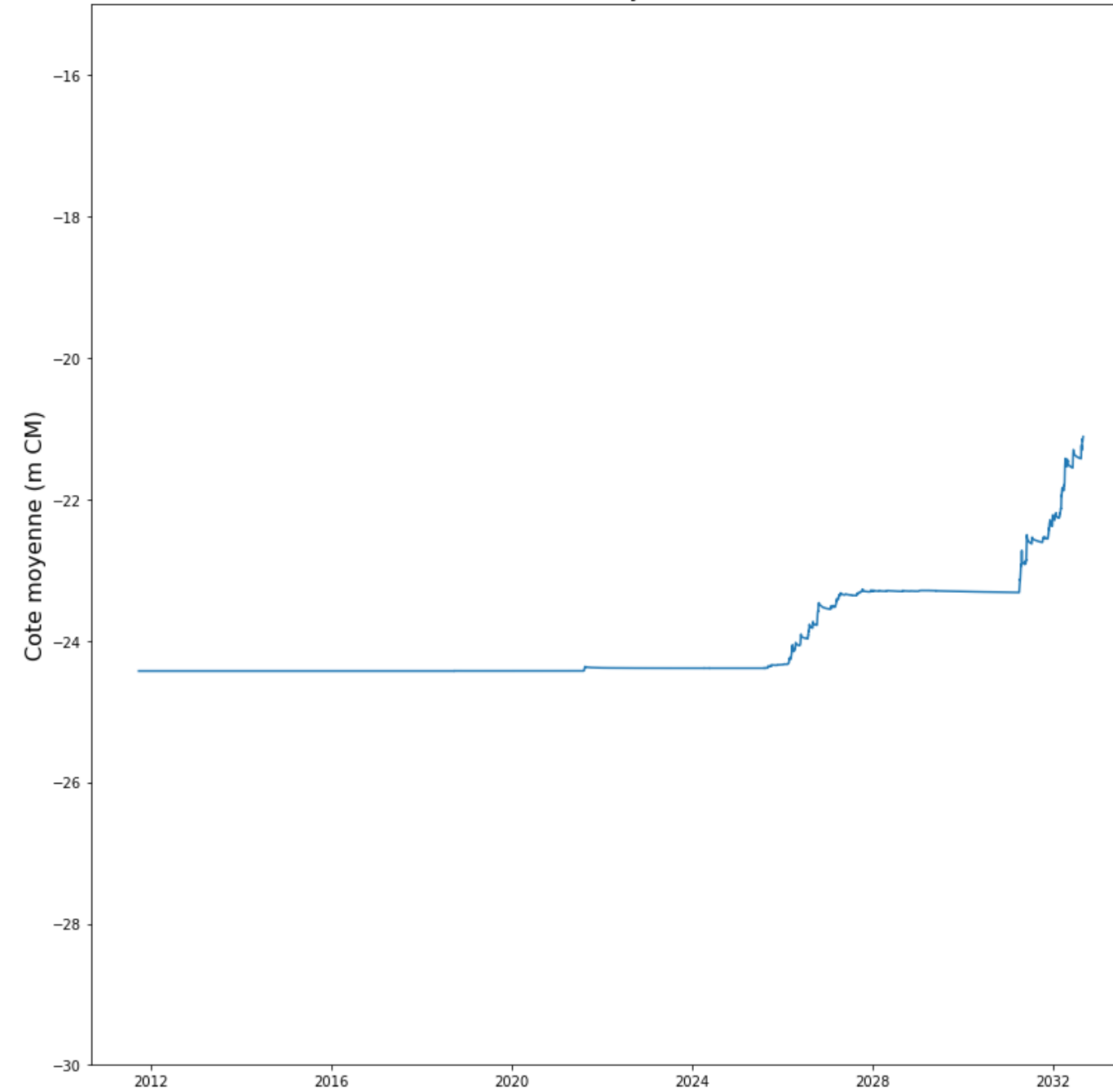
Evolution de la cote moyenne de la zone 27

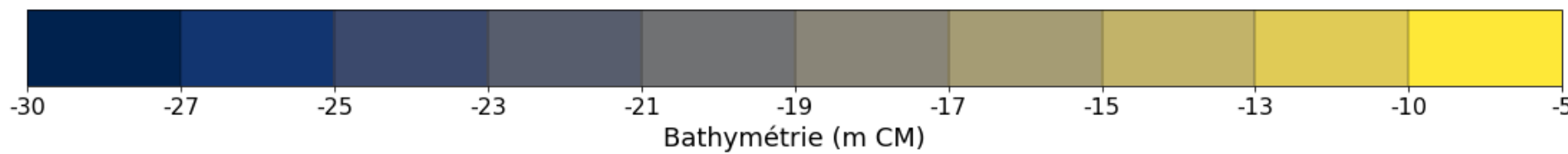
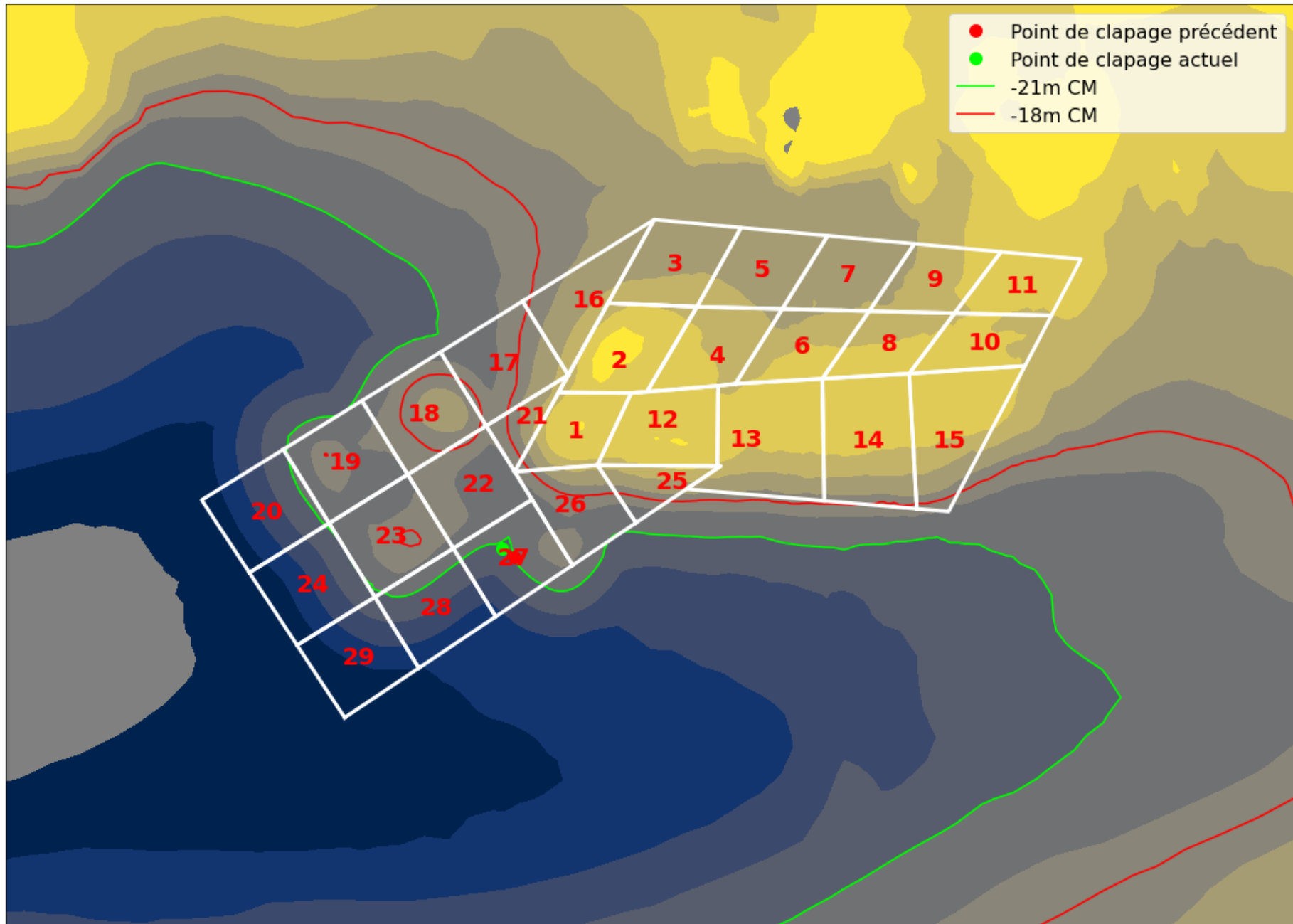




Date de changement de point : 06-09-2032

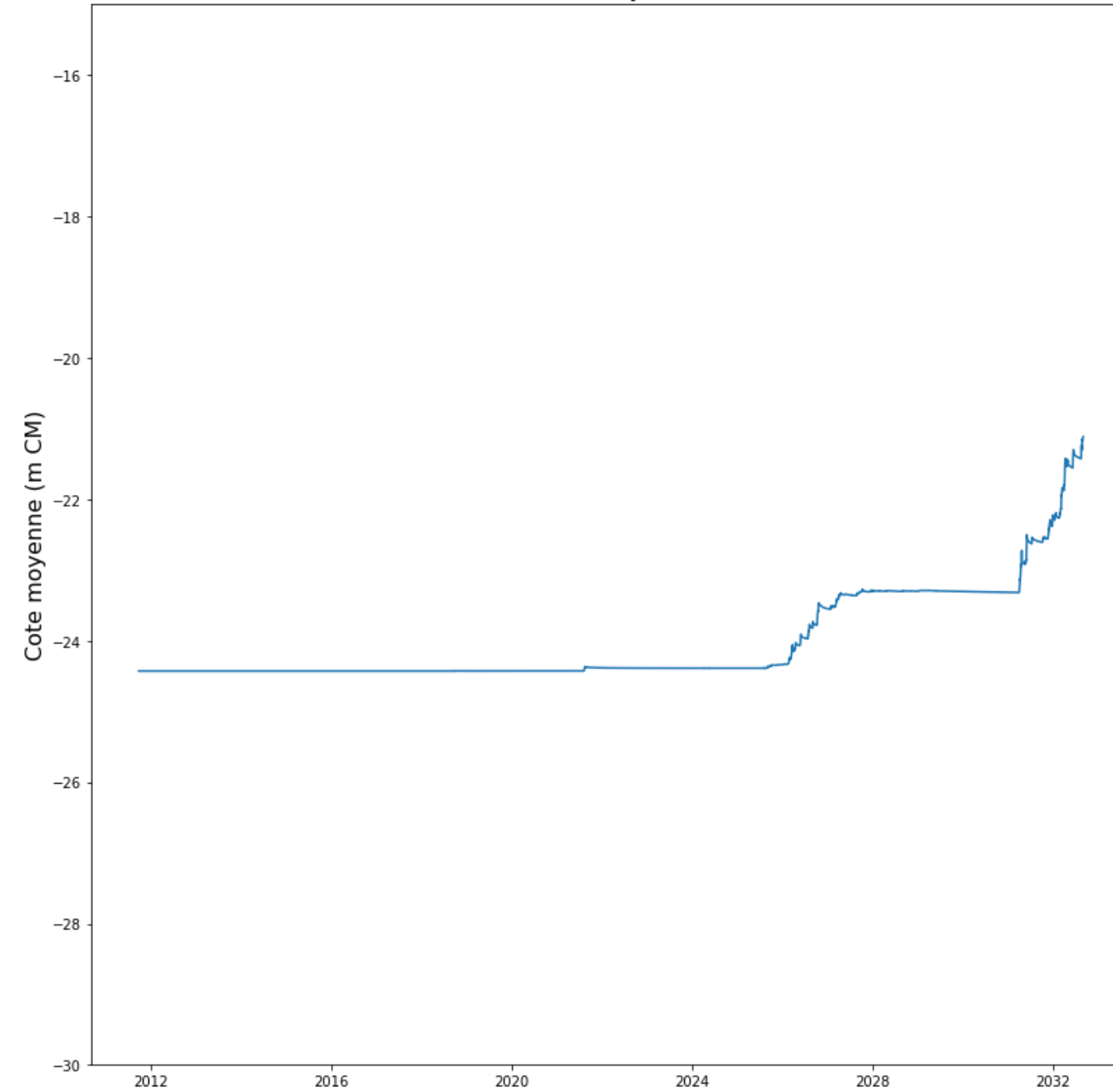
Evolution de la cote moyenne de la zone 27



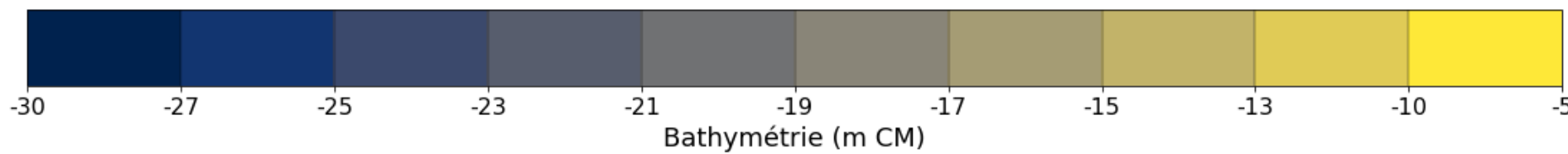
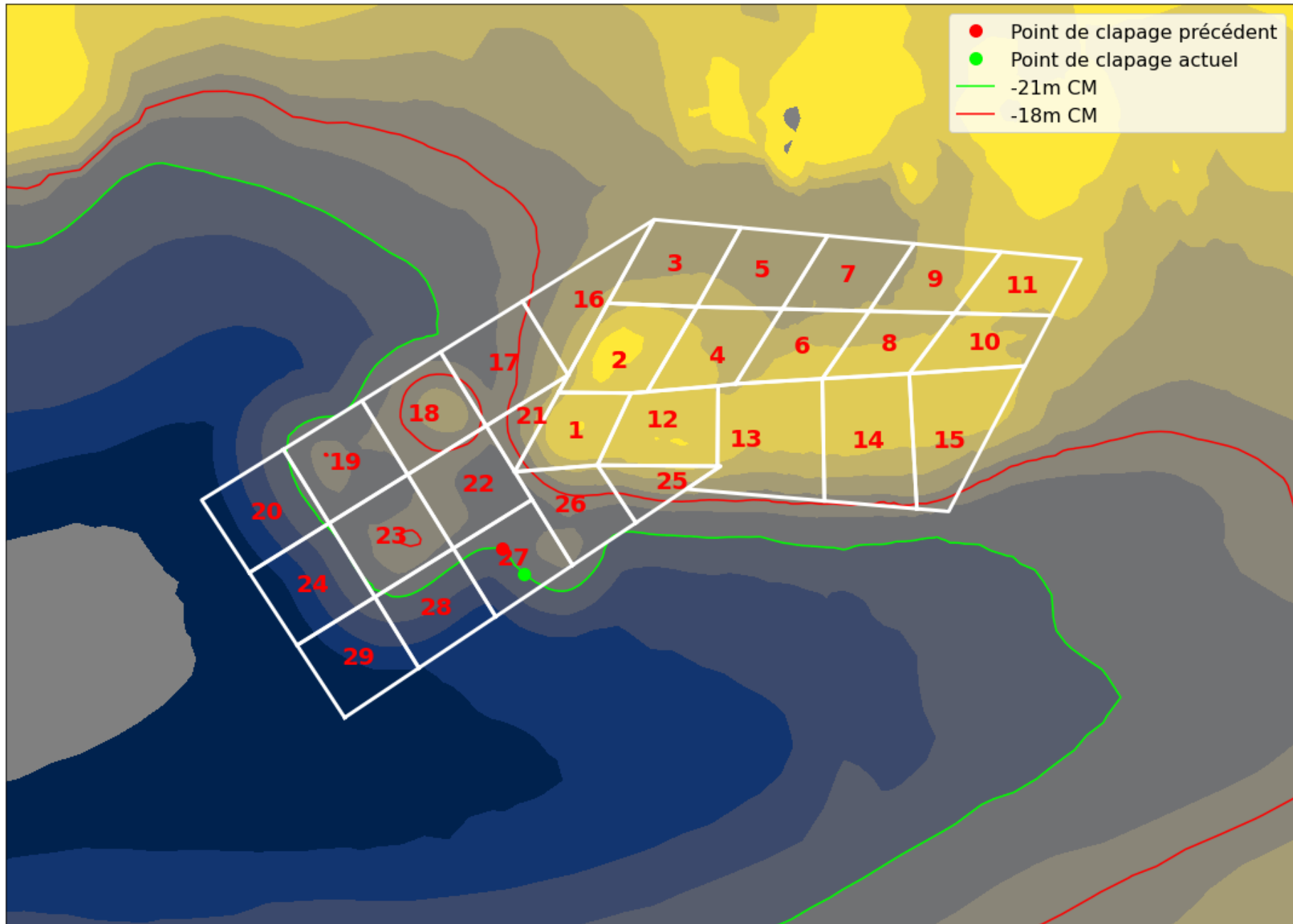


Date de changement de point : 06-09-2032

Evolution de la cote moyenne de la zone 27

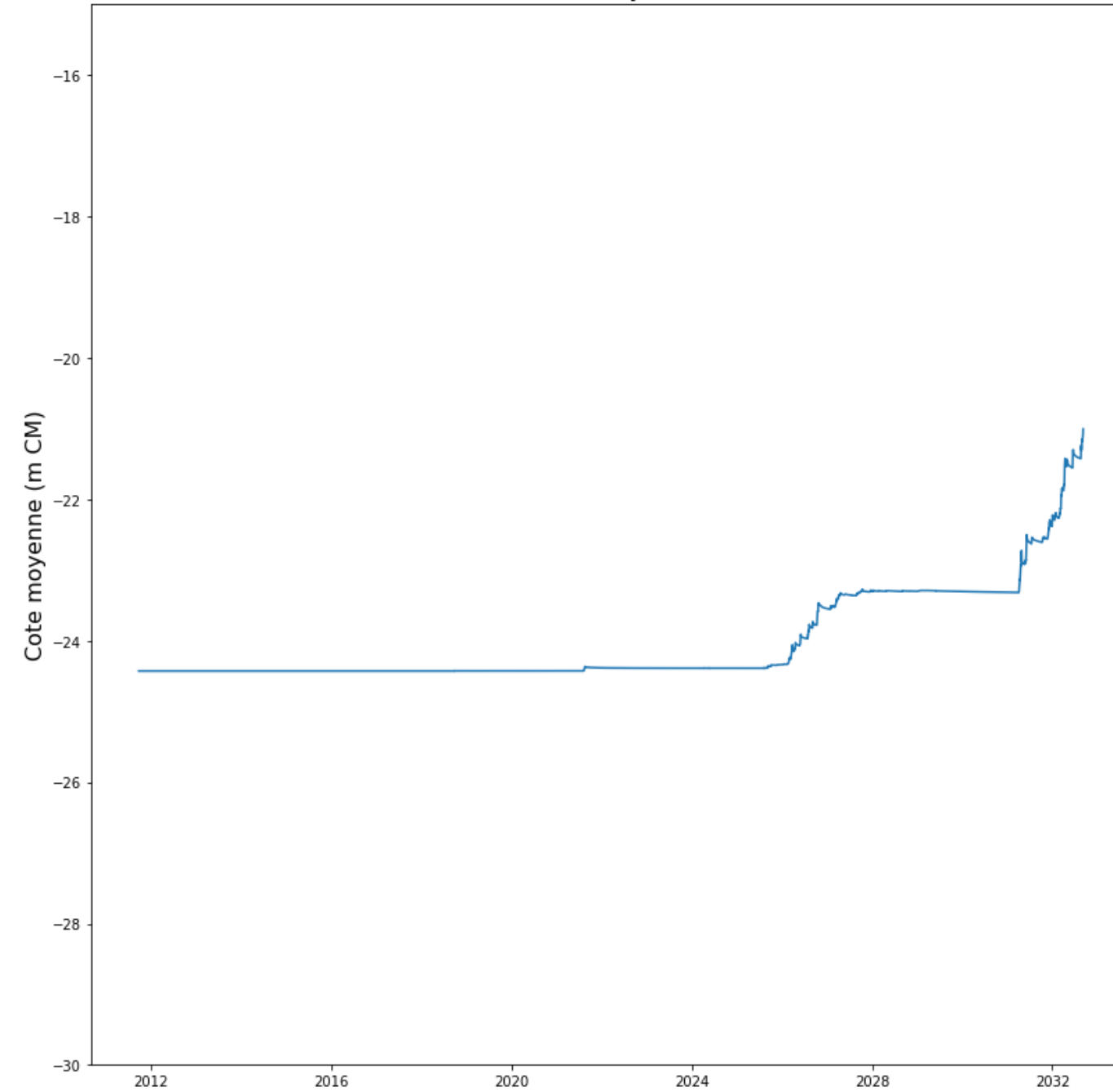


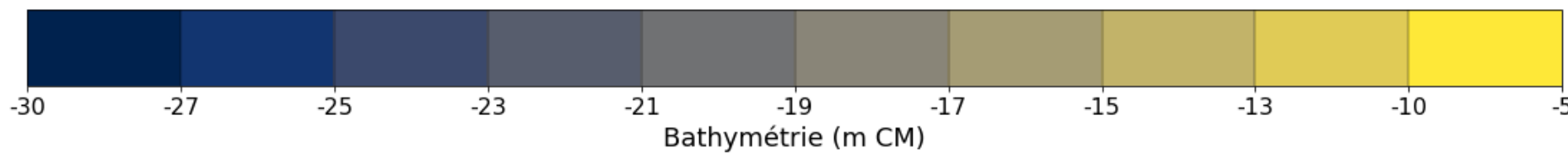
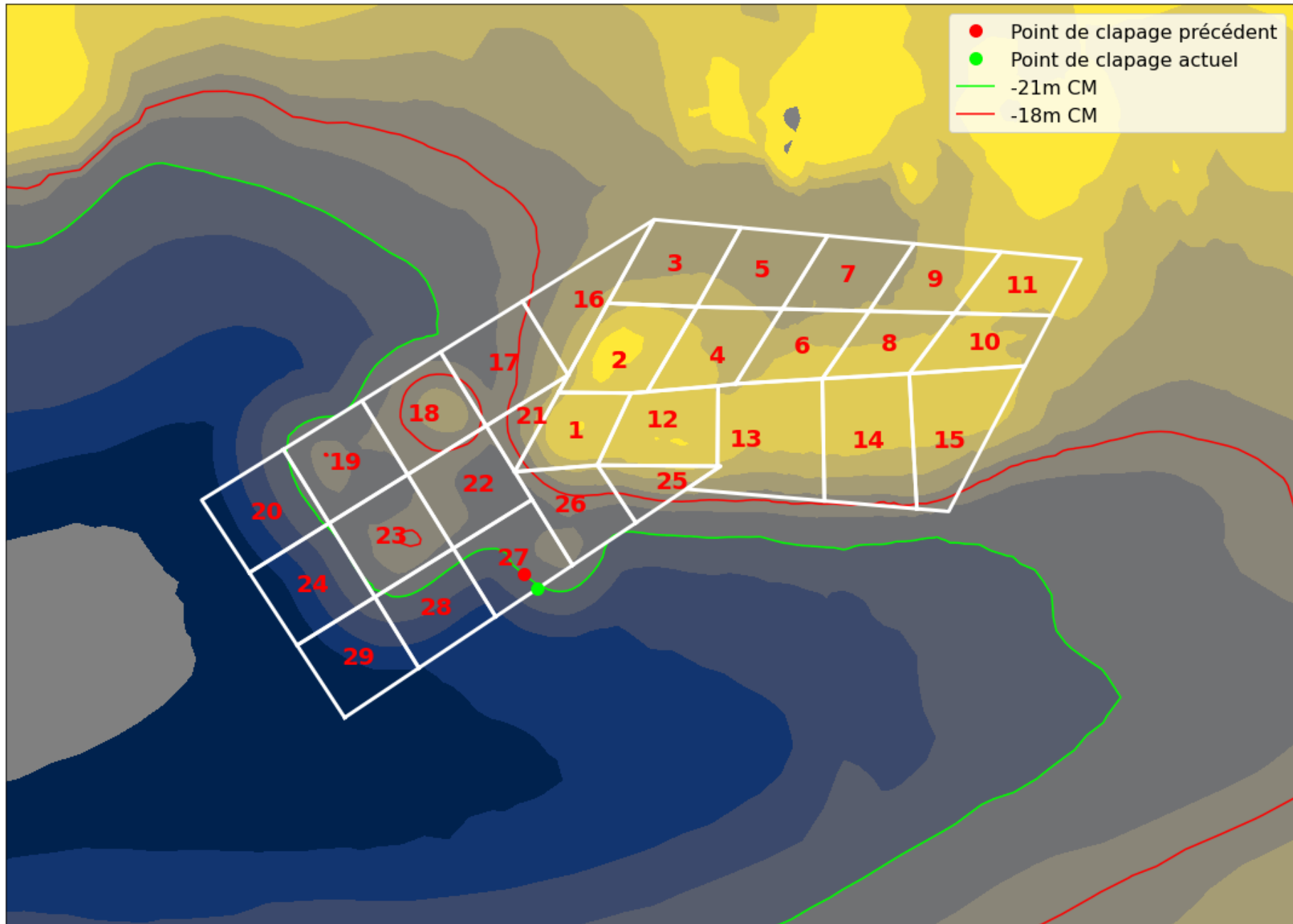




Date de changement de point : 07-09-2032

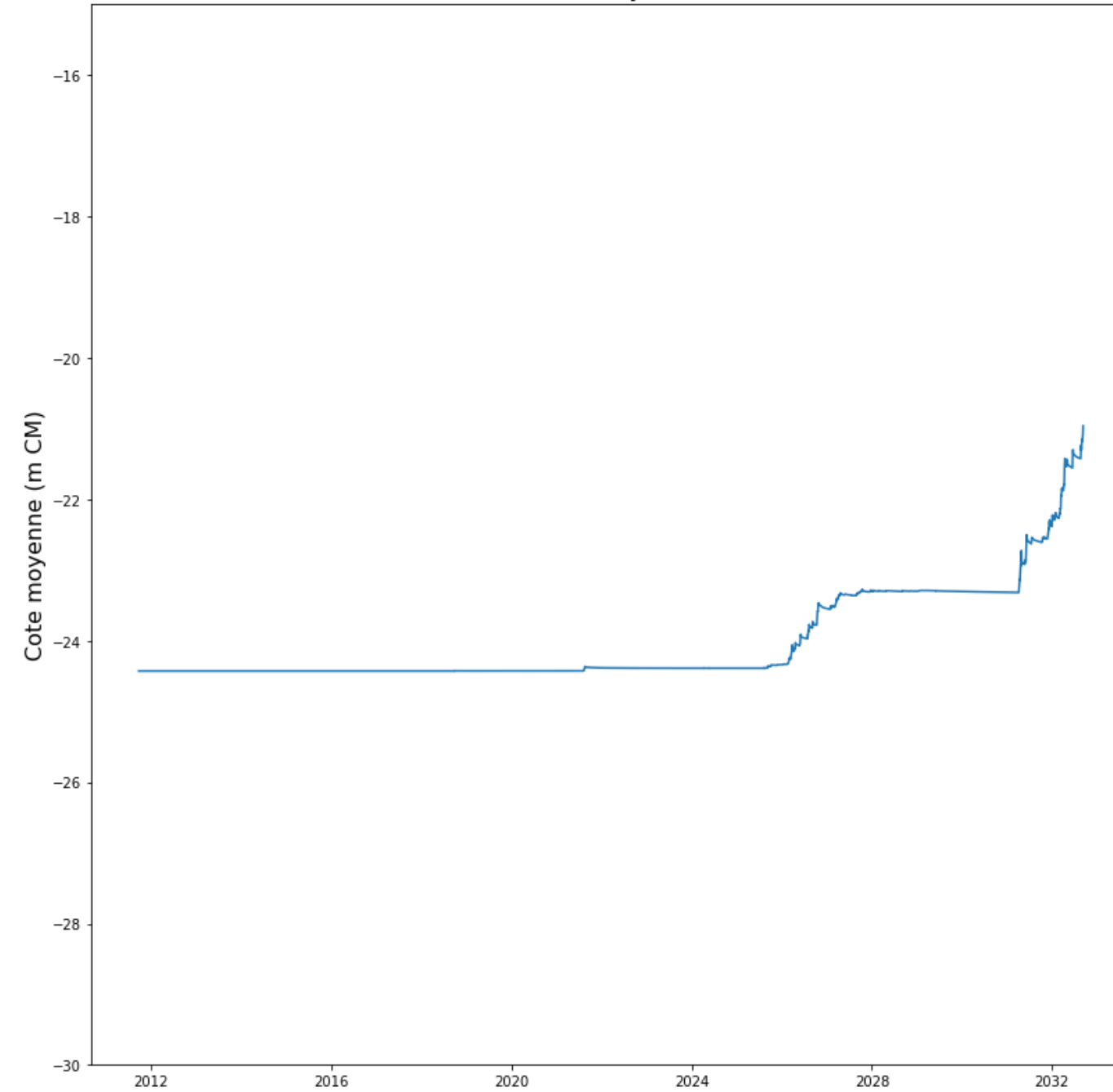
Evolution de la cote moyenne de la zone 27

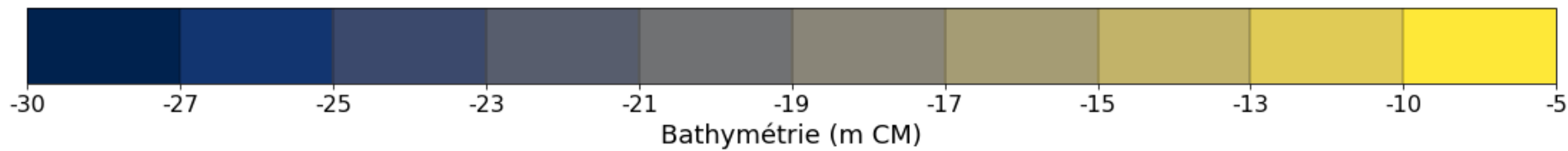
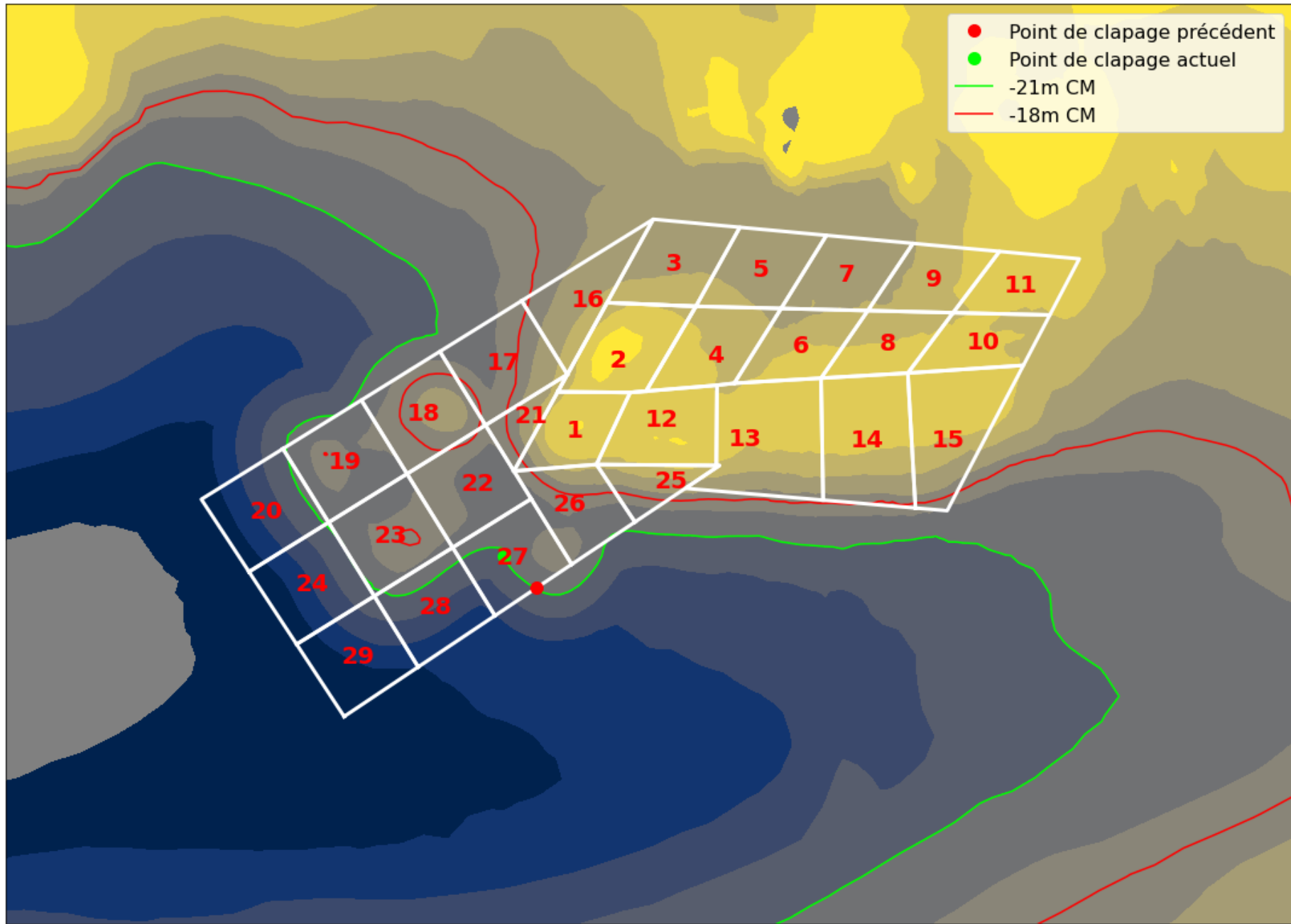




Date de changement de point : 09-09-2032

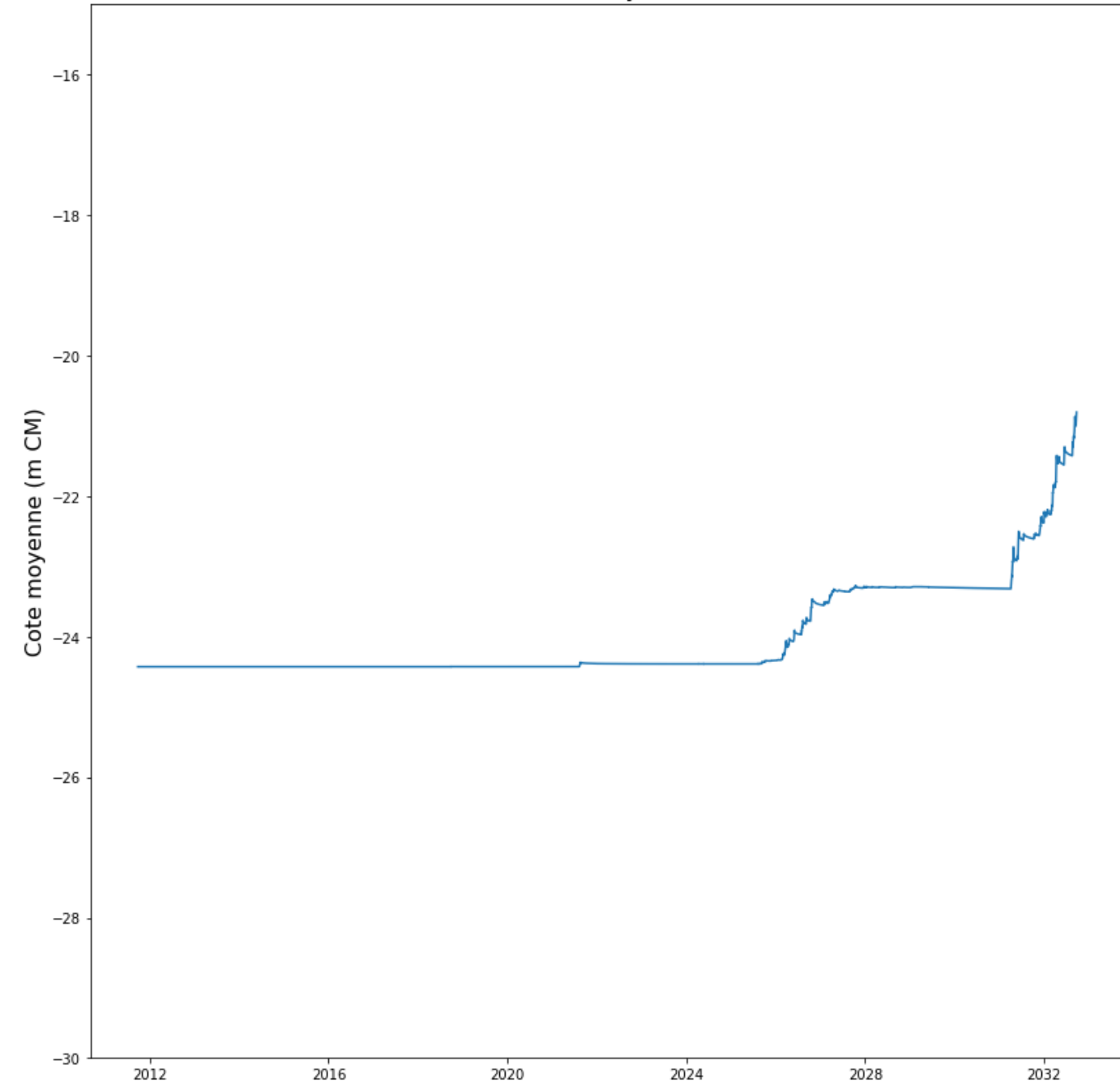
Evolution de la cote moyenne de la zone 27

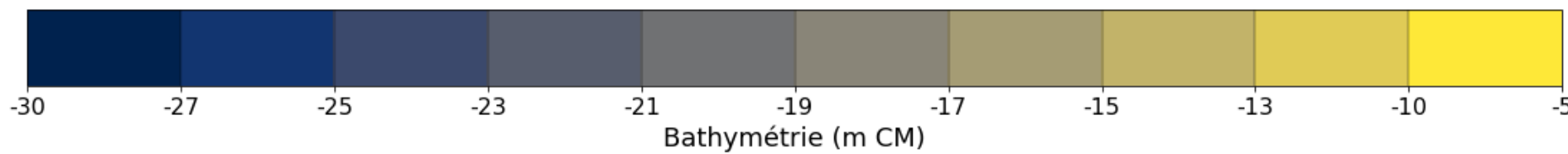
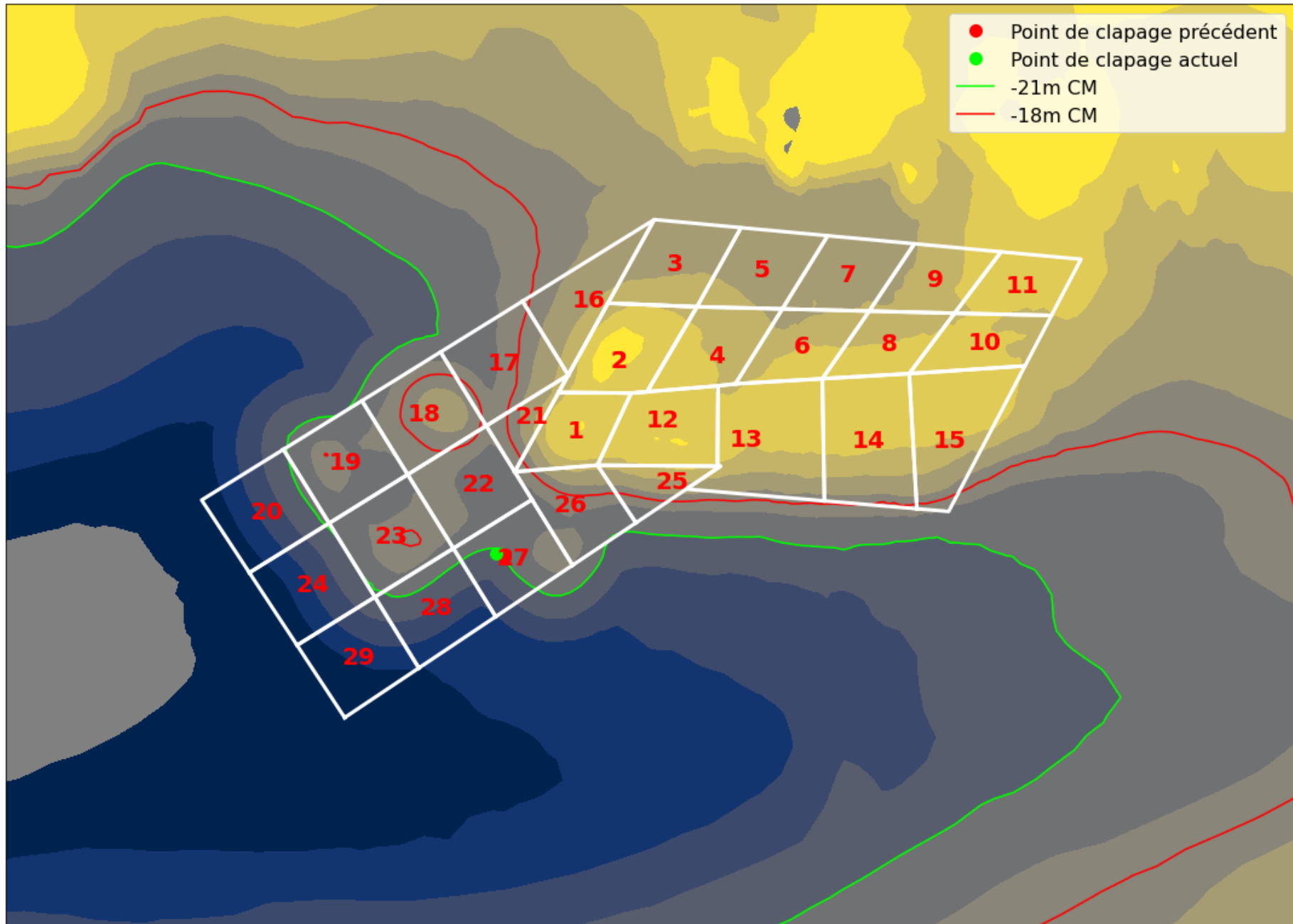




Date de changement de point : 23-09-2032

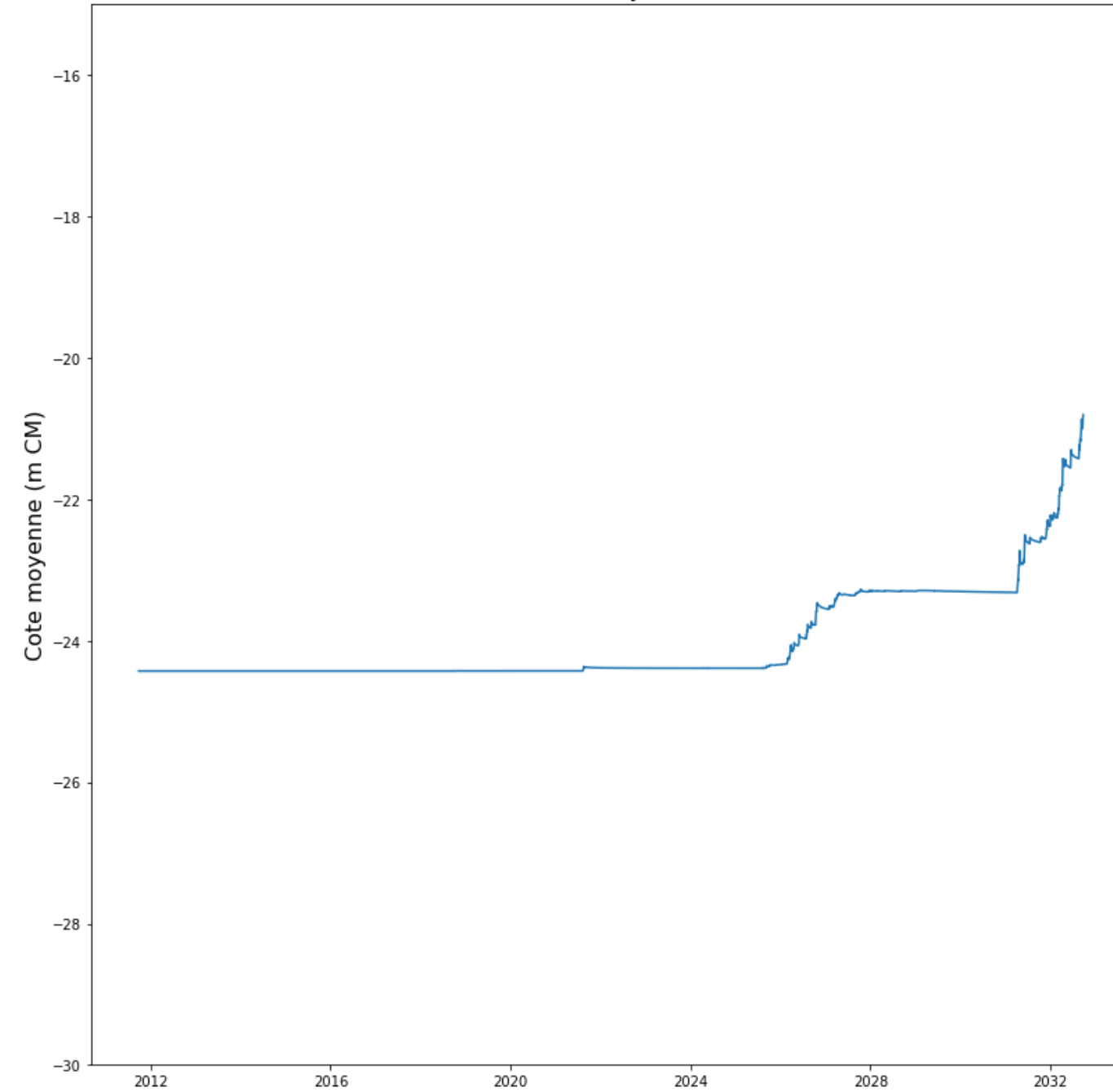
Evolution de la cote moyenne de la zone 27

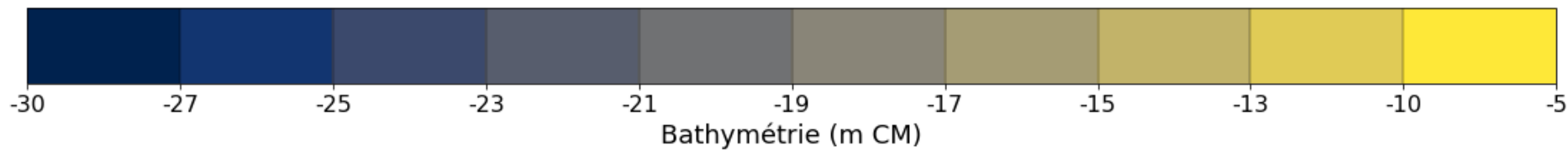
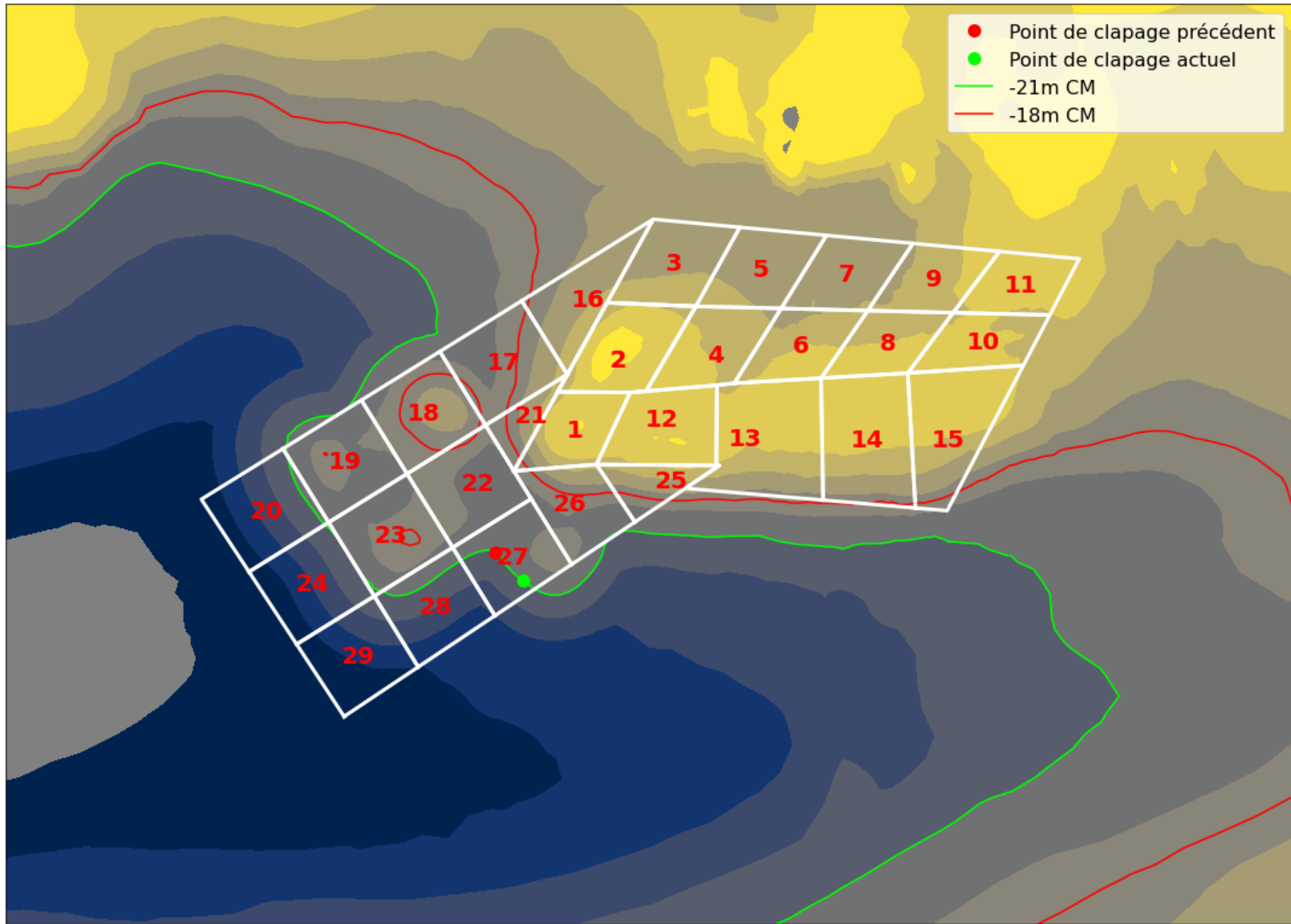




Date de changement de point : 24-09-2032

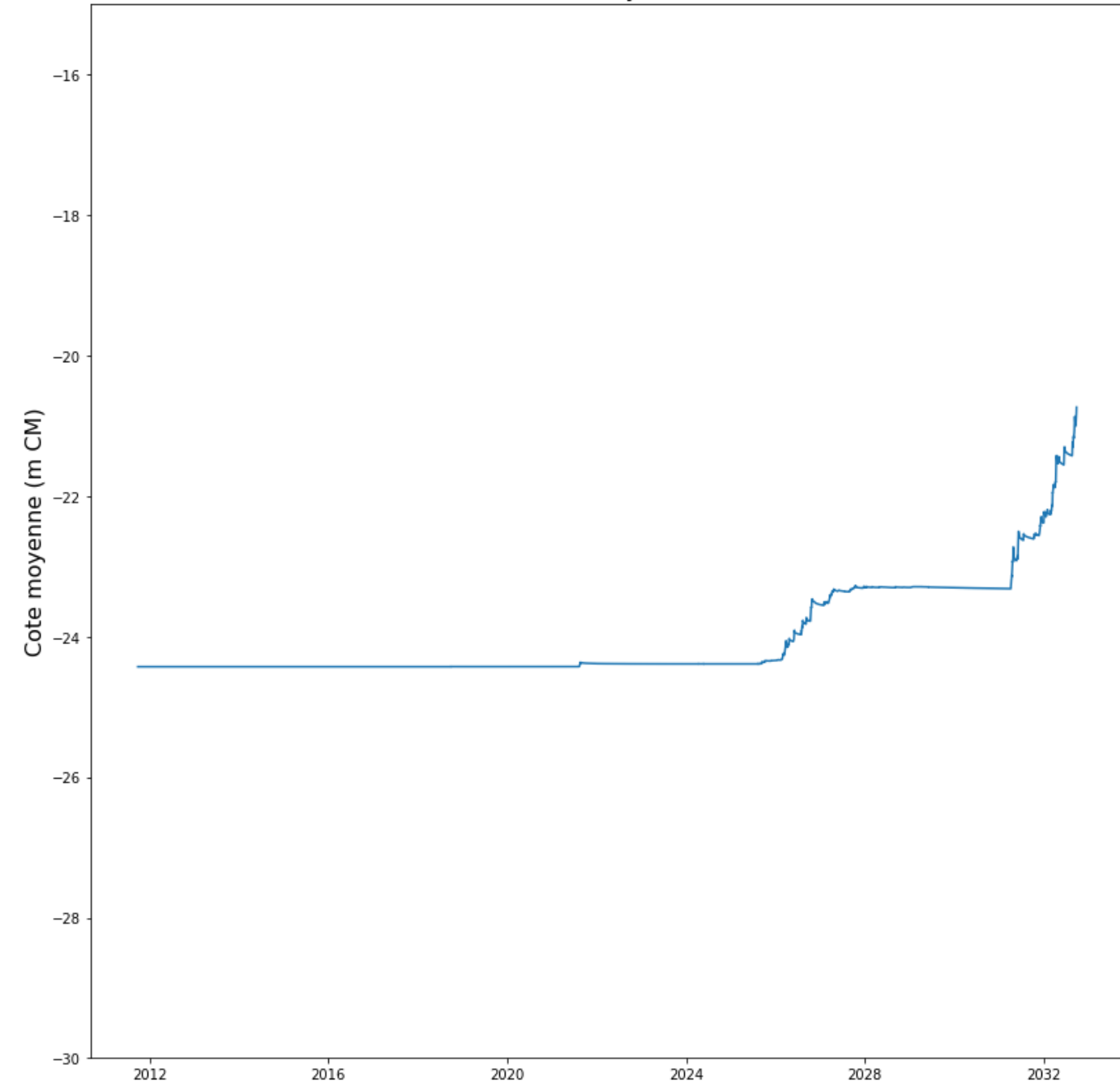
Evolution de la cote moyenne de la zone 27

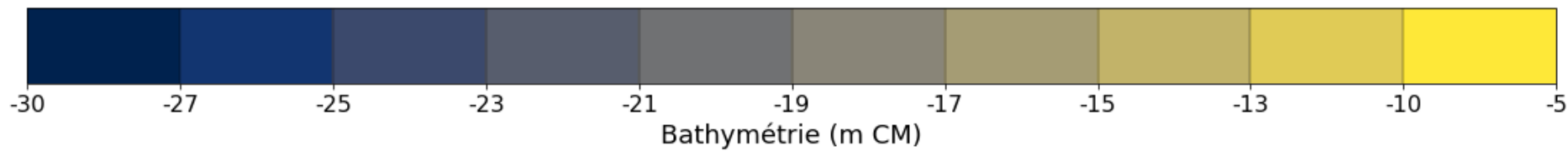
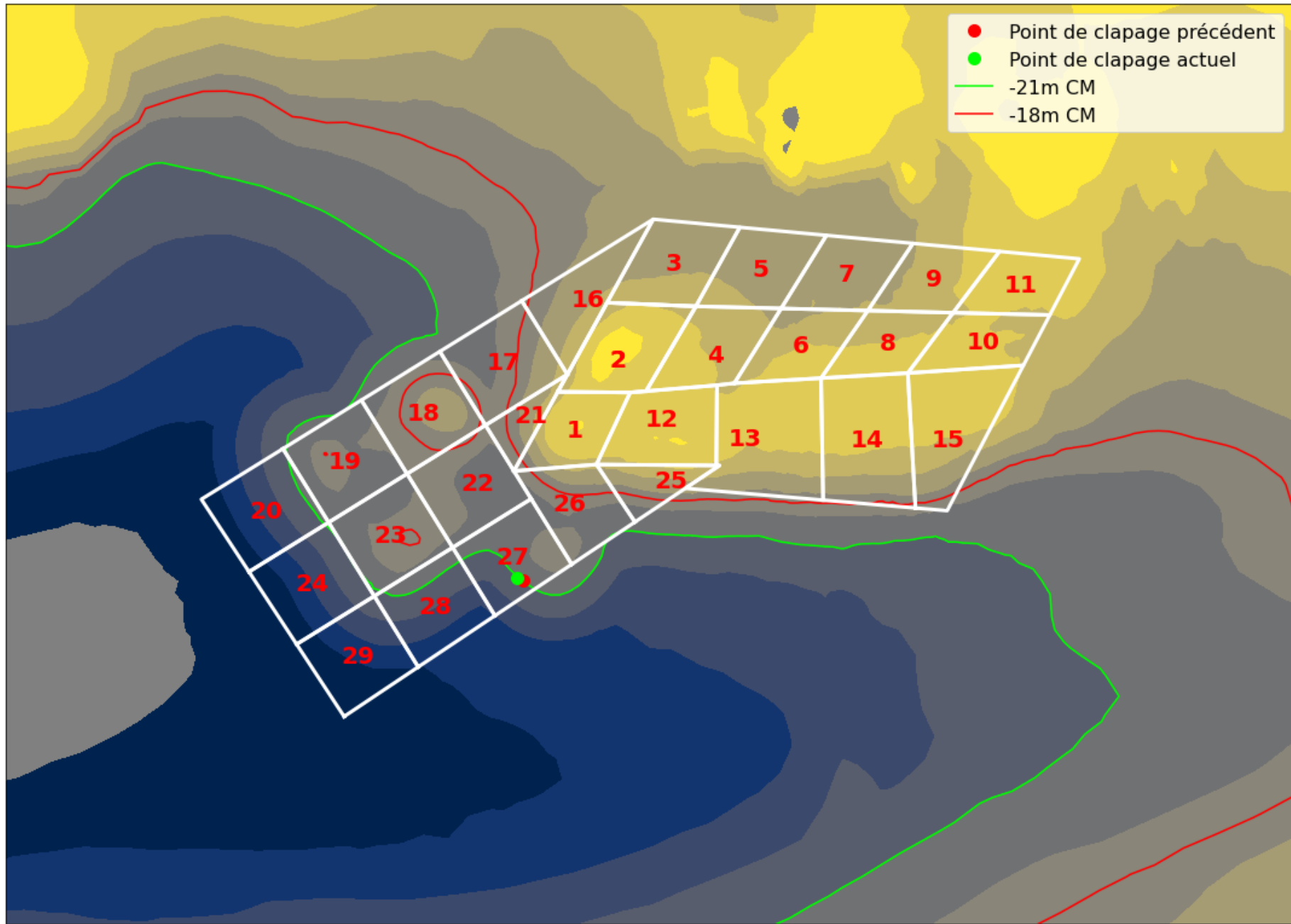




Date de changement de point : 24-09-2032

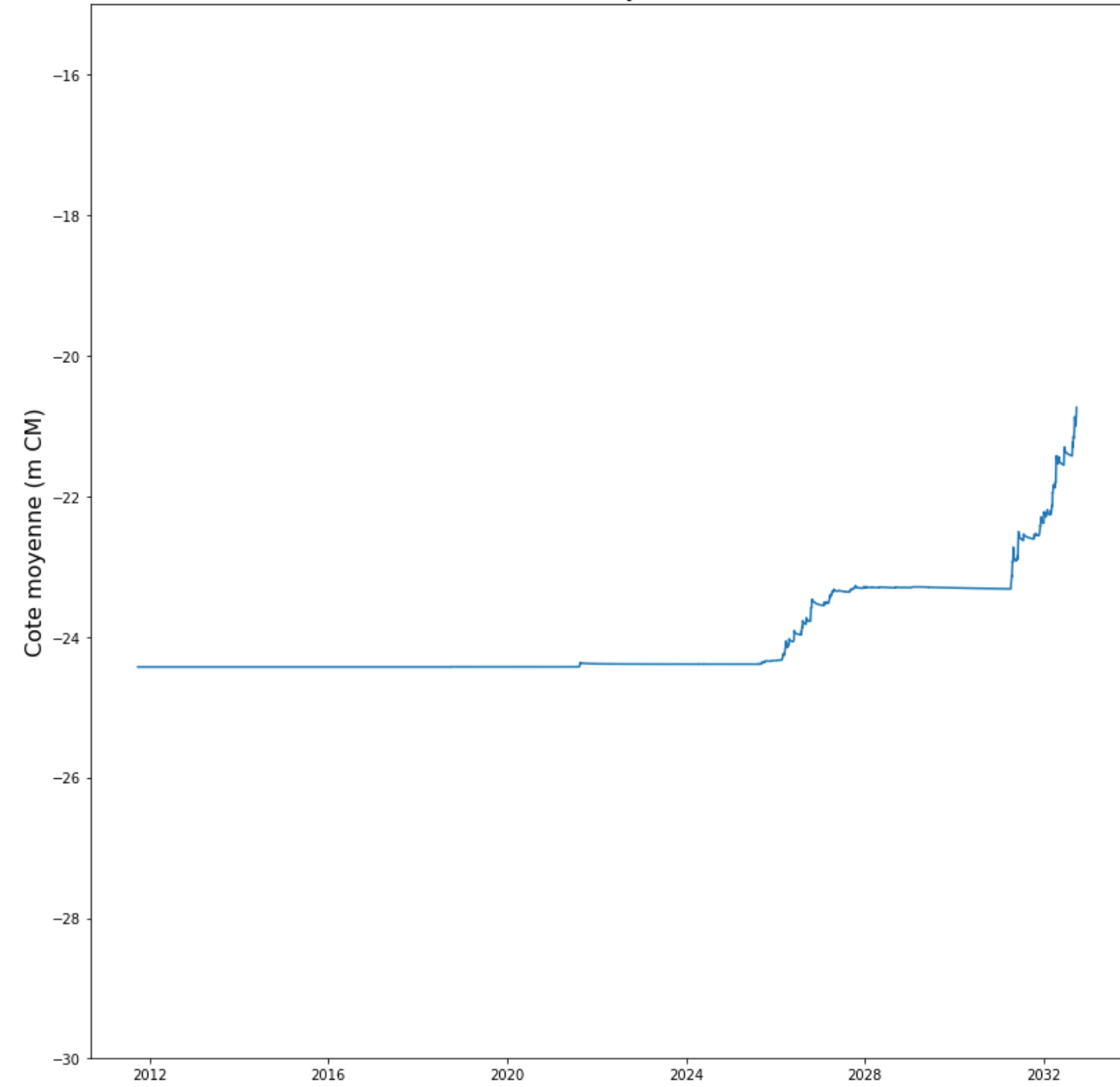
Evolution de la cote moyenne de la zone 27



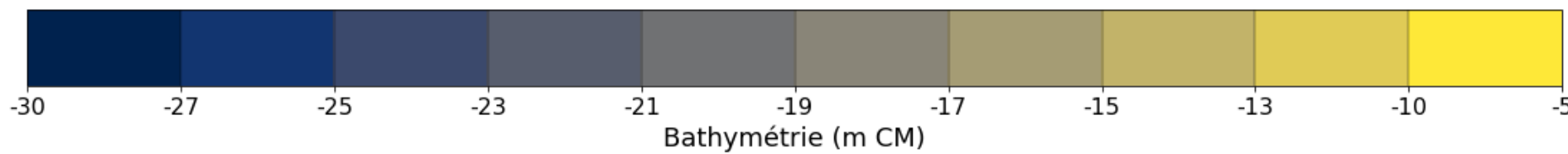
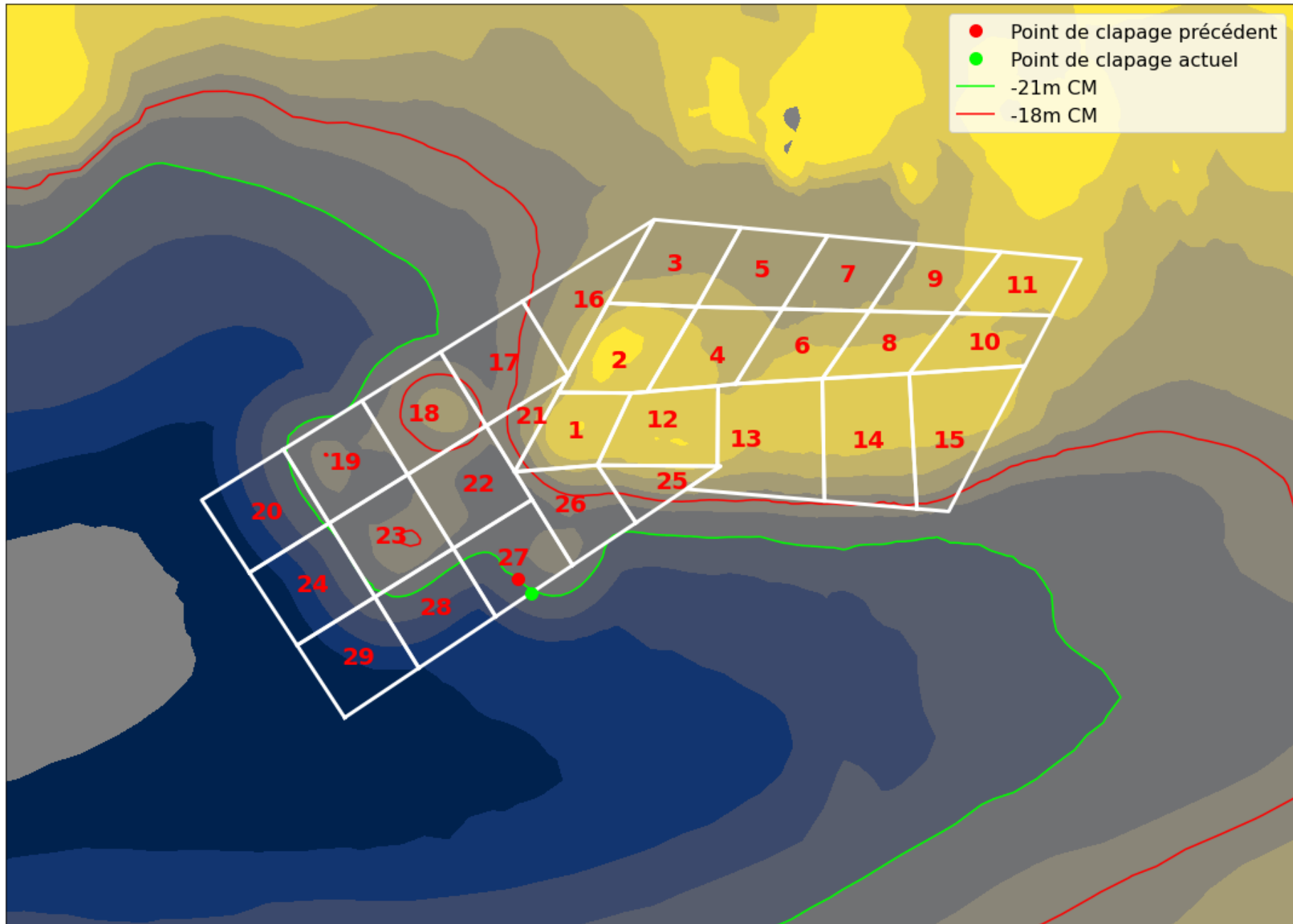


Date de changement de point : 25-09-2032

Evolution de la cote moyenne de la zone 27

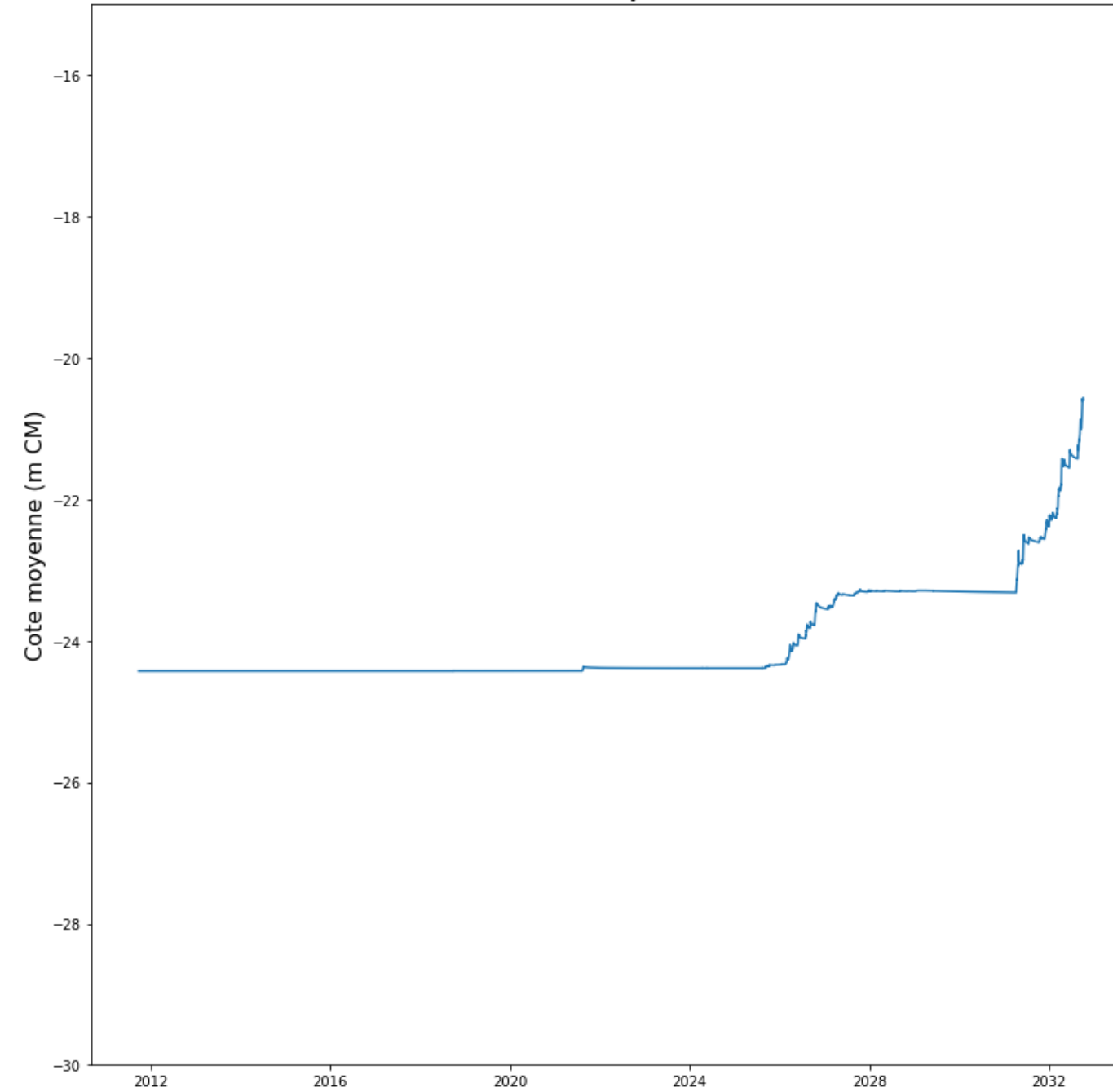


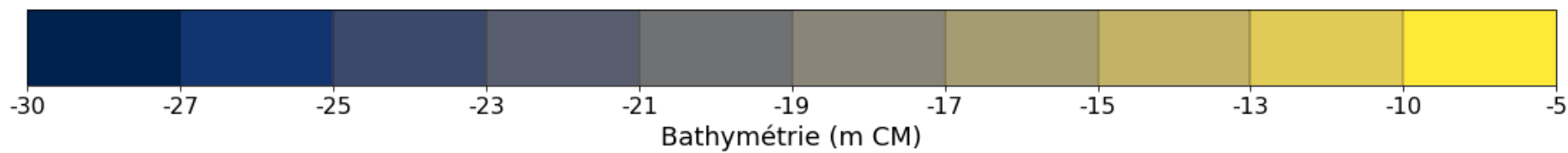
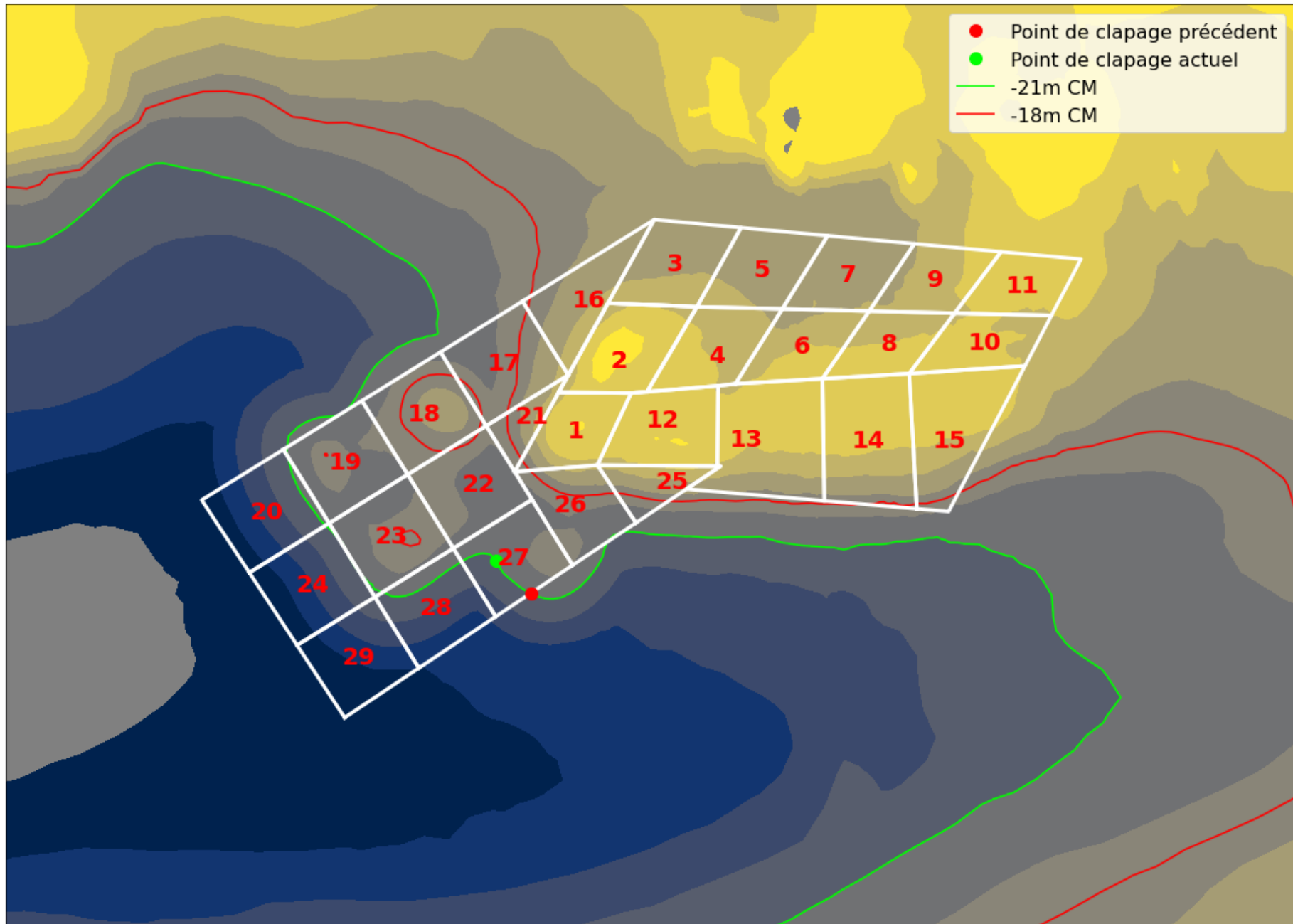




Date de changement de point : 02-10-2032

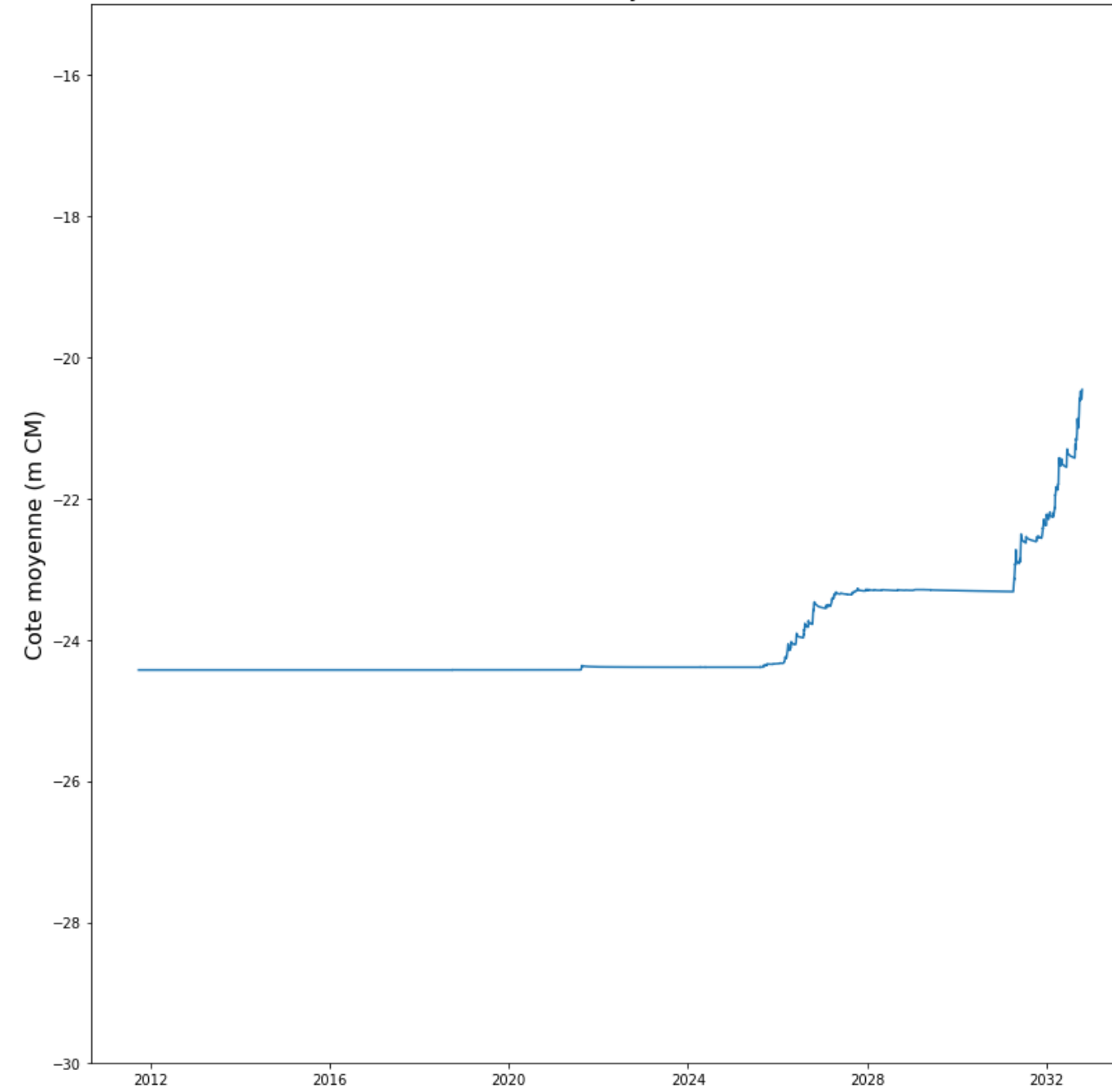
Evolution de la cote moyenne de la zone 27

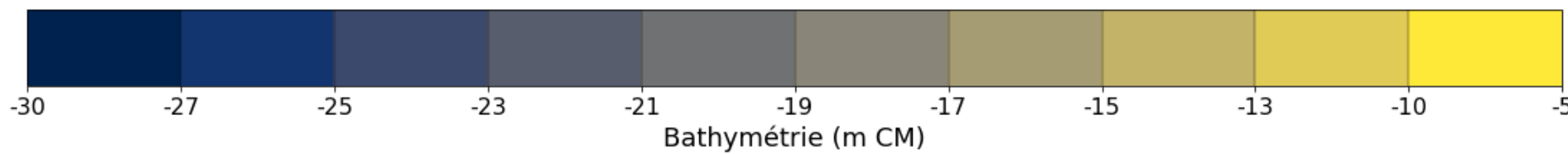
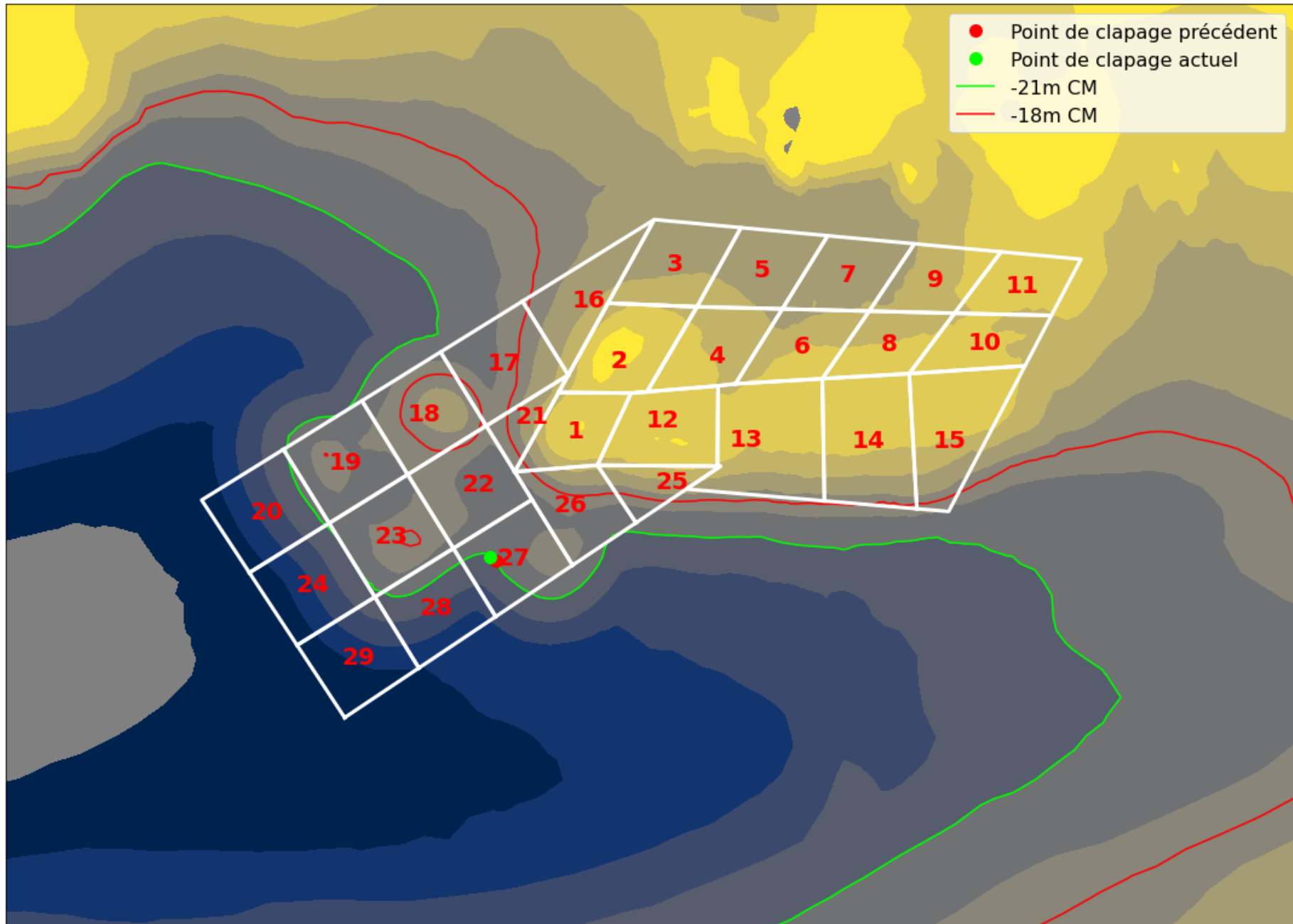




Date de changement de point : 18-10-2032

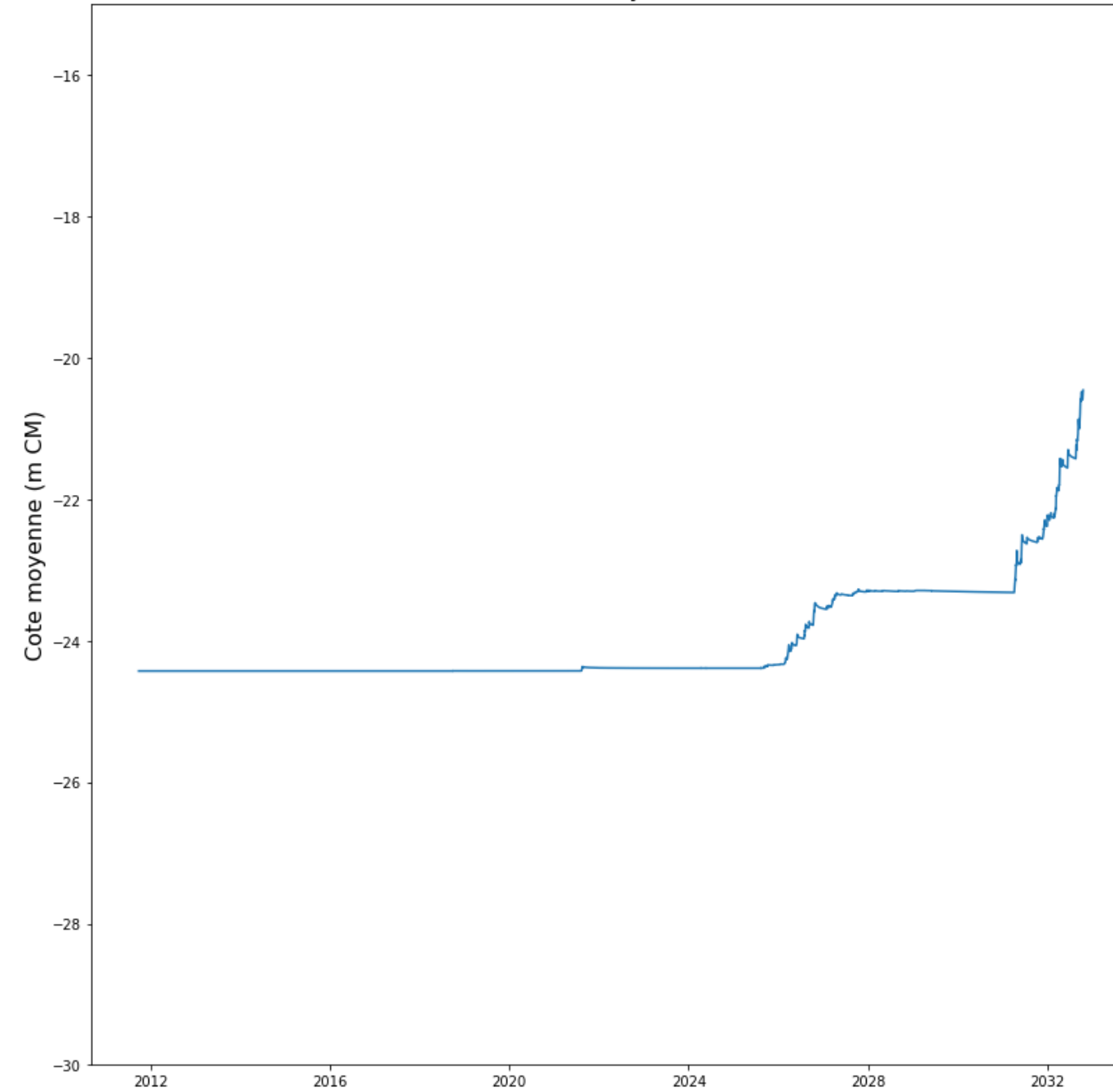
Evolution de la cote moyenne de la zone 27

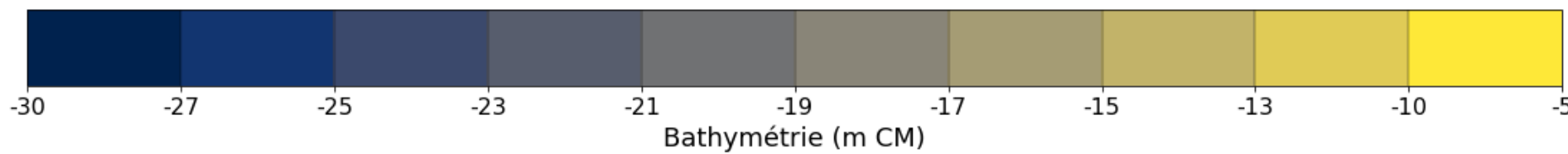
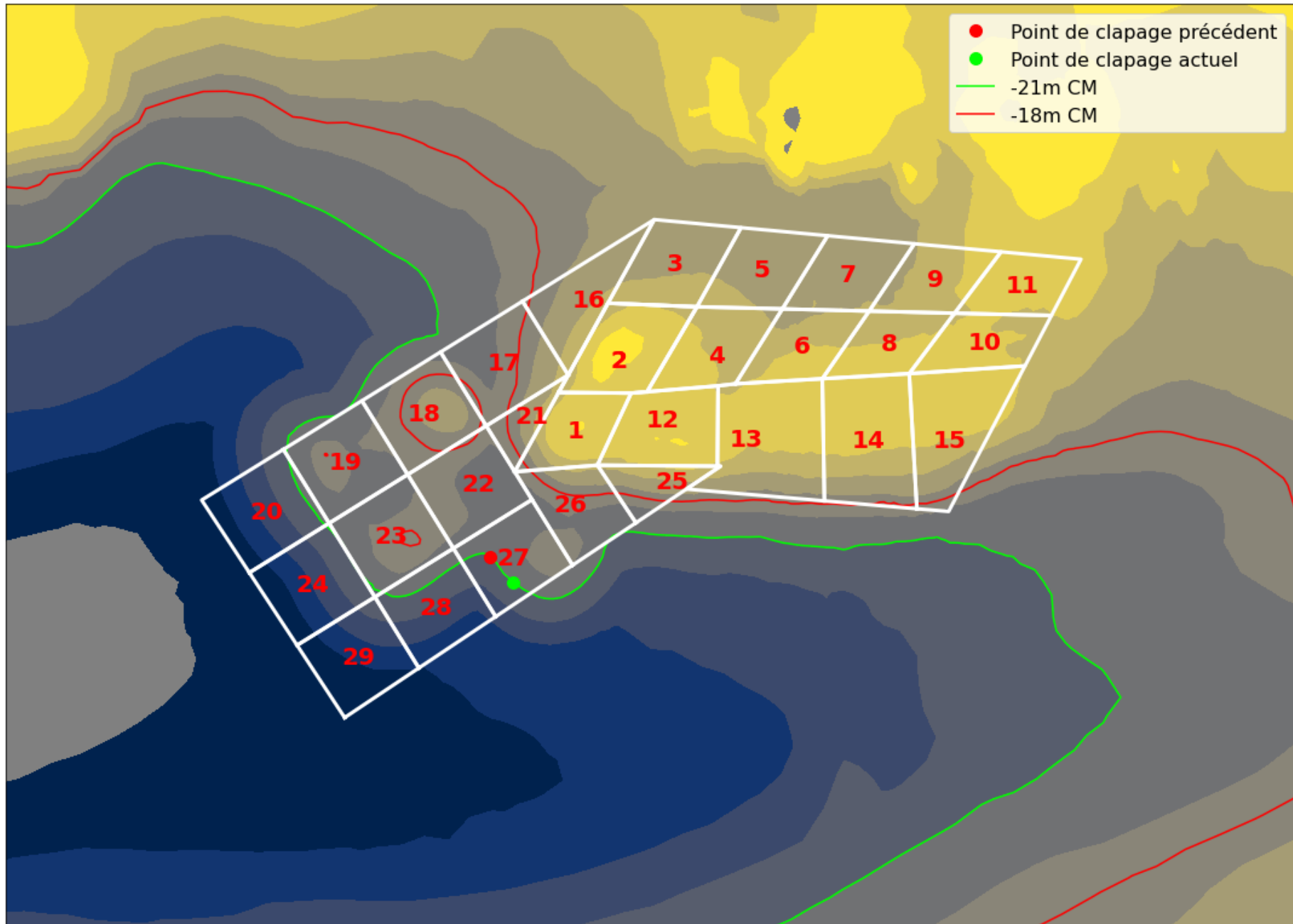




Date de changement de point : 19-10-2032

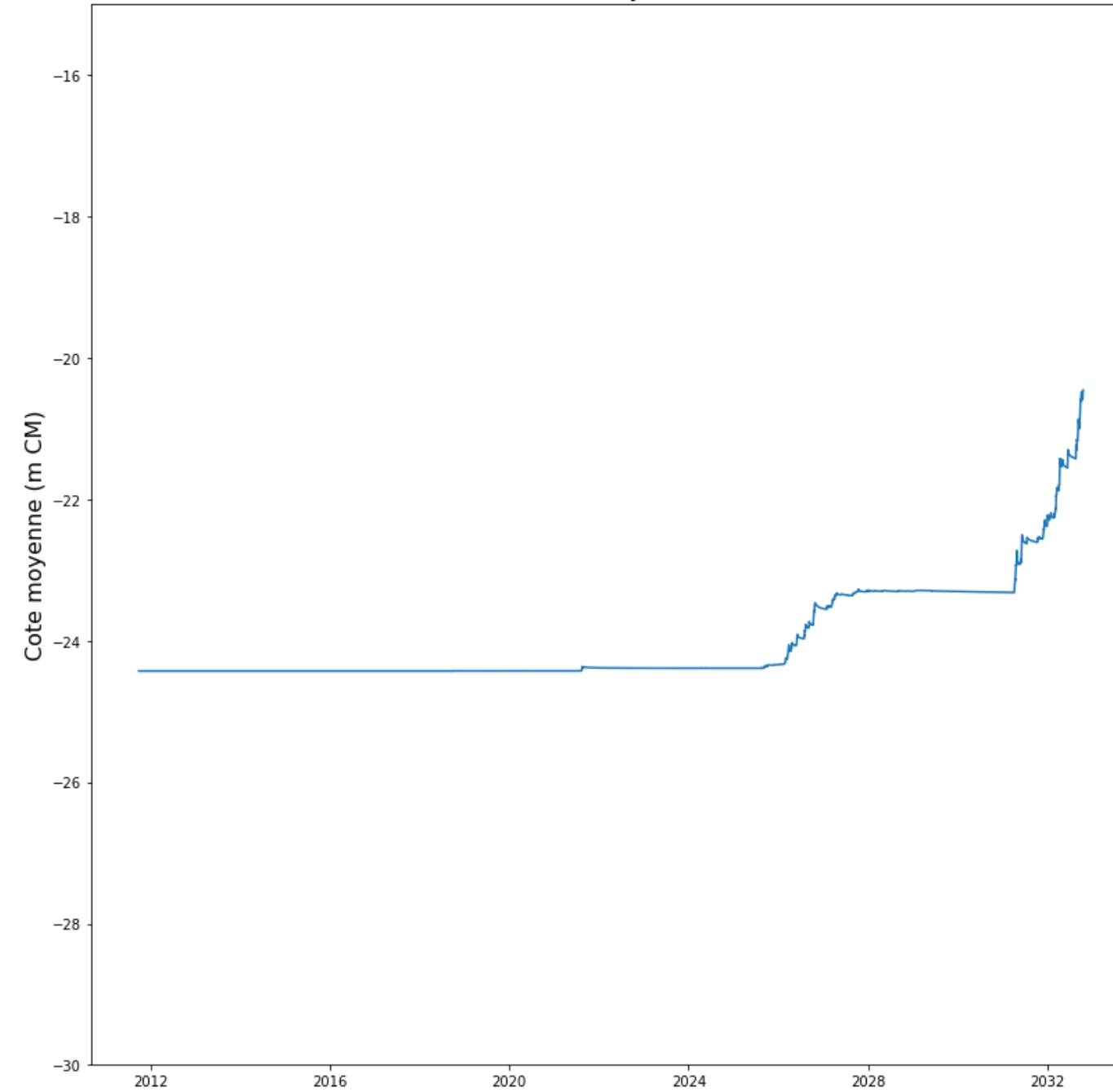
Evolution de la cote moyenne de la zone 27

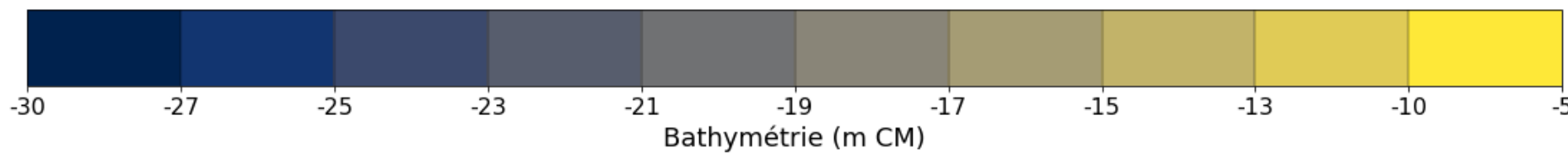
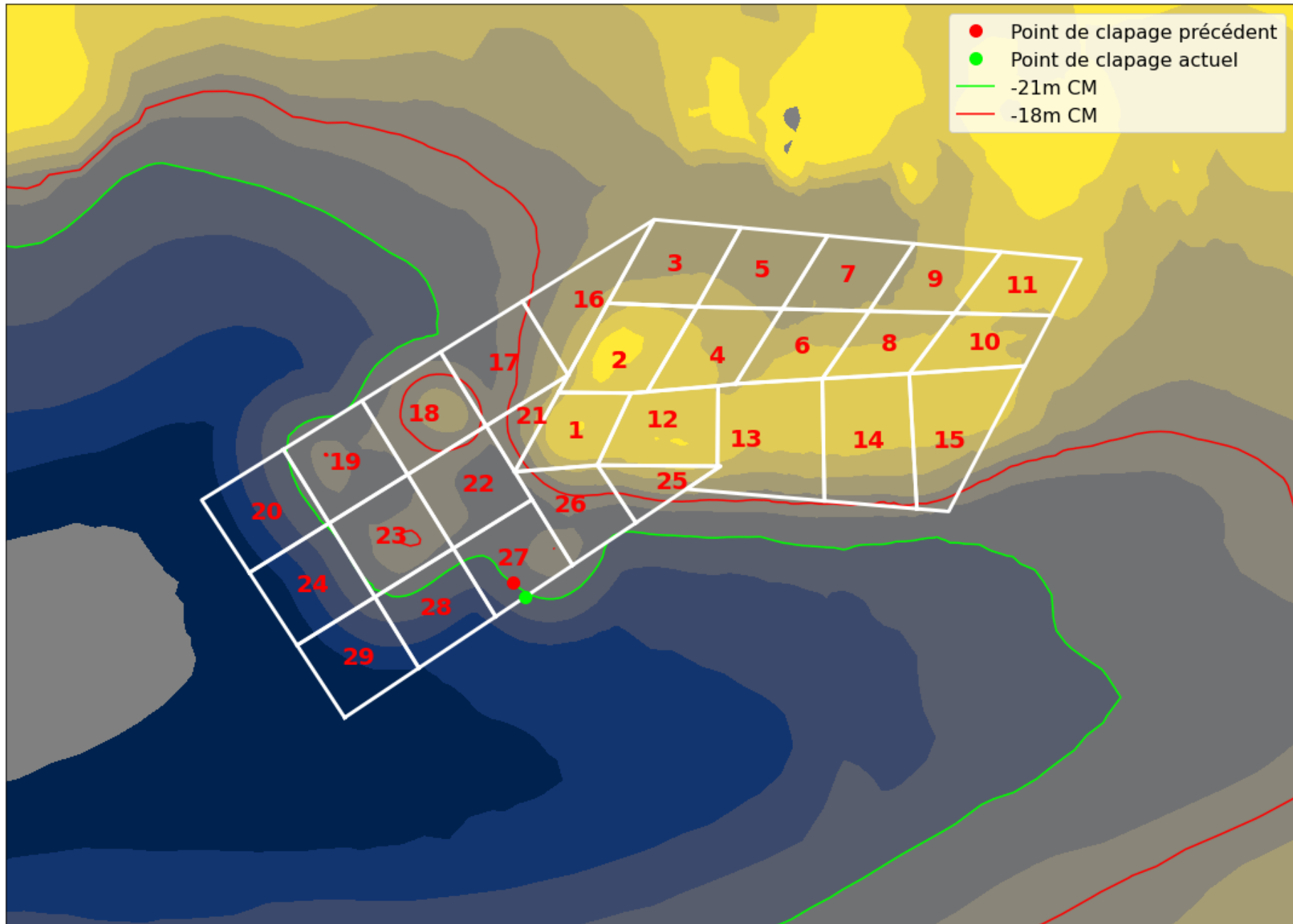




Date de changement de point : 19-10-2032

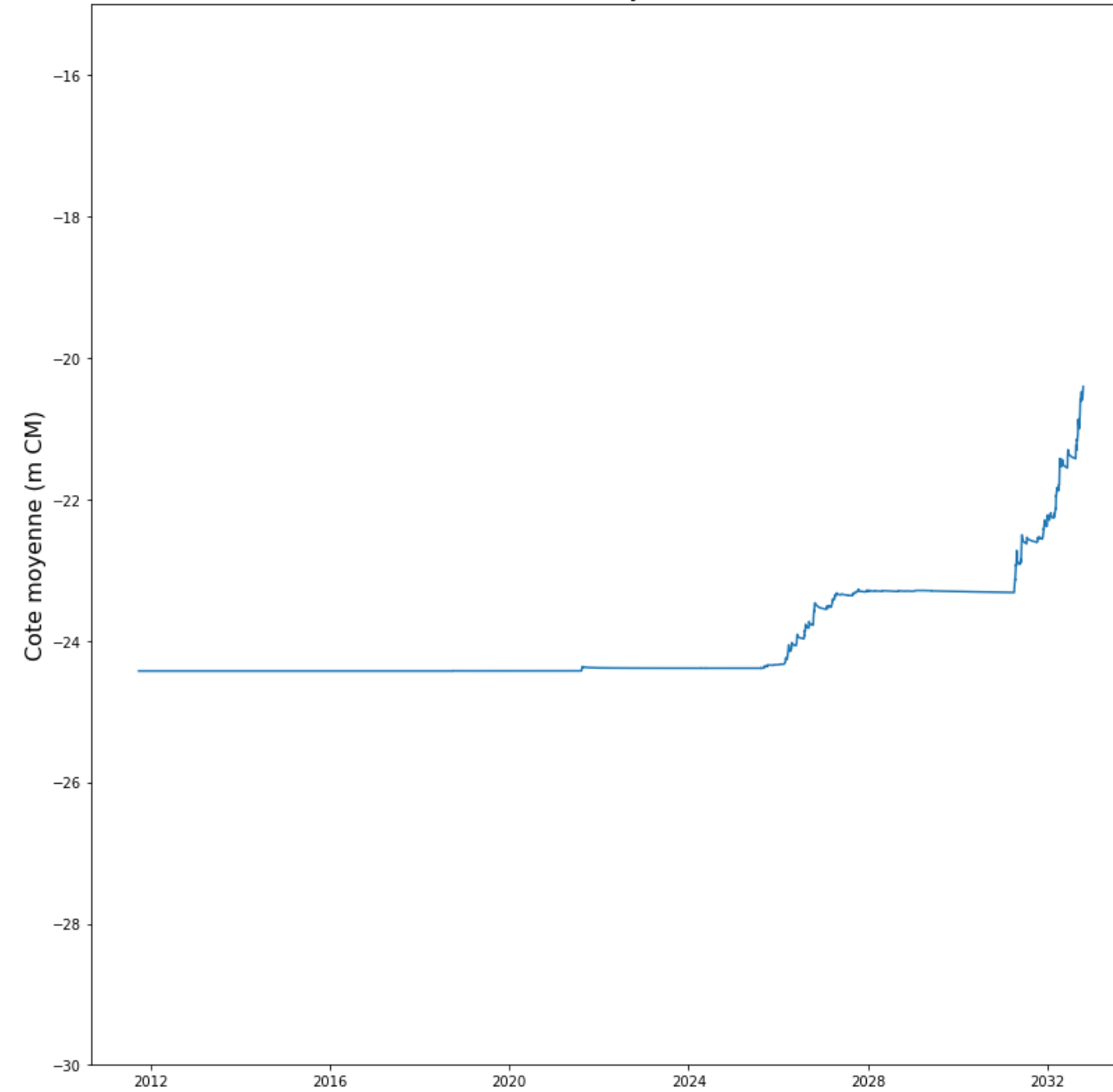
Evolution de la cote moyenne de la zone 27

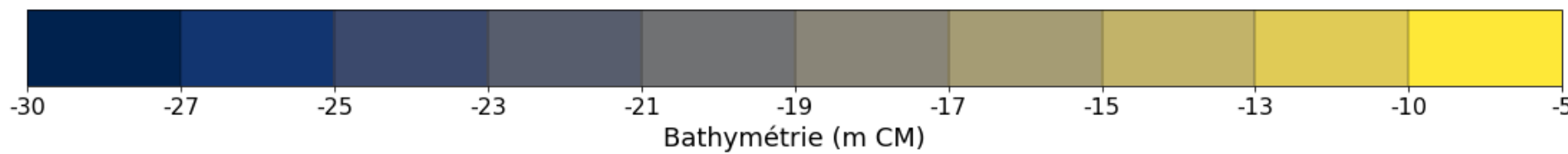
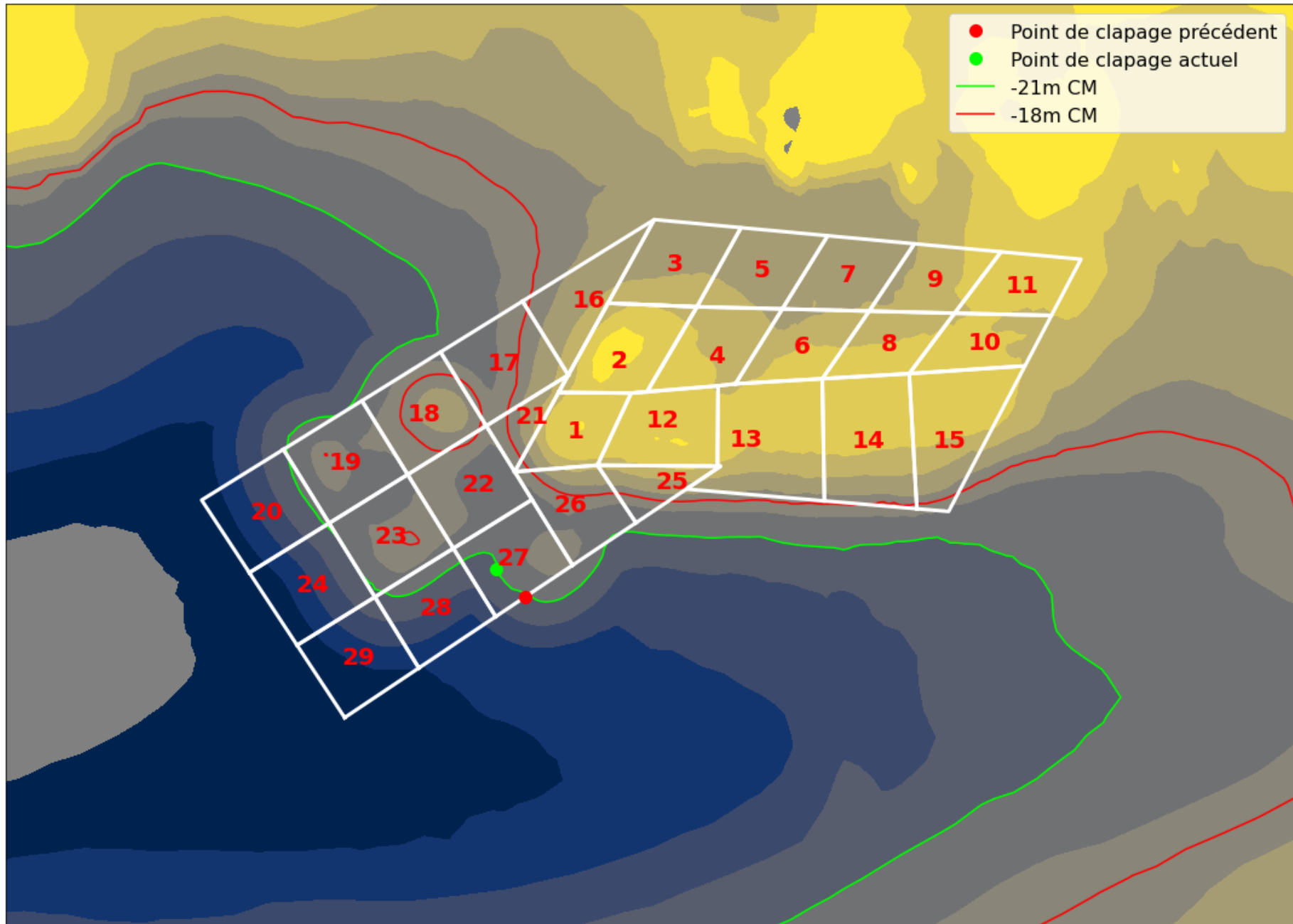




Date de changement de point : 20-10-2032

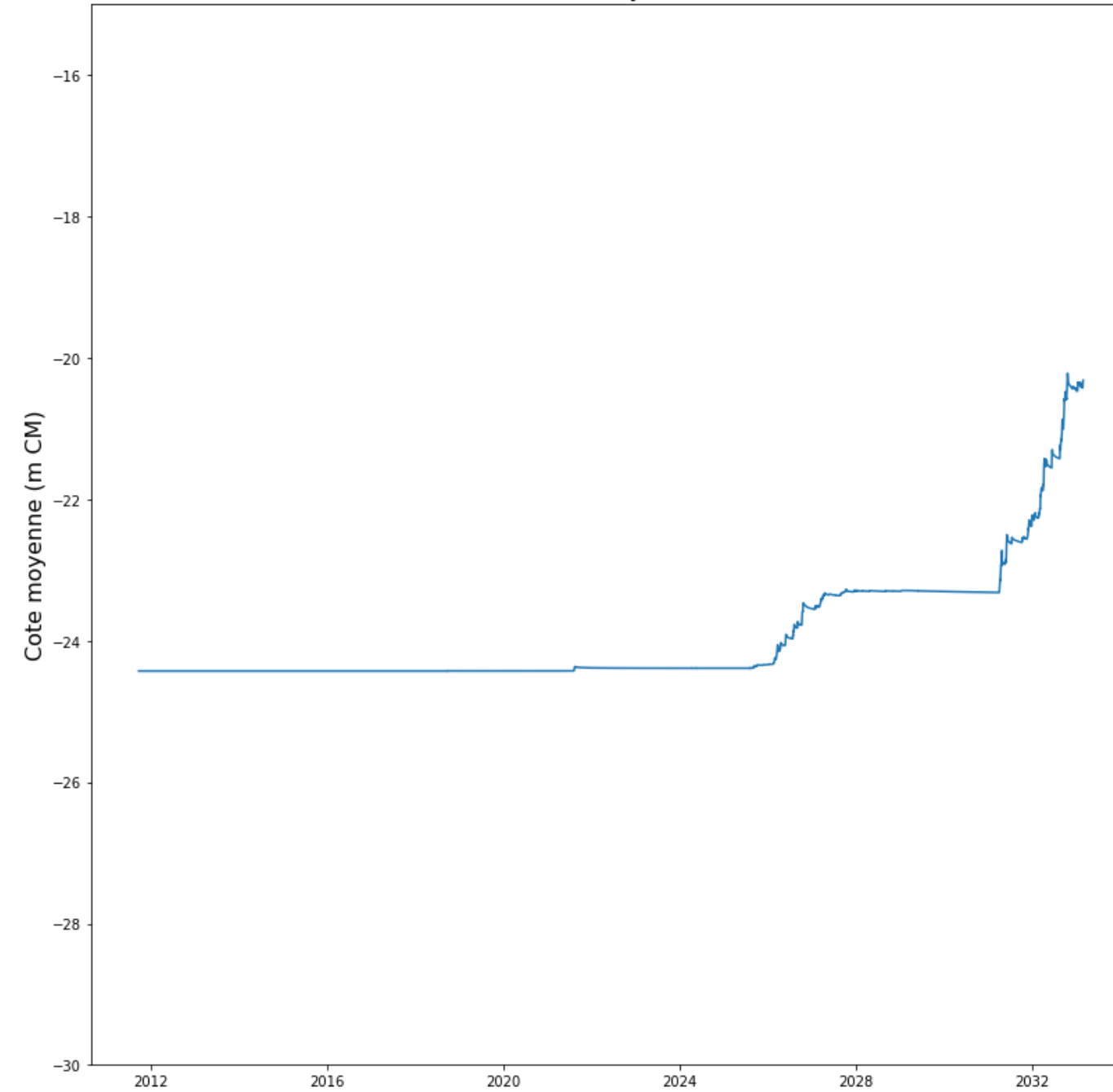
Evolution de la cote moyenne de la zone 27



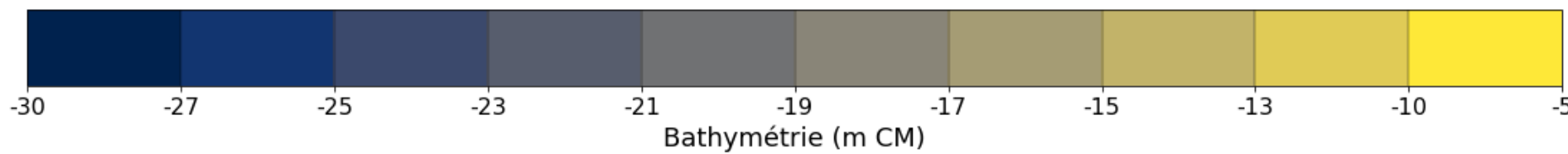
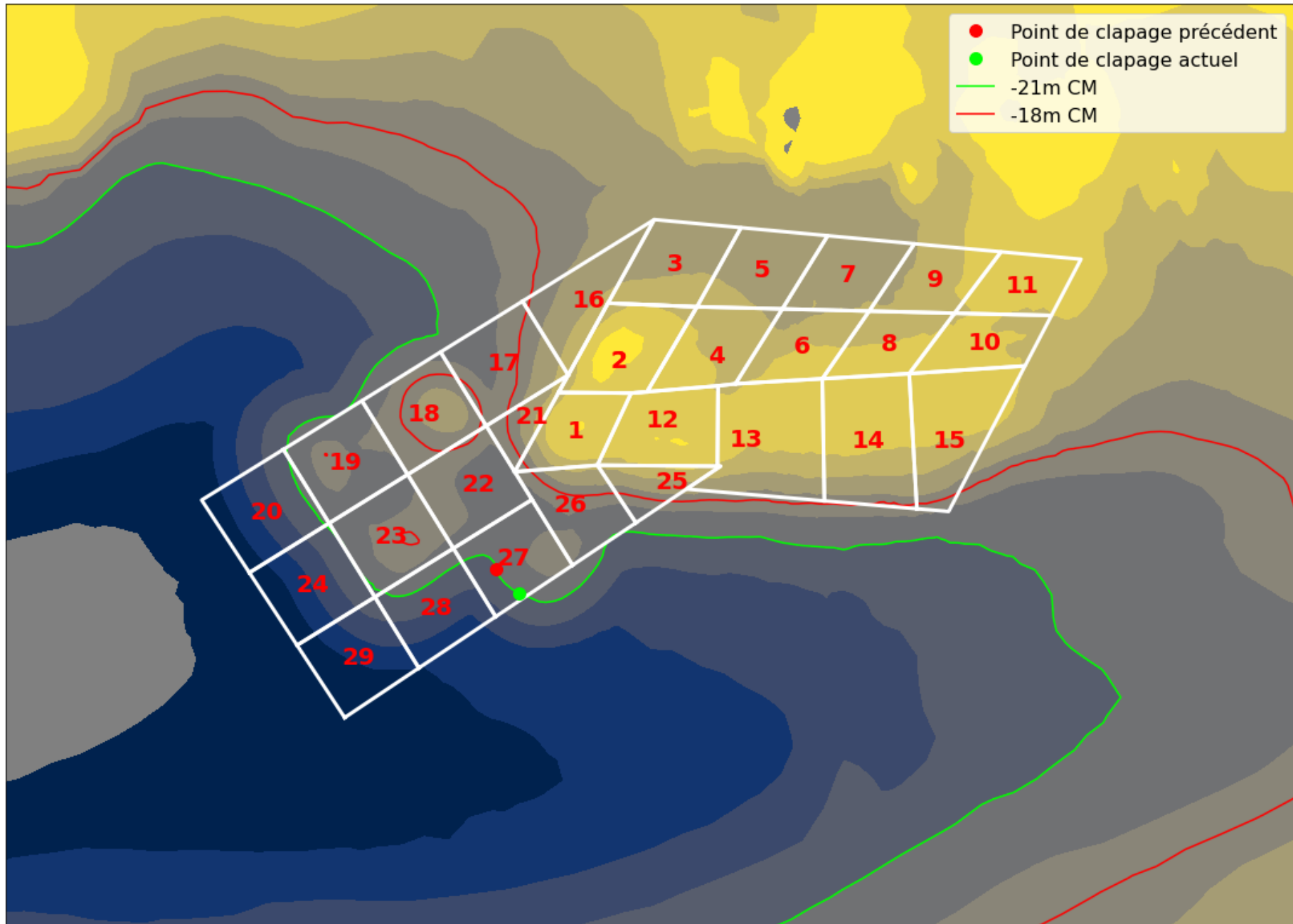


Date de changement de point : 02-03-2033

Evolution de la cote moyenne de la zone 27

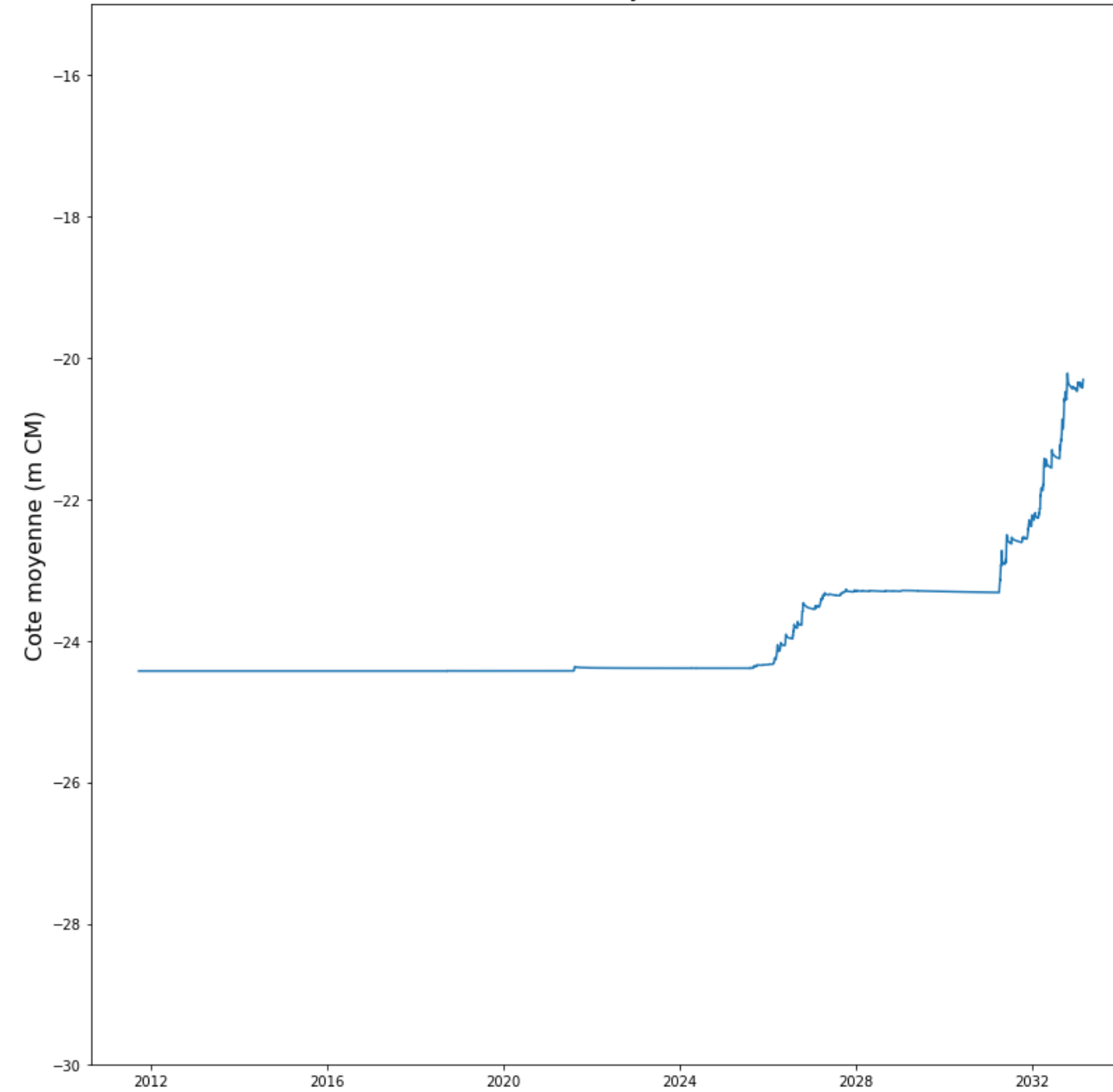


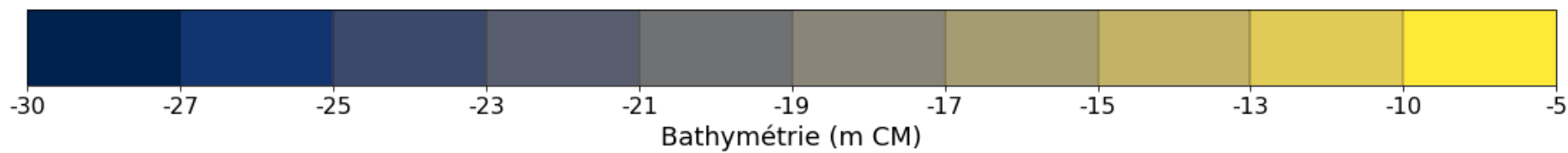
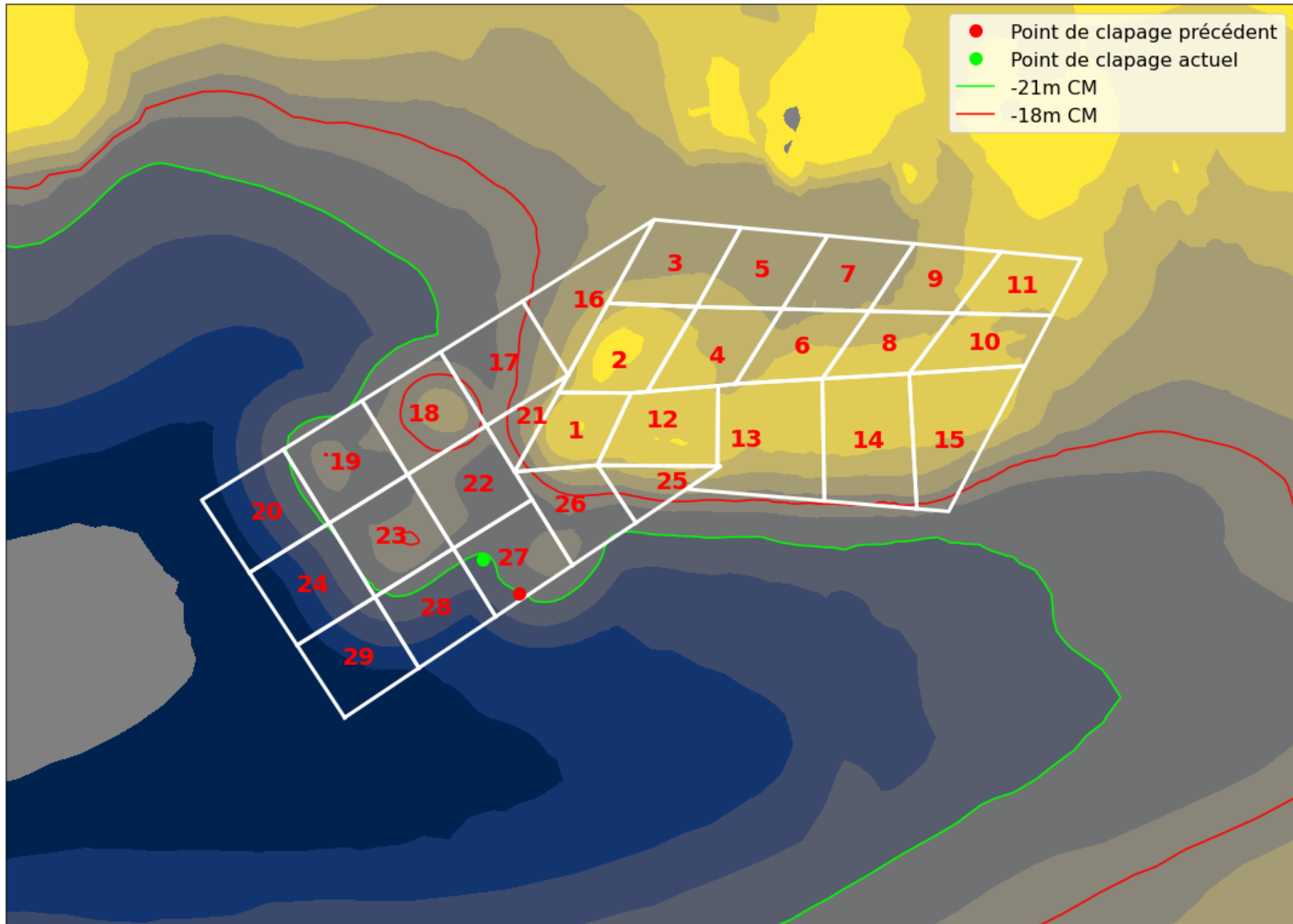




Date de changement de point : 02-03-2033

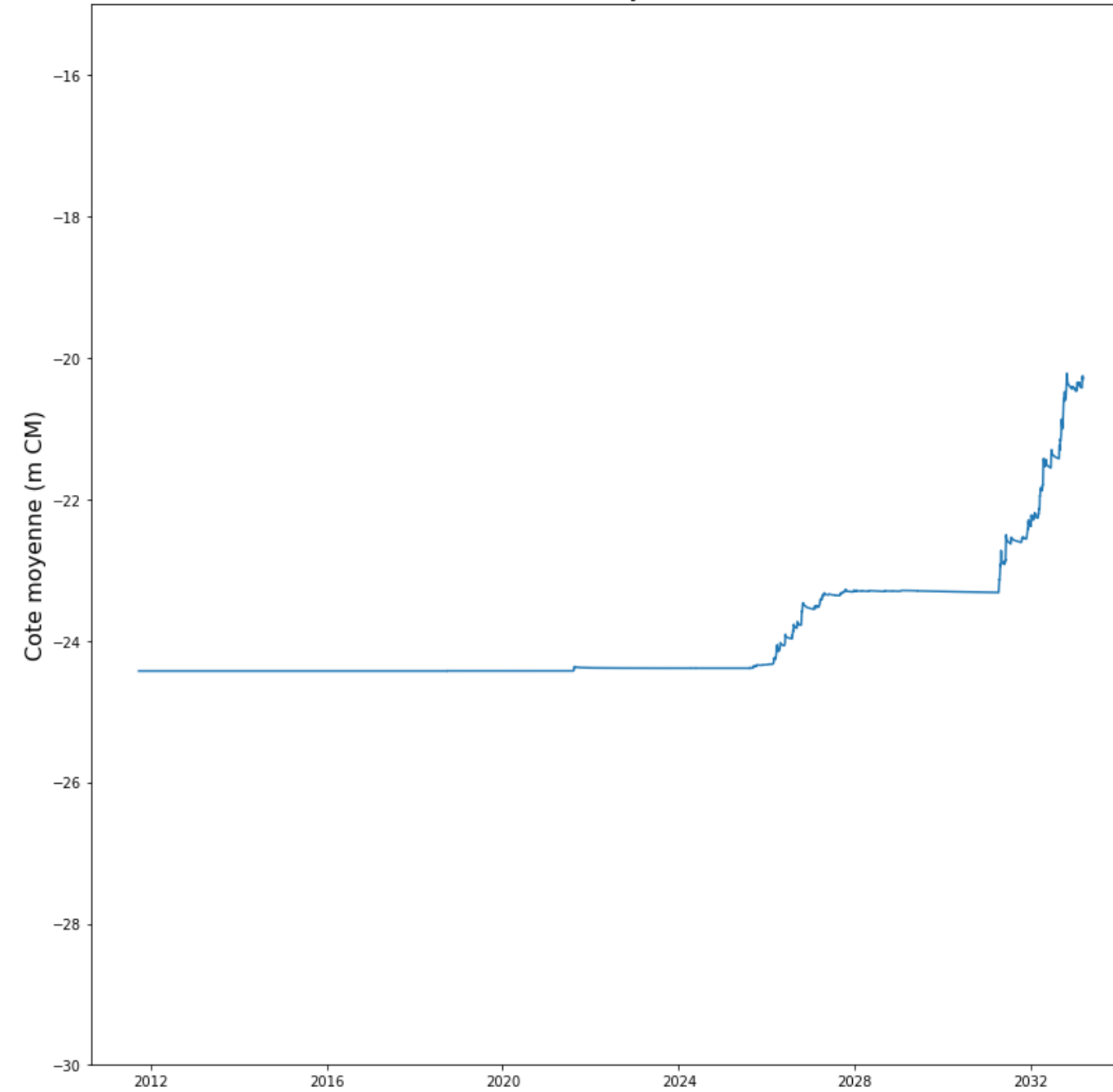
Evolution de la cote moyenne de la zone 27

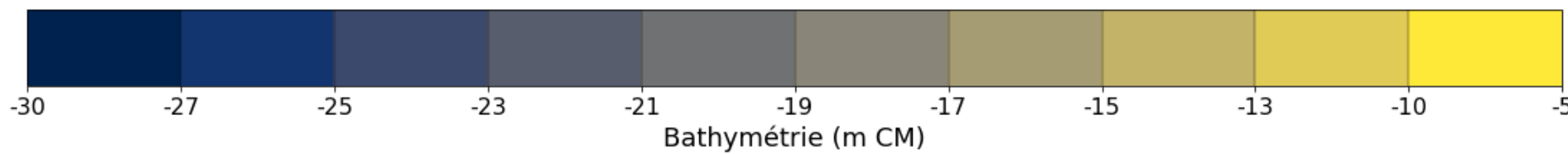
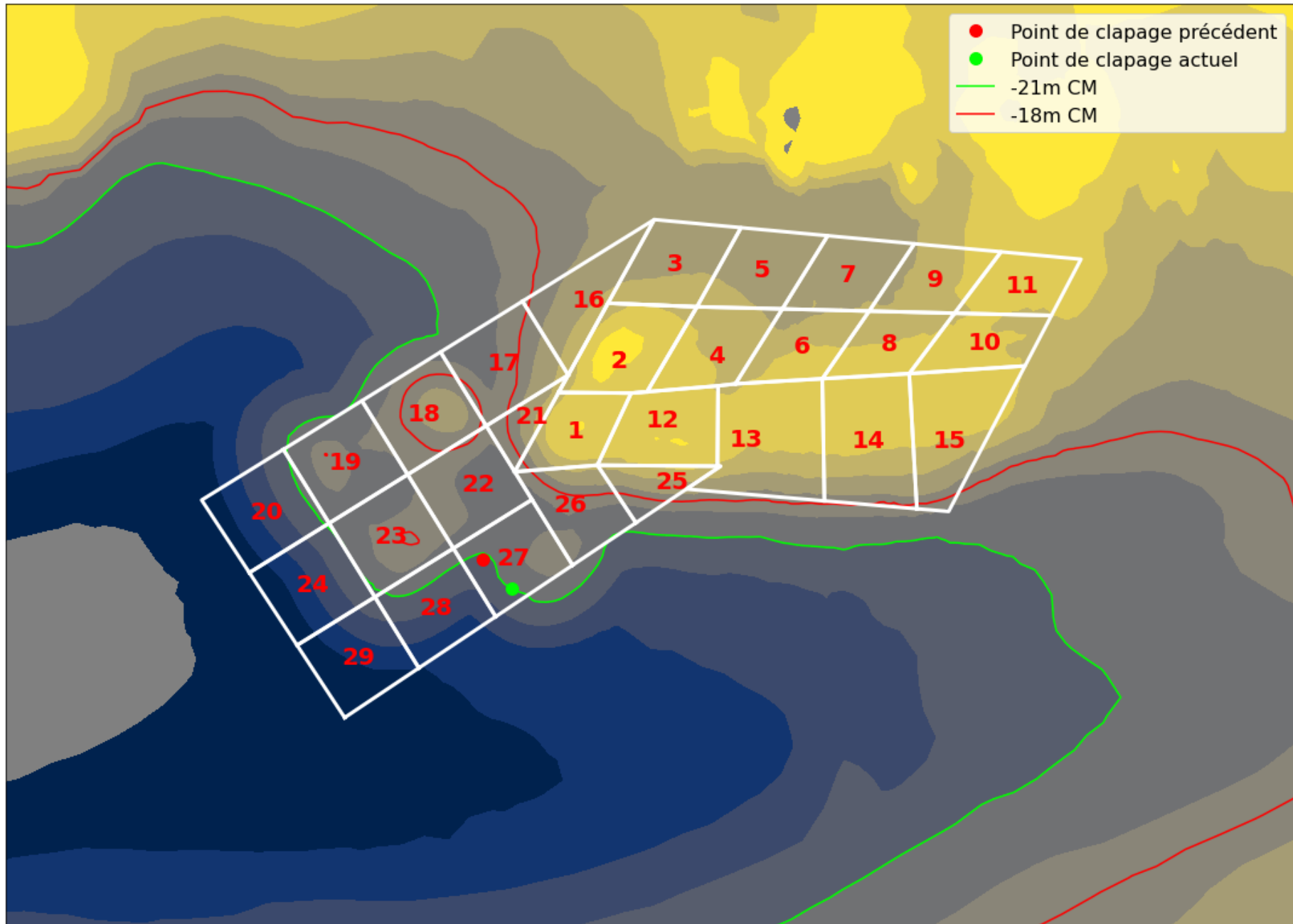




Date de changement de point : 07-03-2033

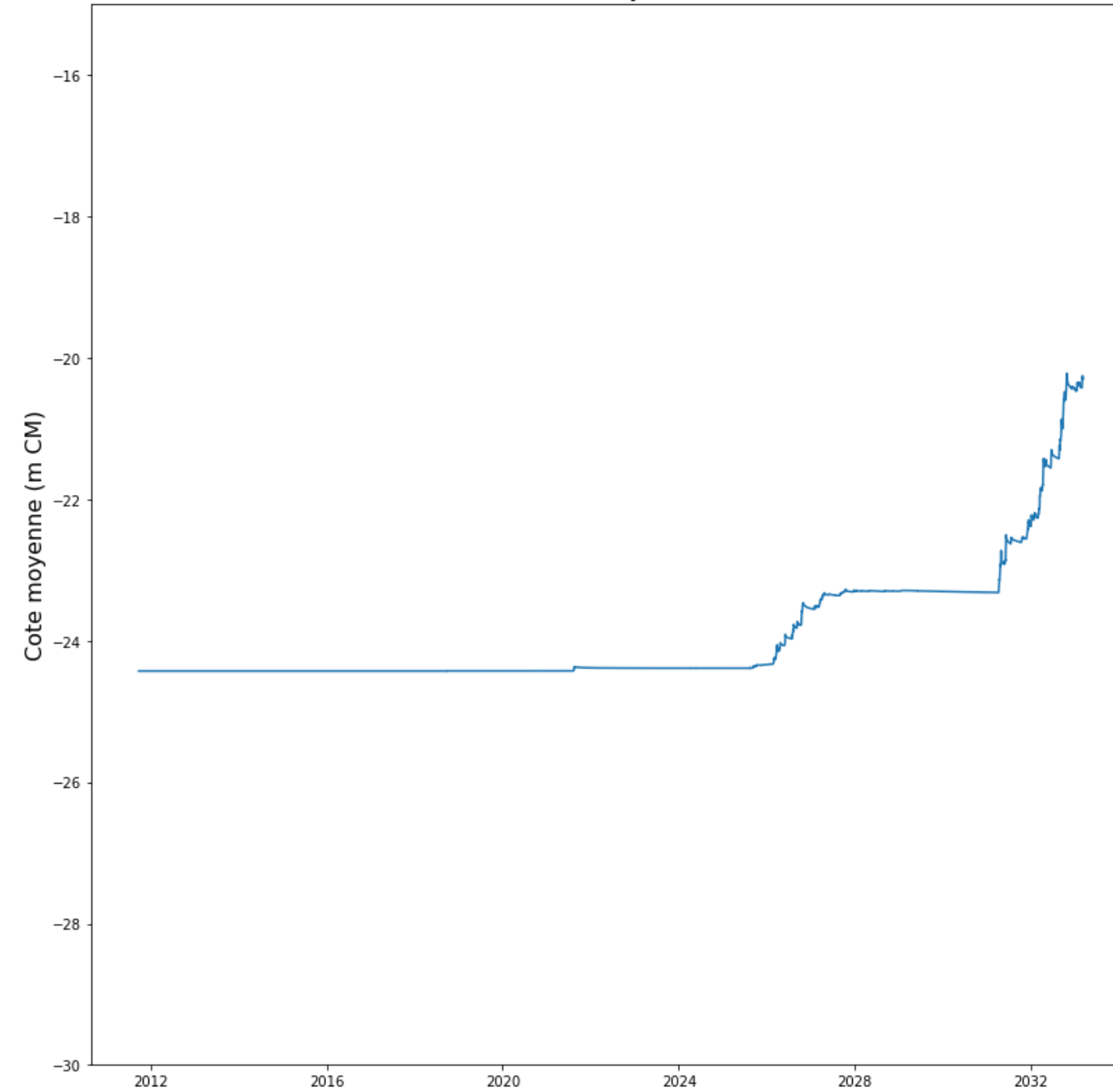
Evolution de la cote moyenne de la zone 27

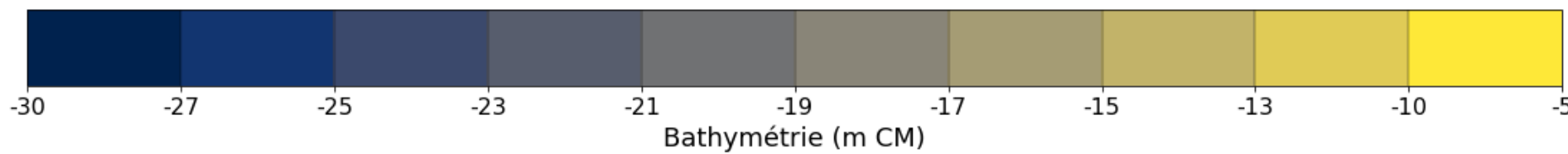
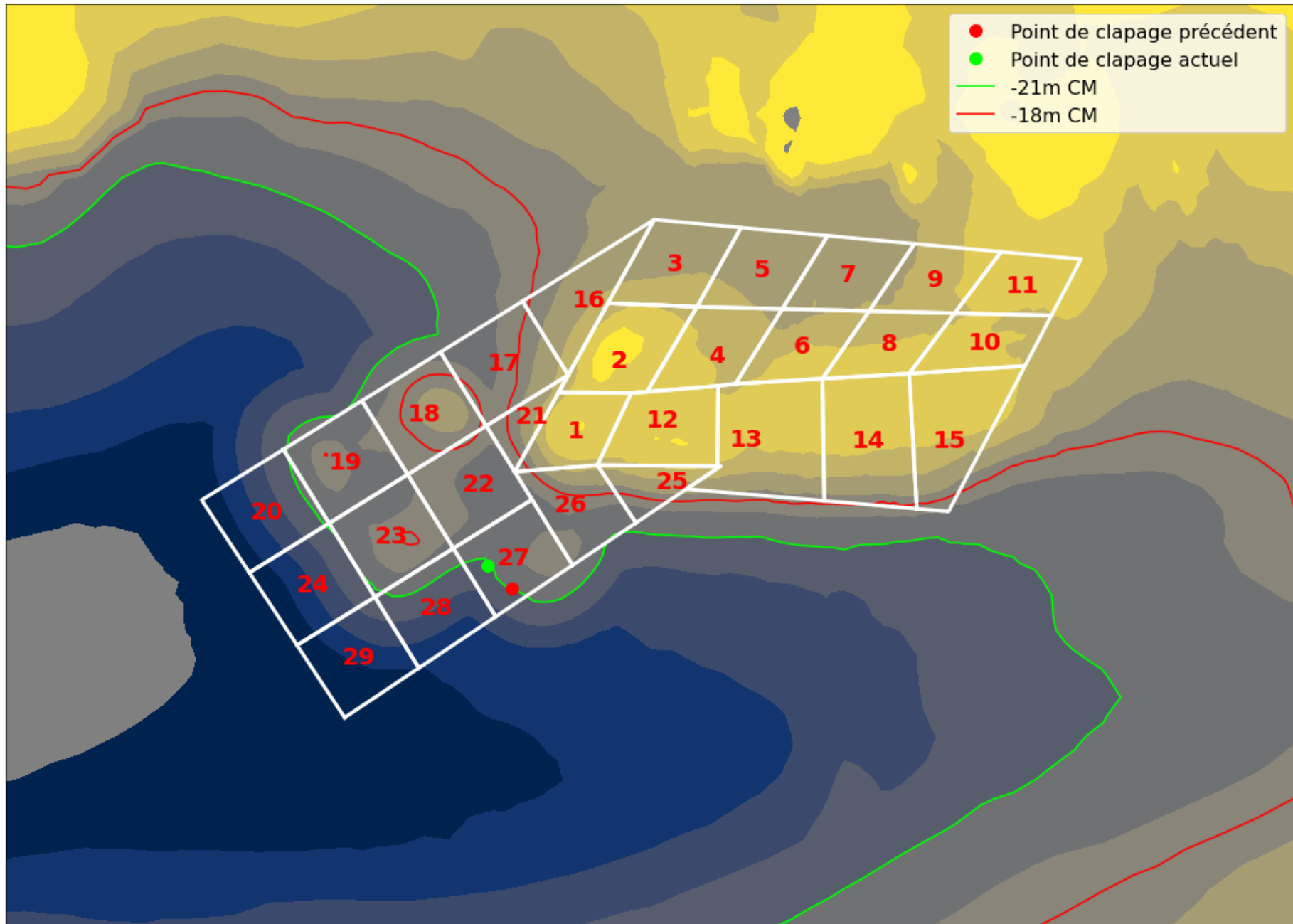




Date de changement de point : 08-03-2033

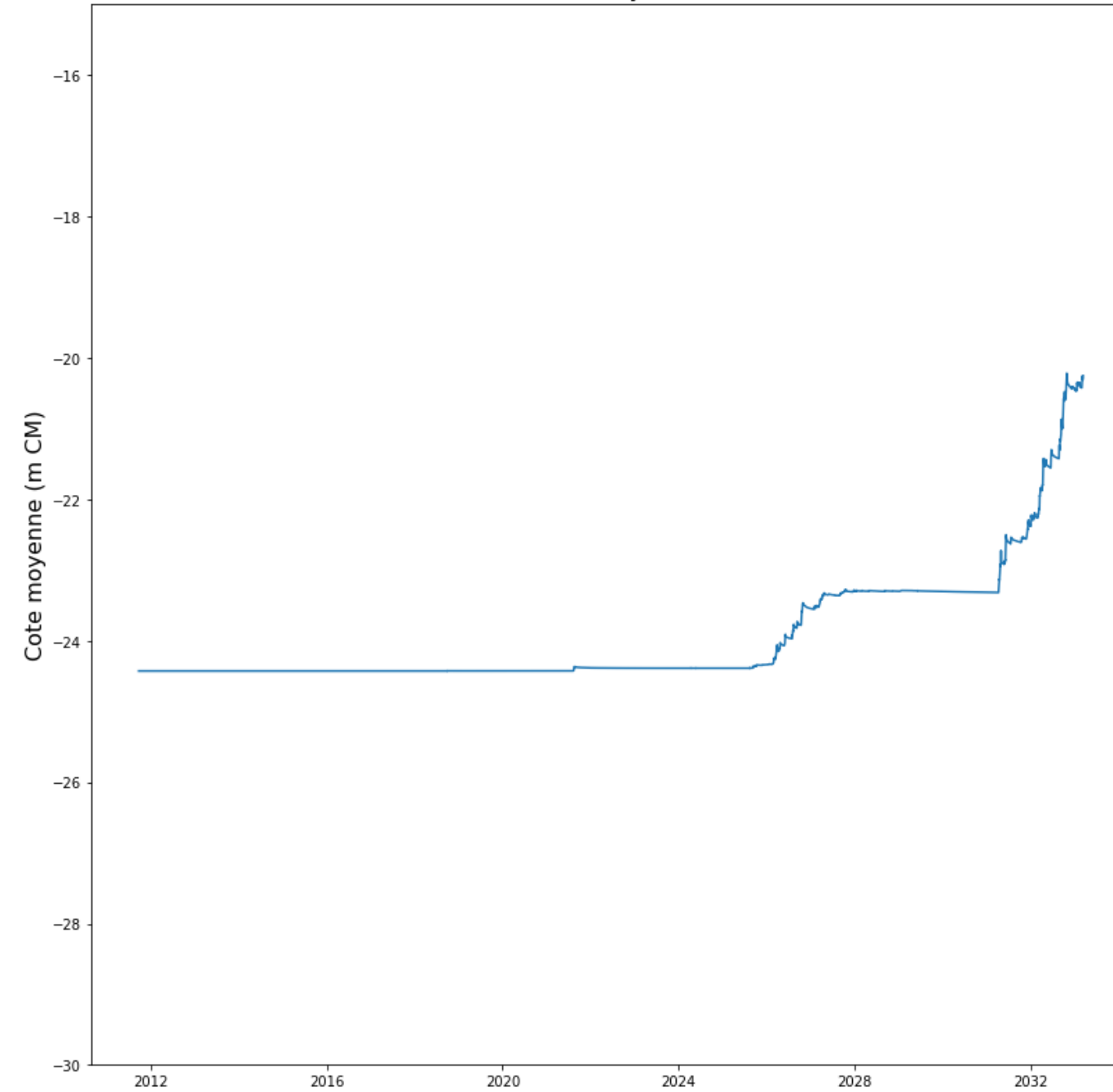
Evolution de la cote moyenne de la zone 27

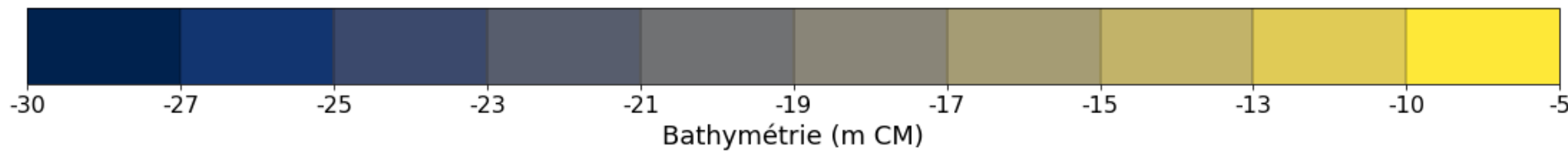
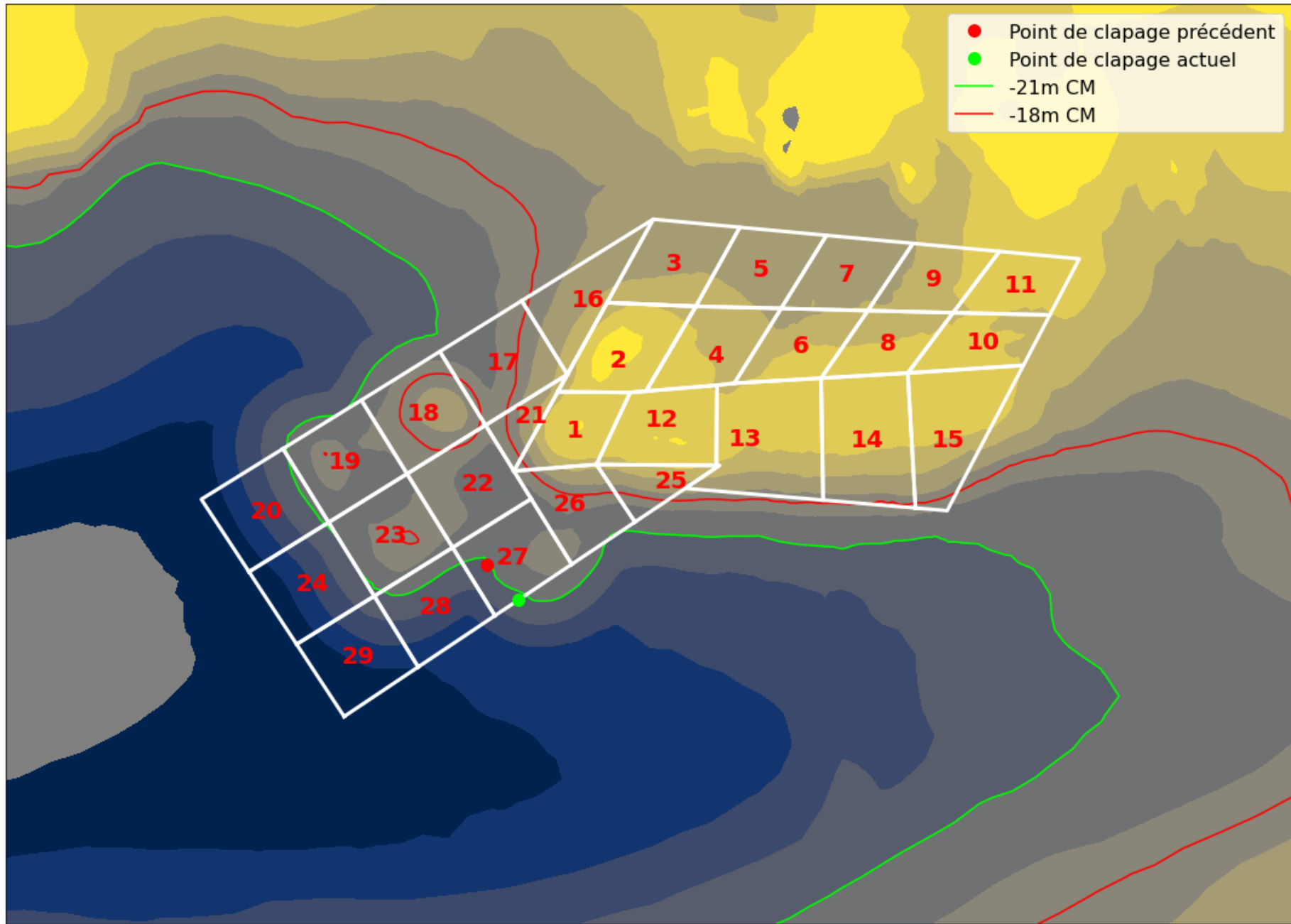




Date de changement de point : 08-03-2033

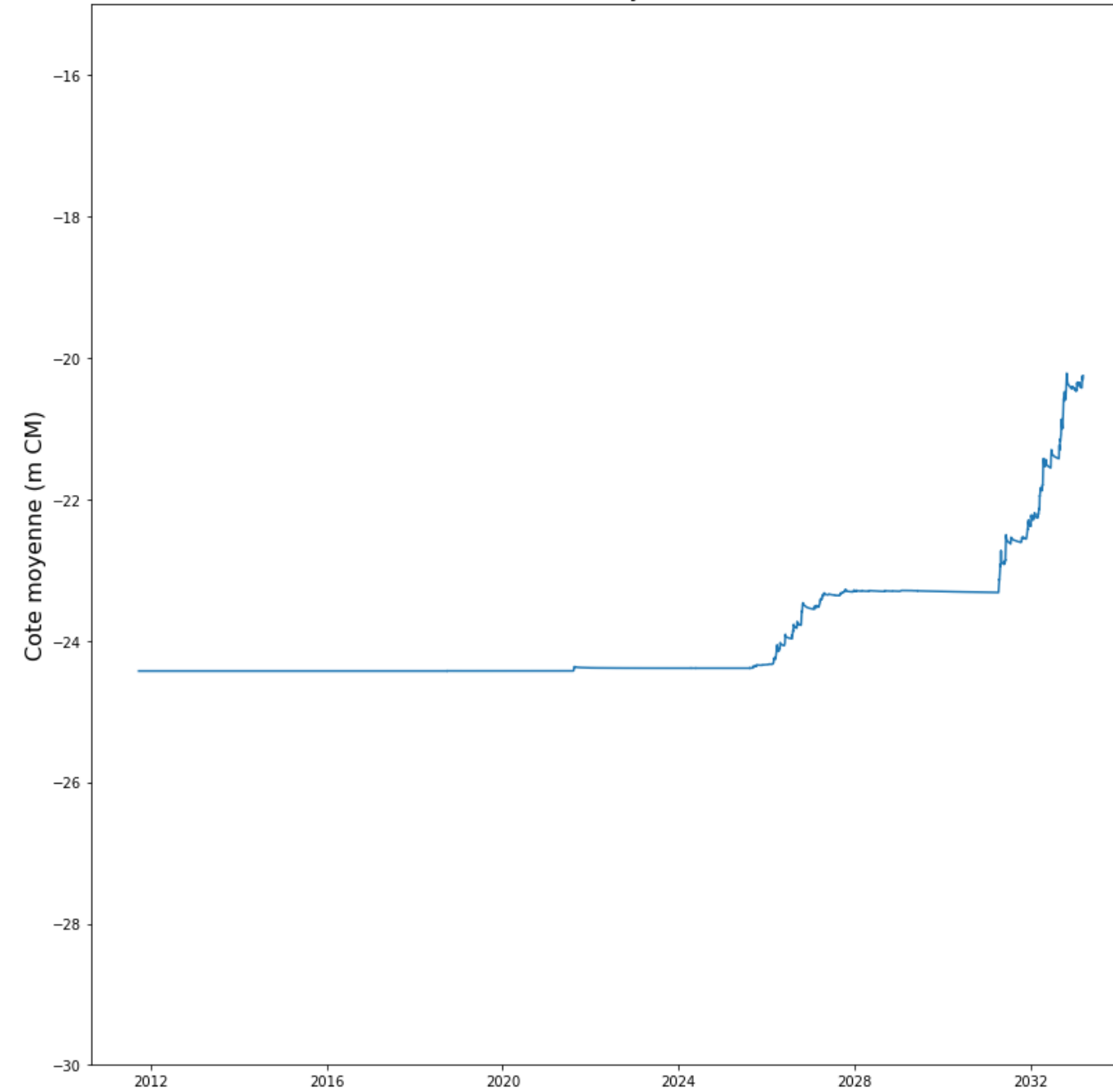
Evolution de la cote moyenne de la zone 27

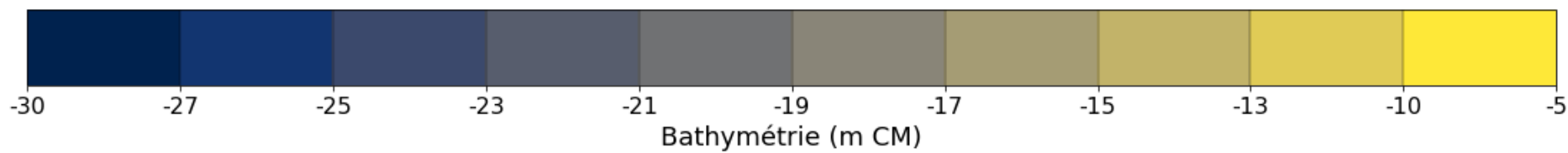
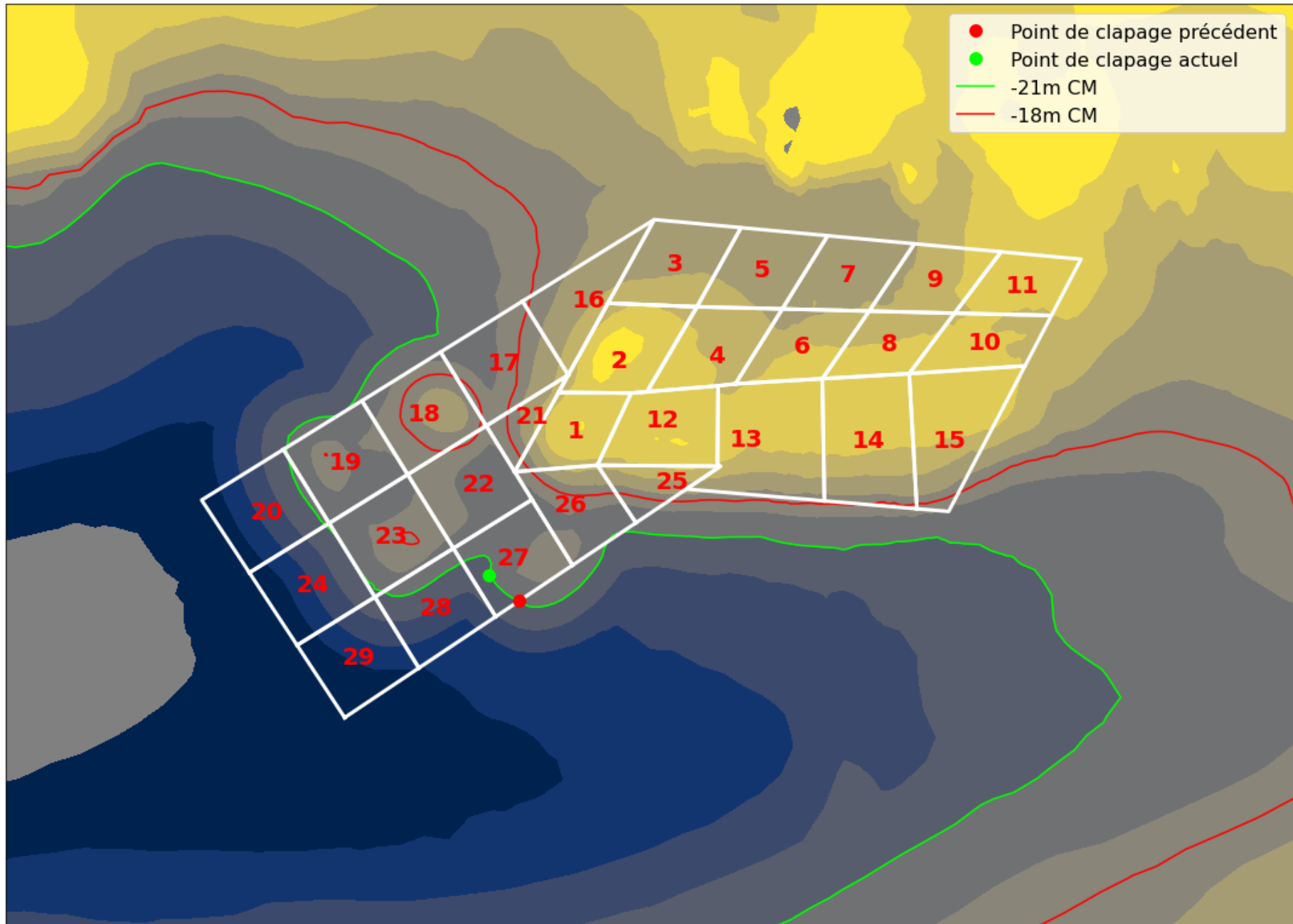




Date de changement de point : 09-03-2033

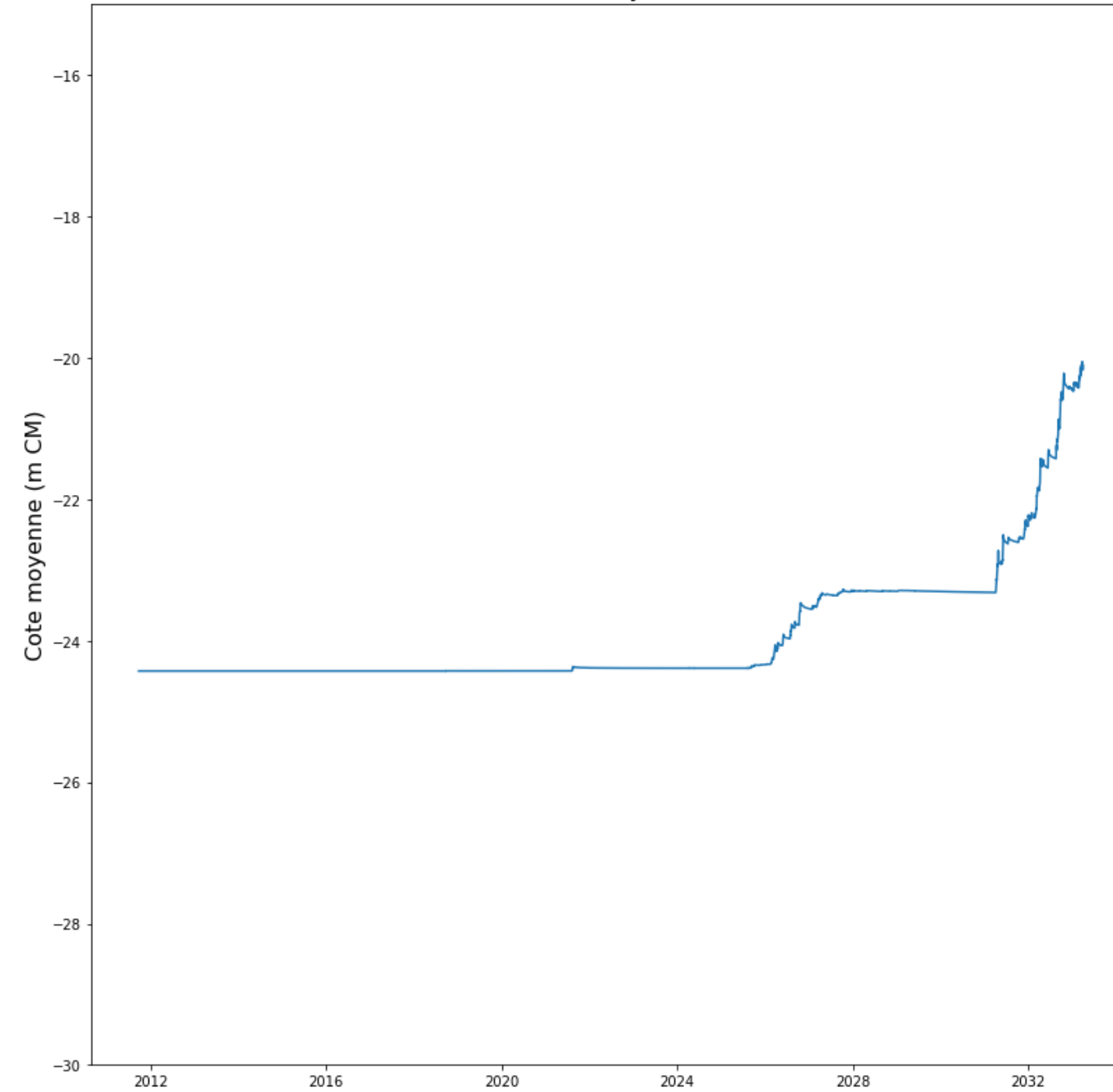
Evolution de la cote moyenne de la zone 27



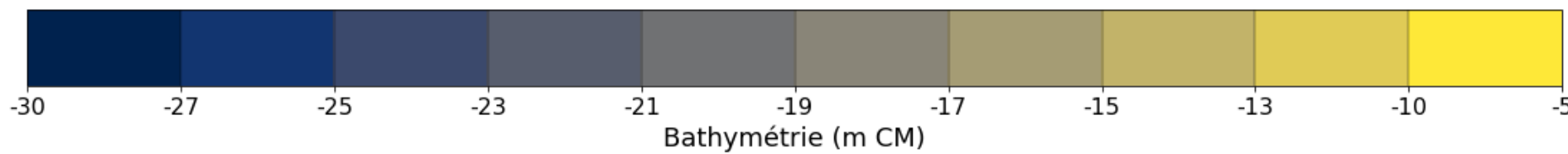
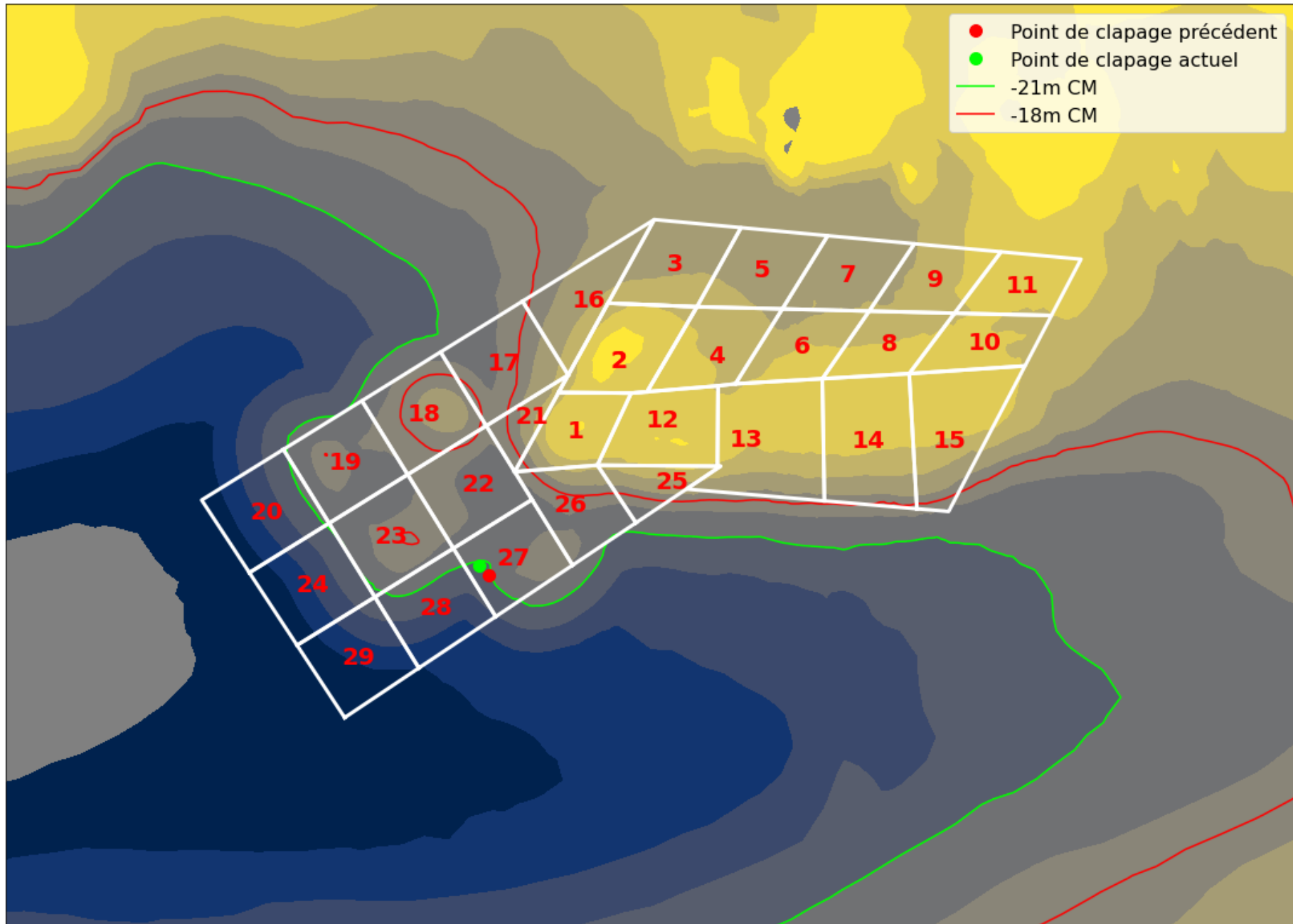


Date de changement de point : 02-04-2033

Evolution de la cote moyenne de la zone 27

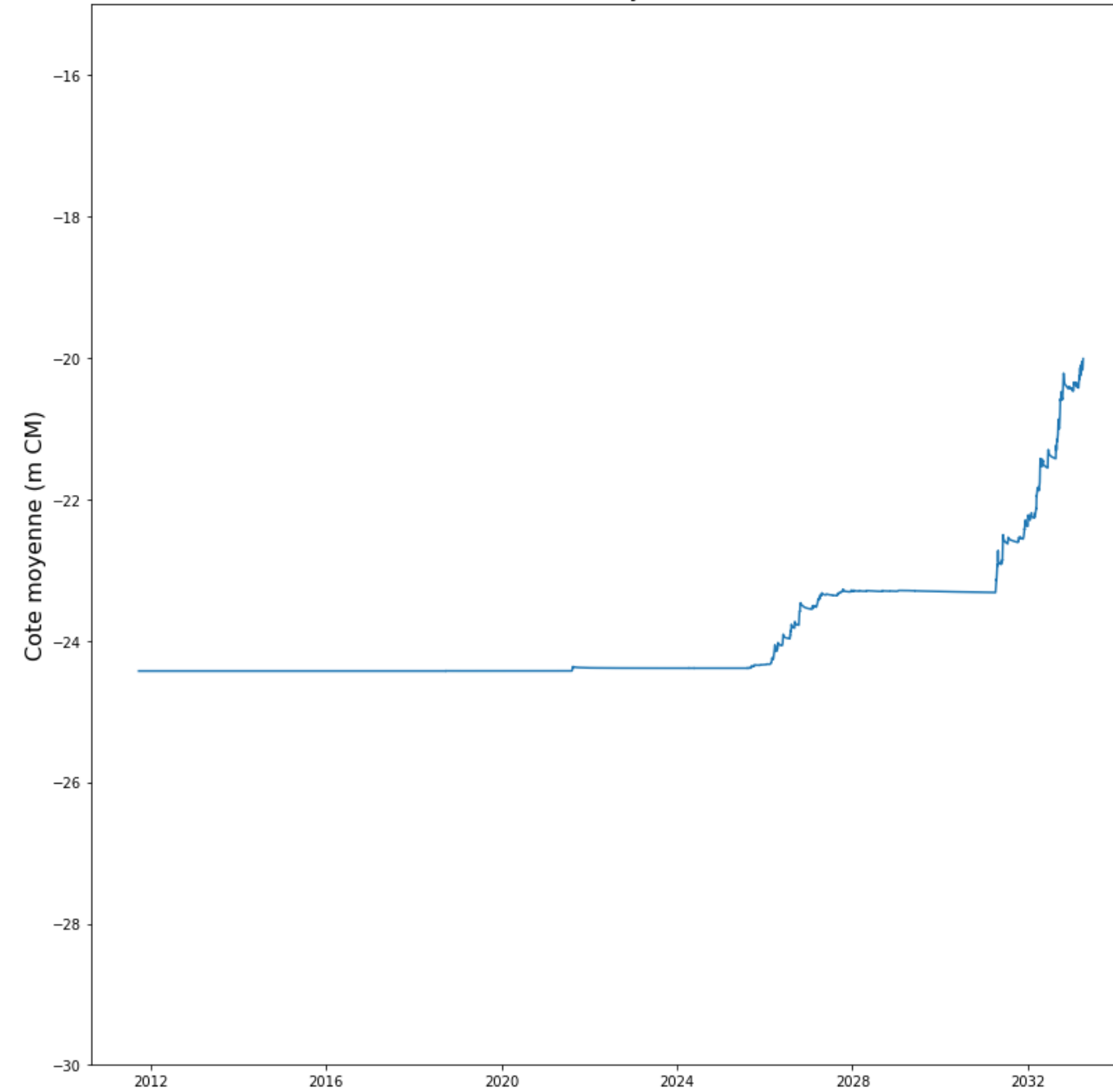


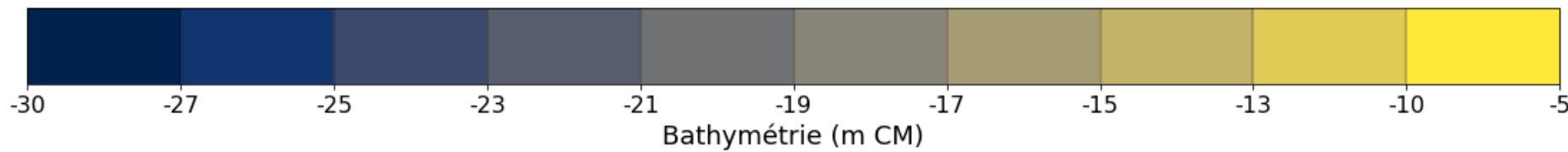
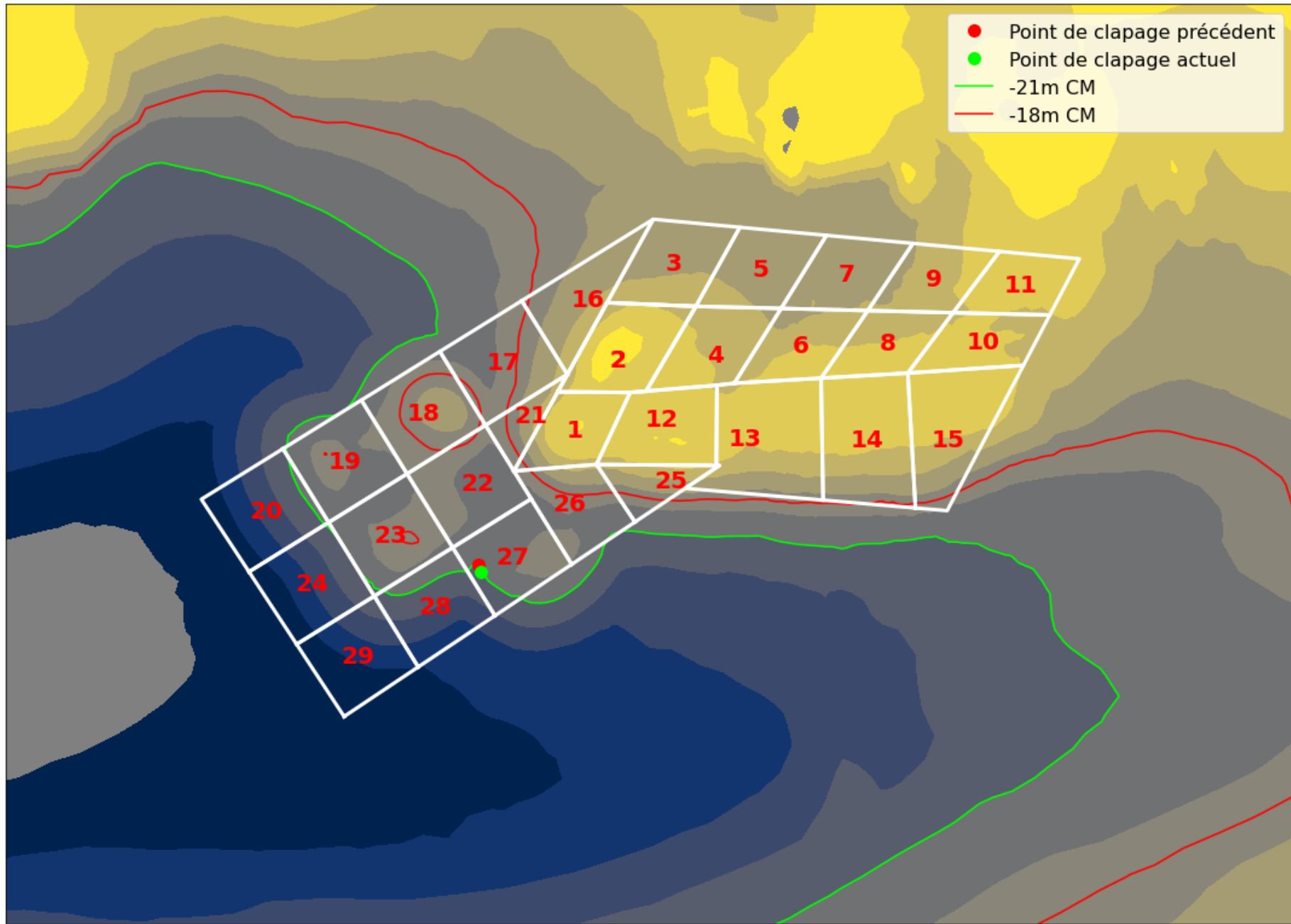




Date de changement de point : 04-04-2033

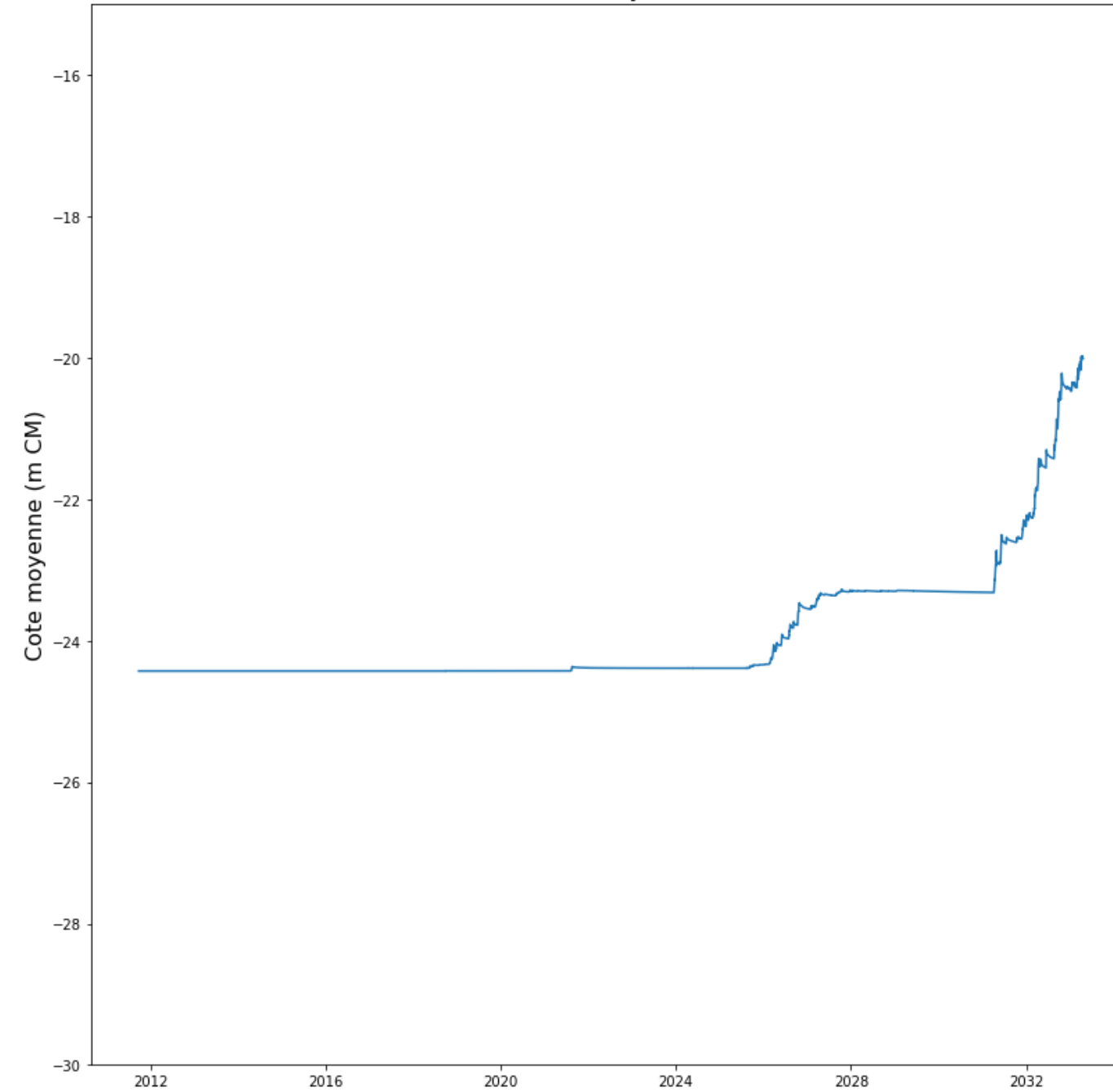
Evolution de la cote moyenne de la zone 27

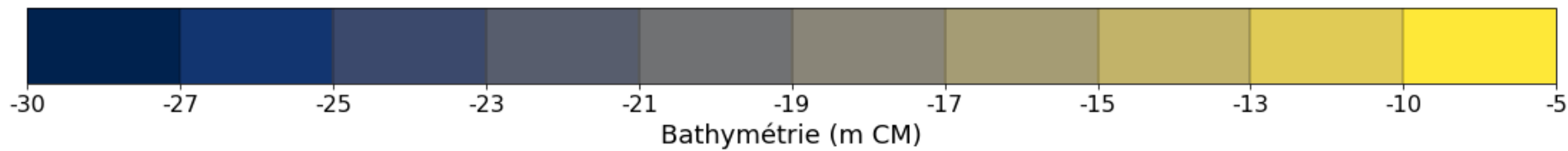
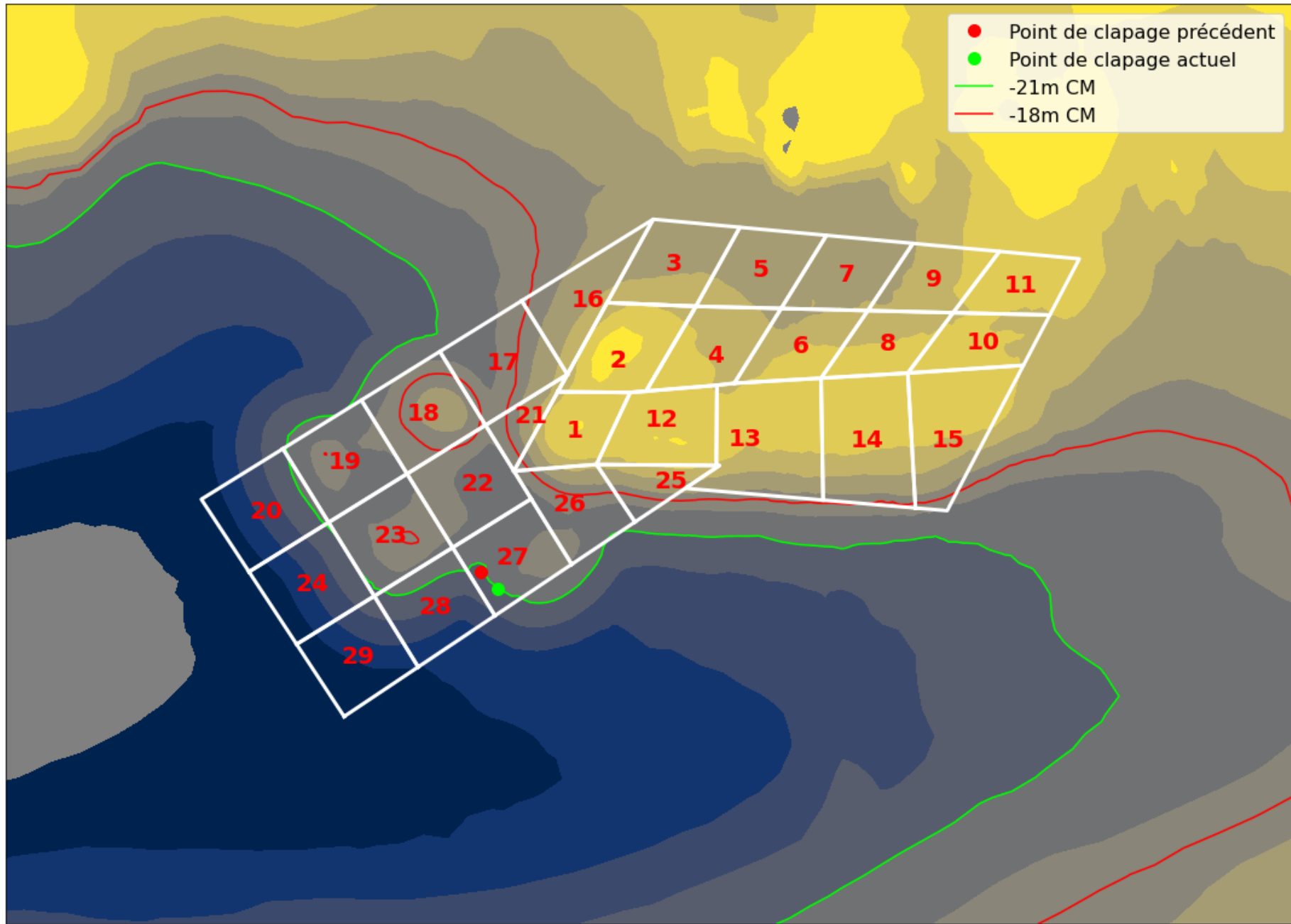




Date de changement de point : 19-04-2033

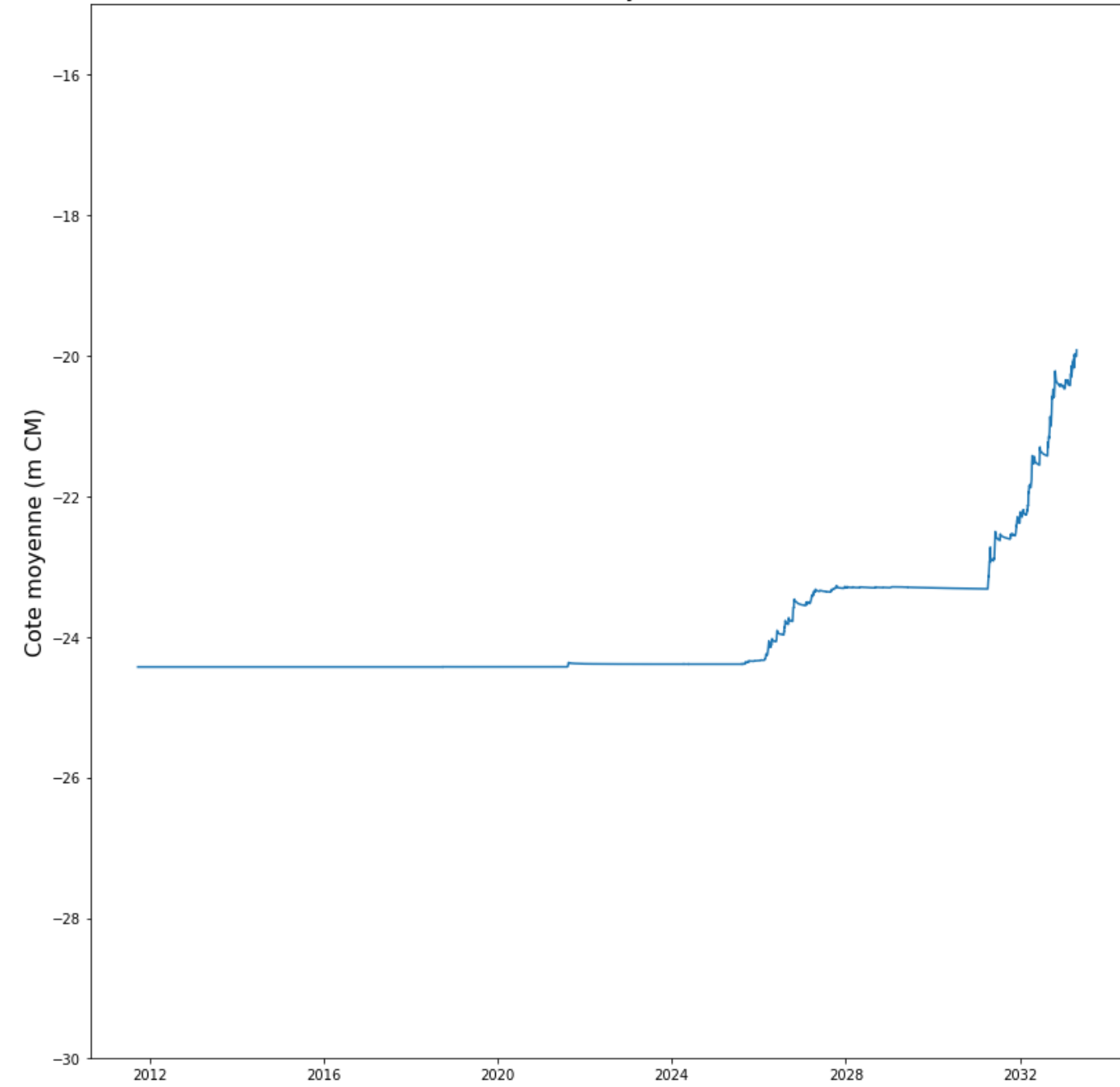
Evolution de la cote moyenne de la zone 27

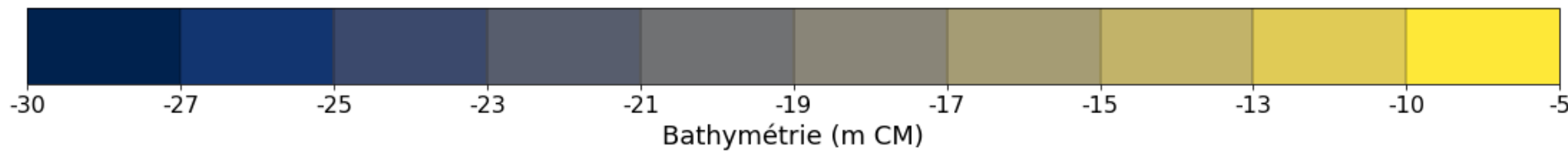
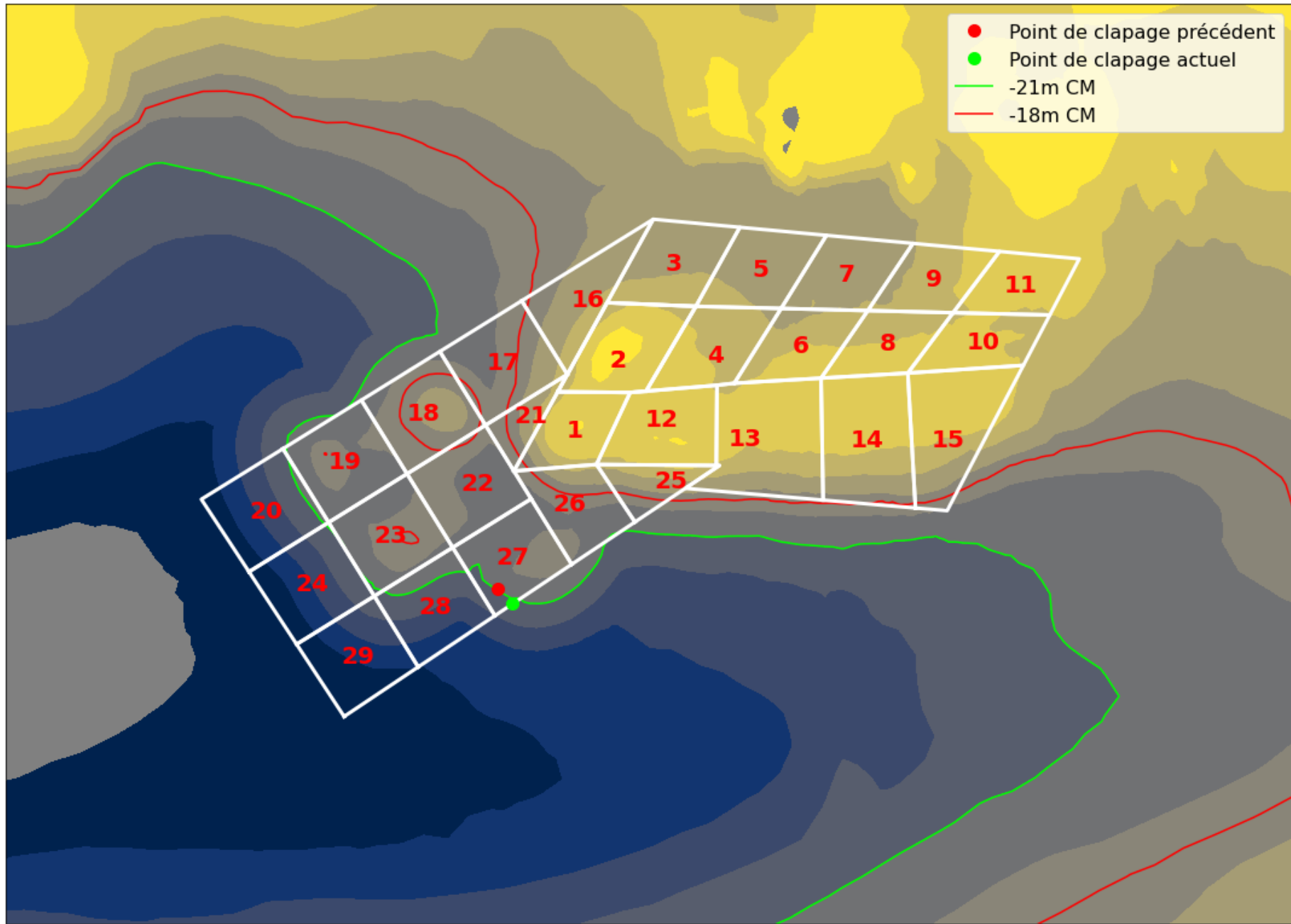




Date de changement de point : 21-04-2033

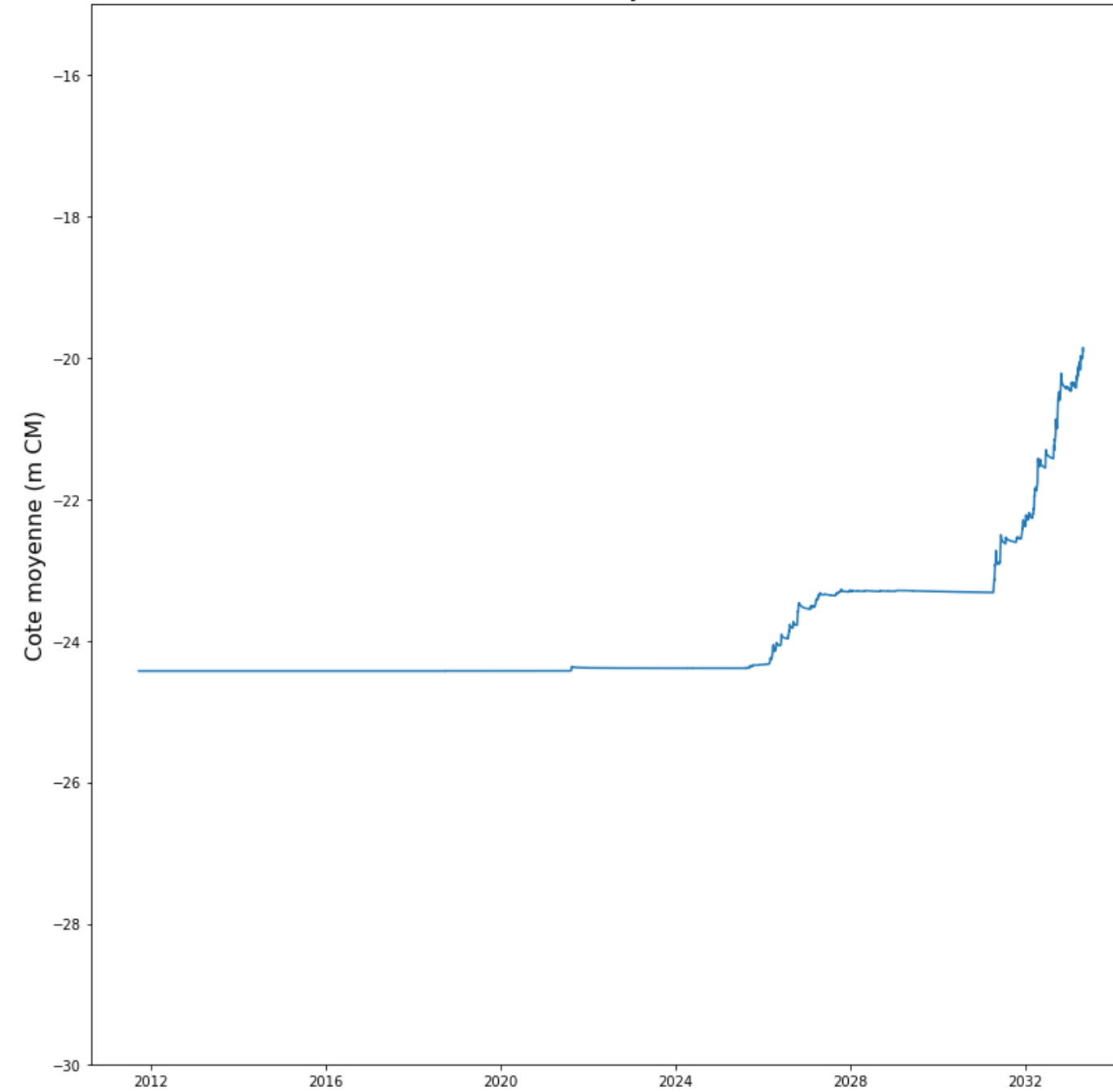
Evolution de la cote moyenne de la zone 27

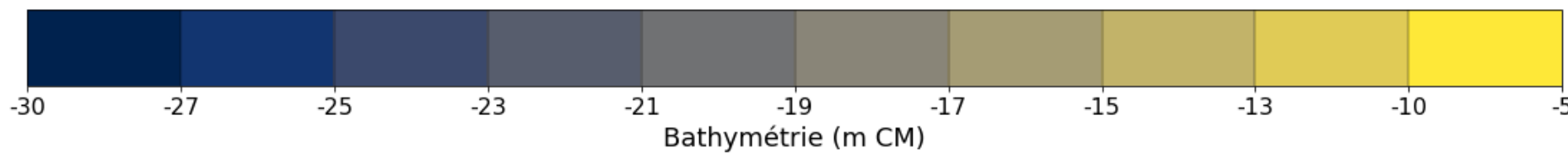
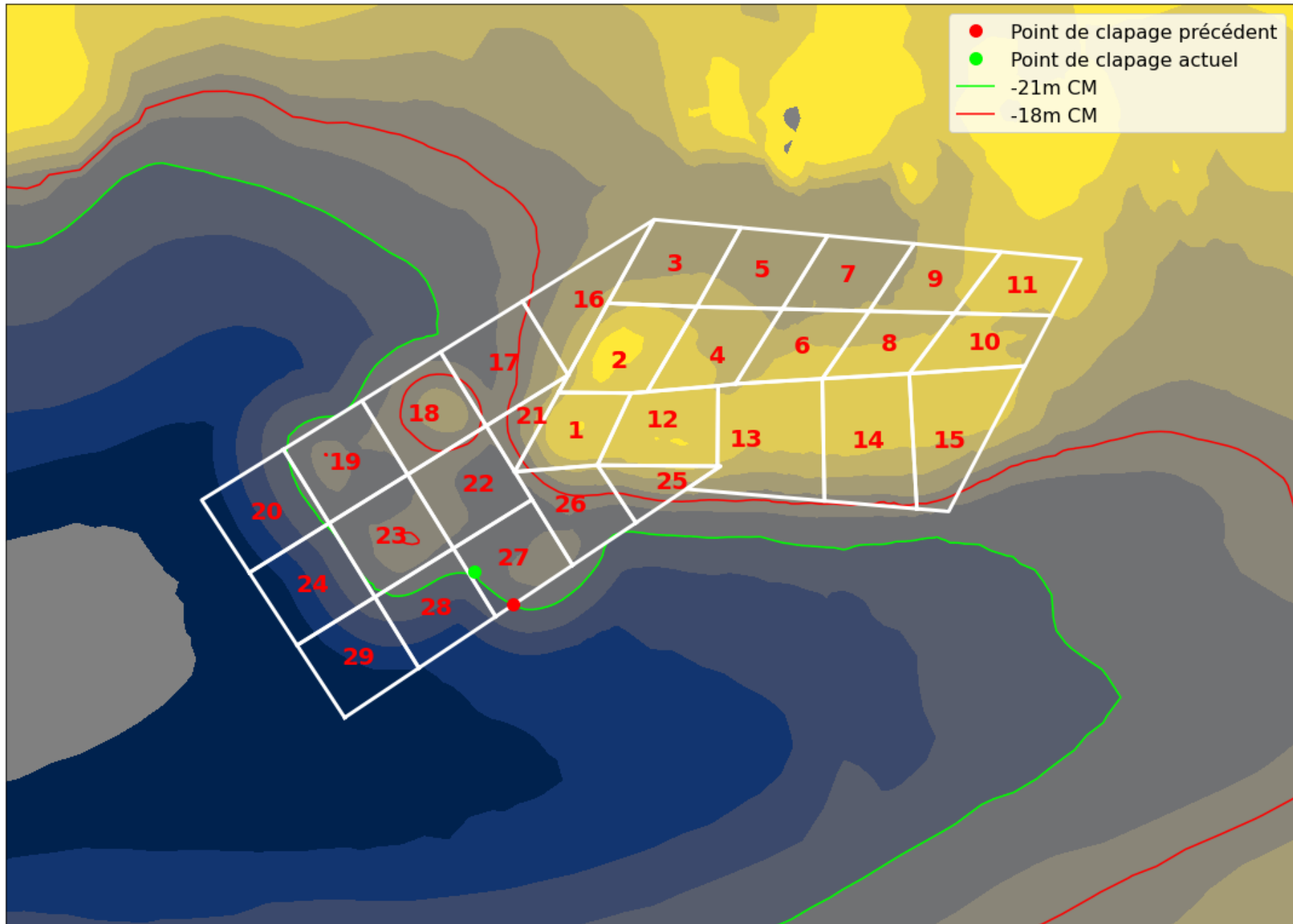




Date de changement de point : 25-04-2033

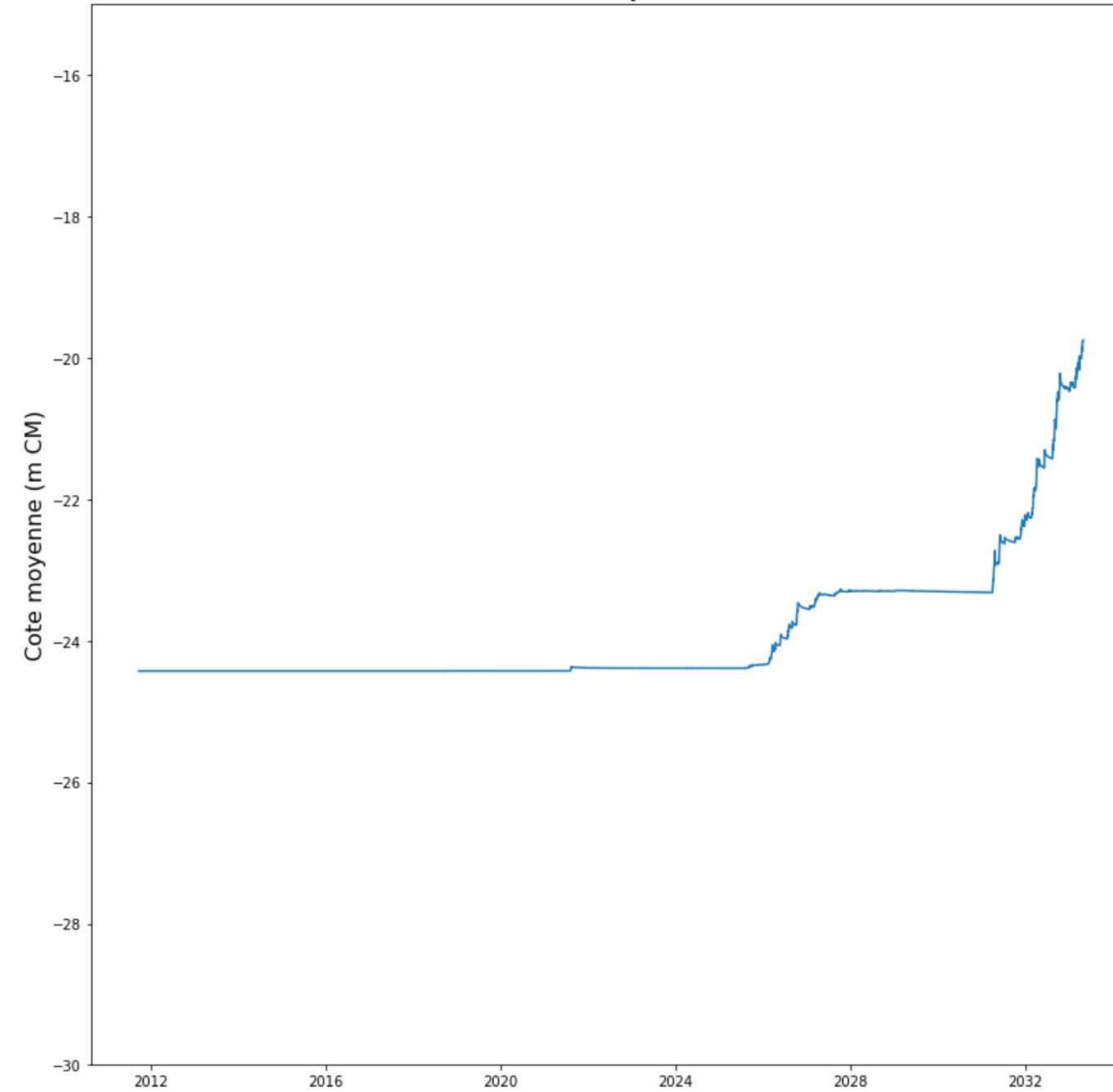
Evolution de la cote moyenne de la zone 27

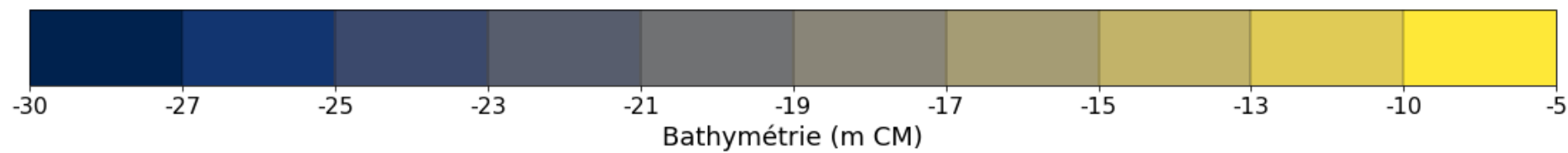
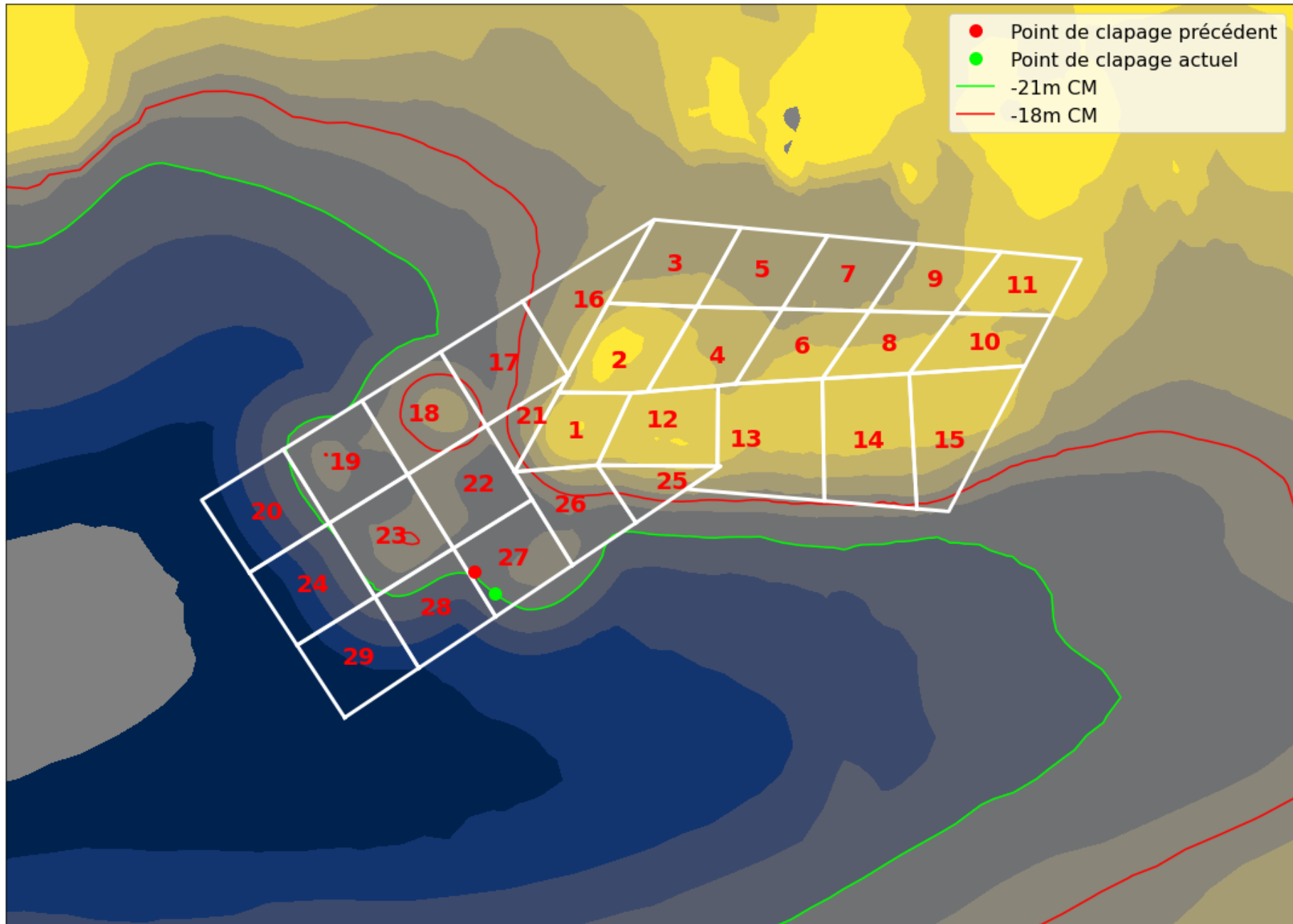




Date de changement de point : 03-05-2033

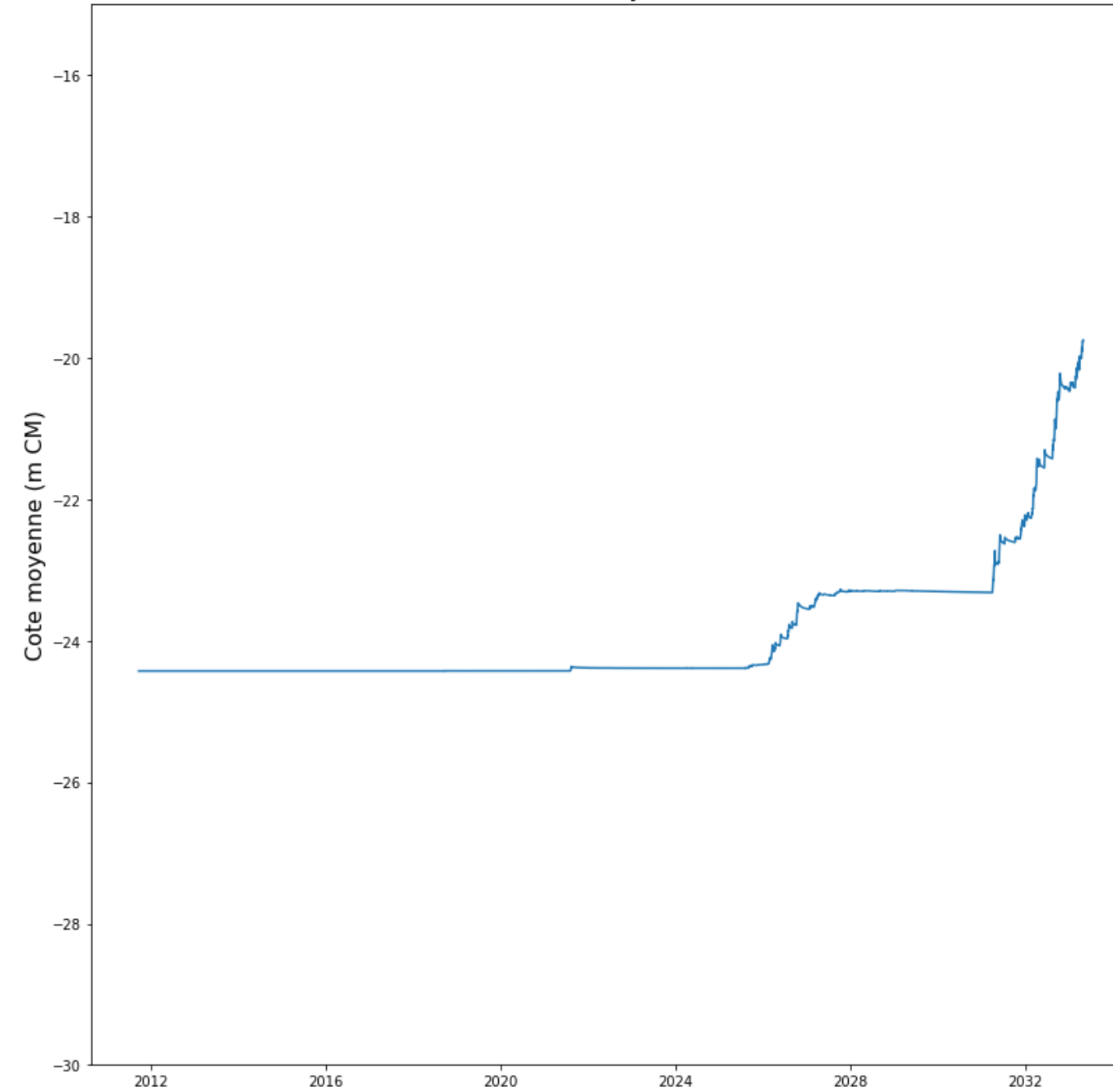
Evolution de la cote moyenne de la zone 27



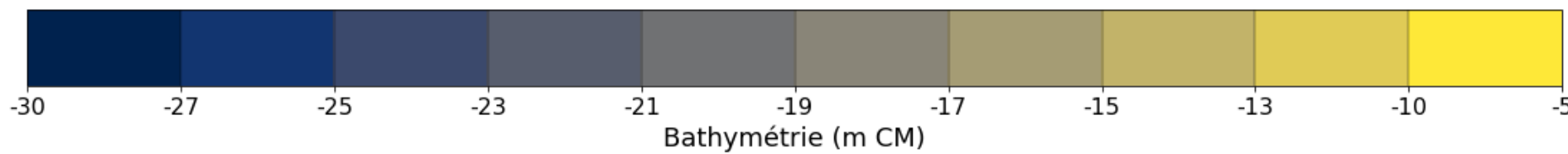
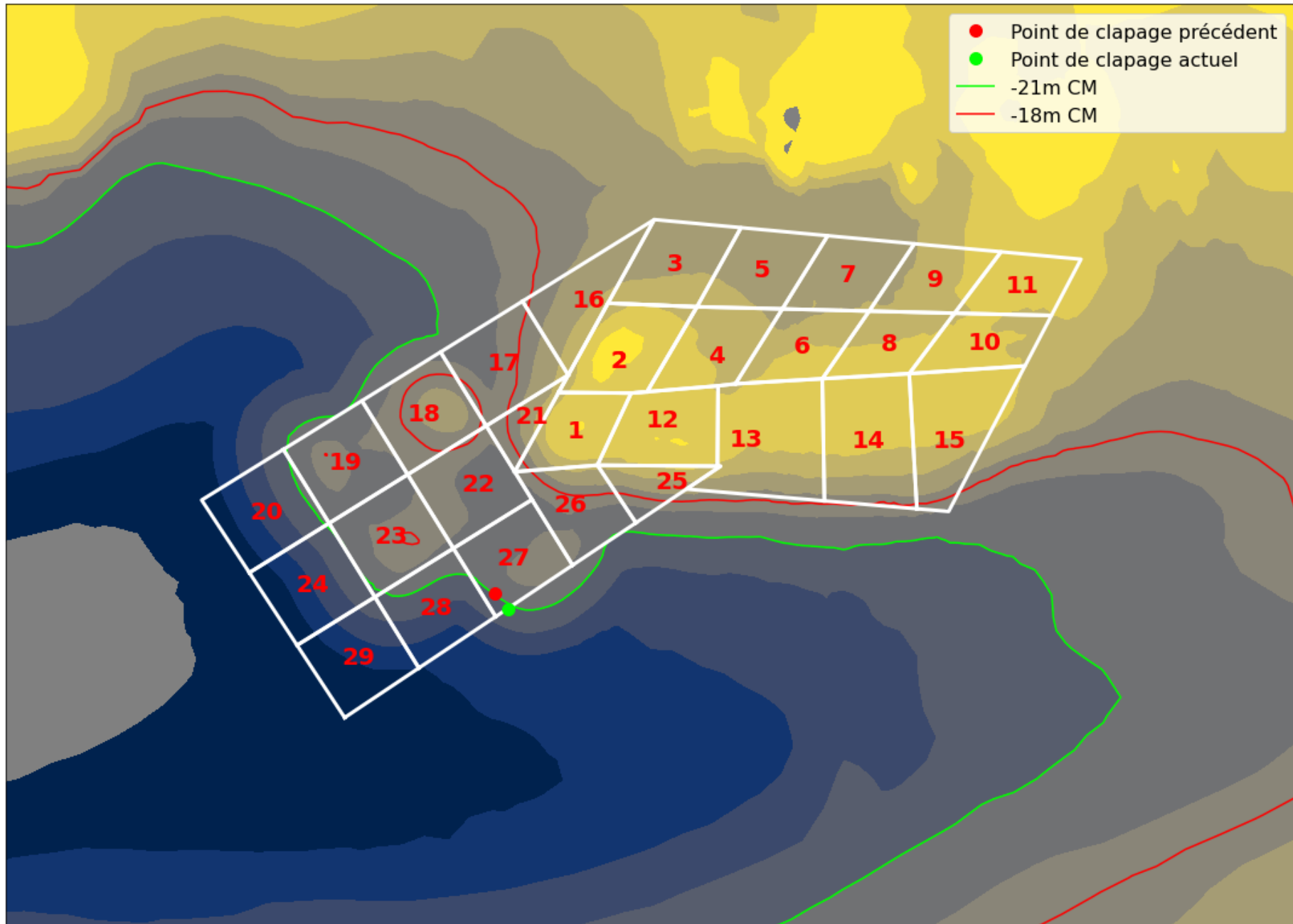


Date de changement de point : 04-05-2033

Evolution de la cote moyenne de la zone 27

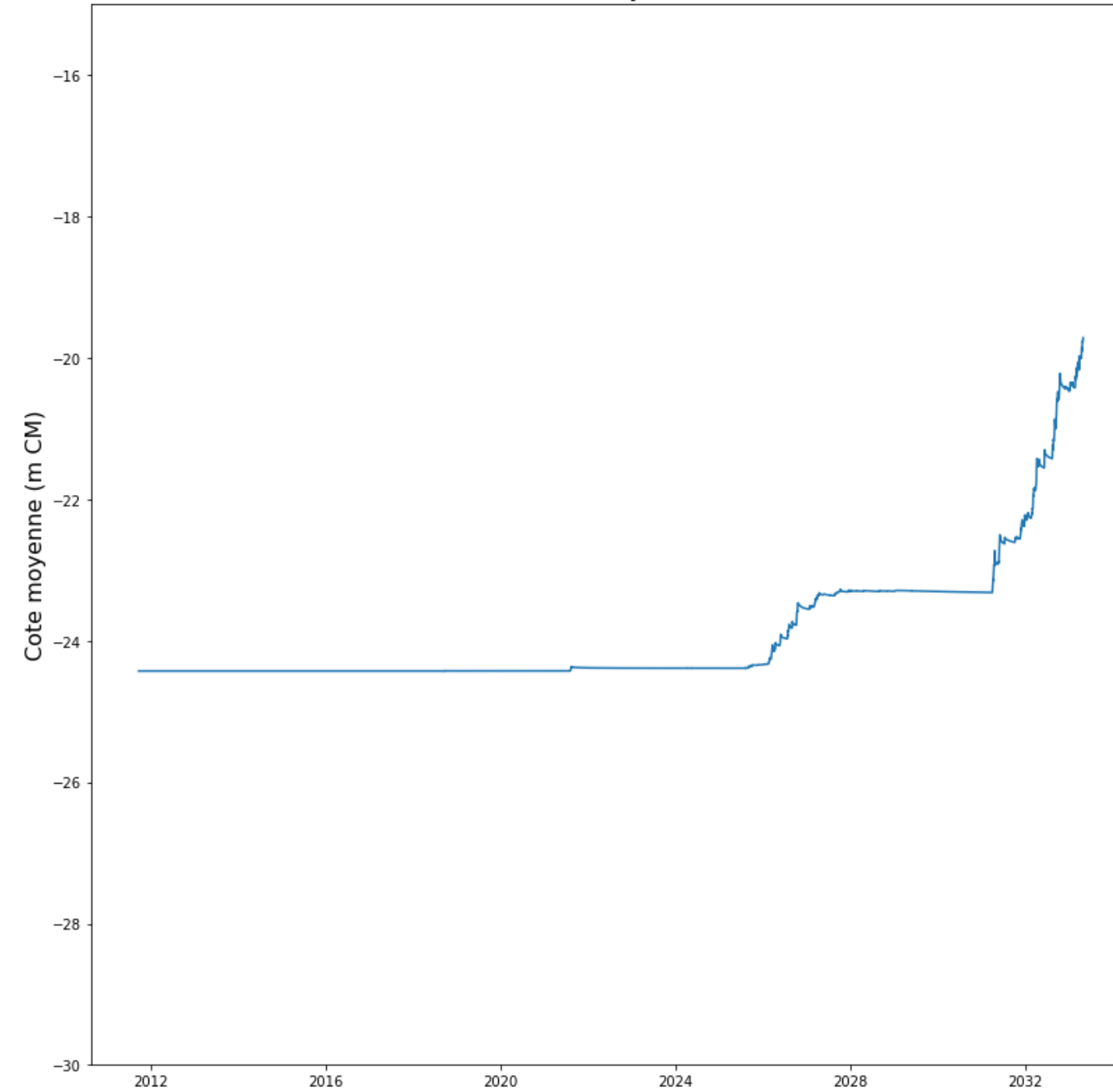


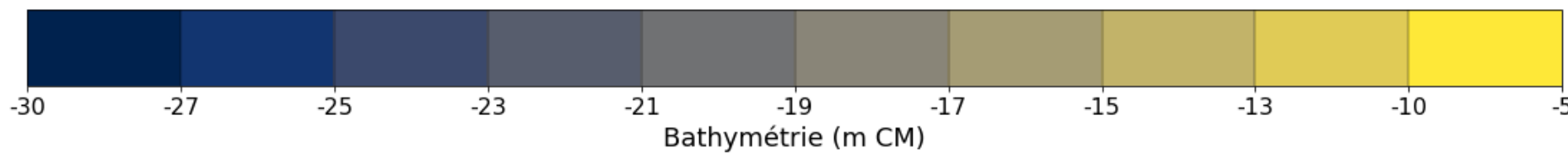
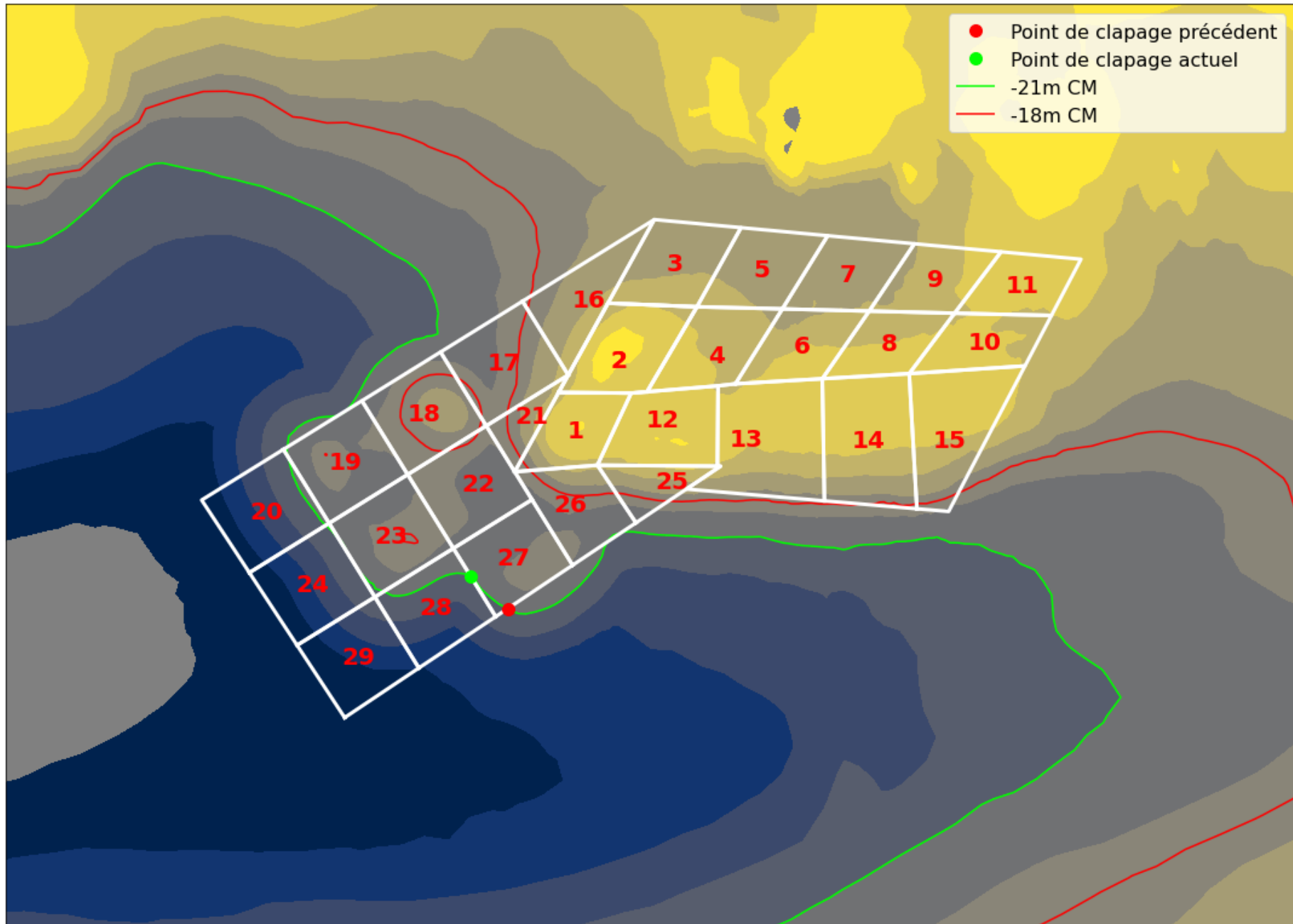




Date de changement de point : 04-05-2033

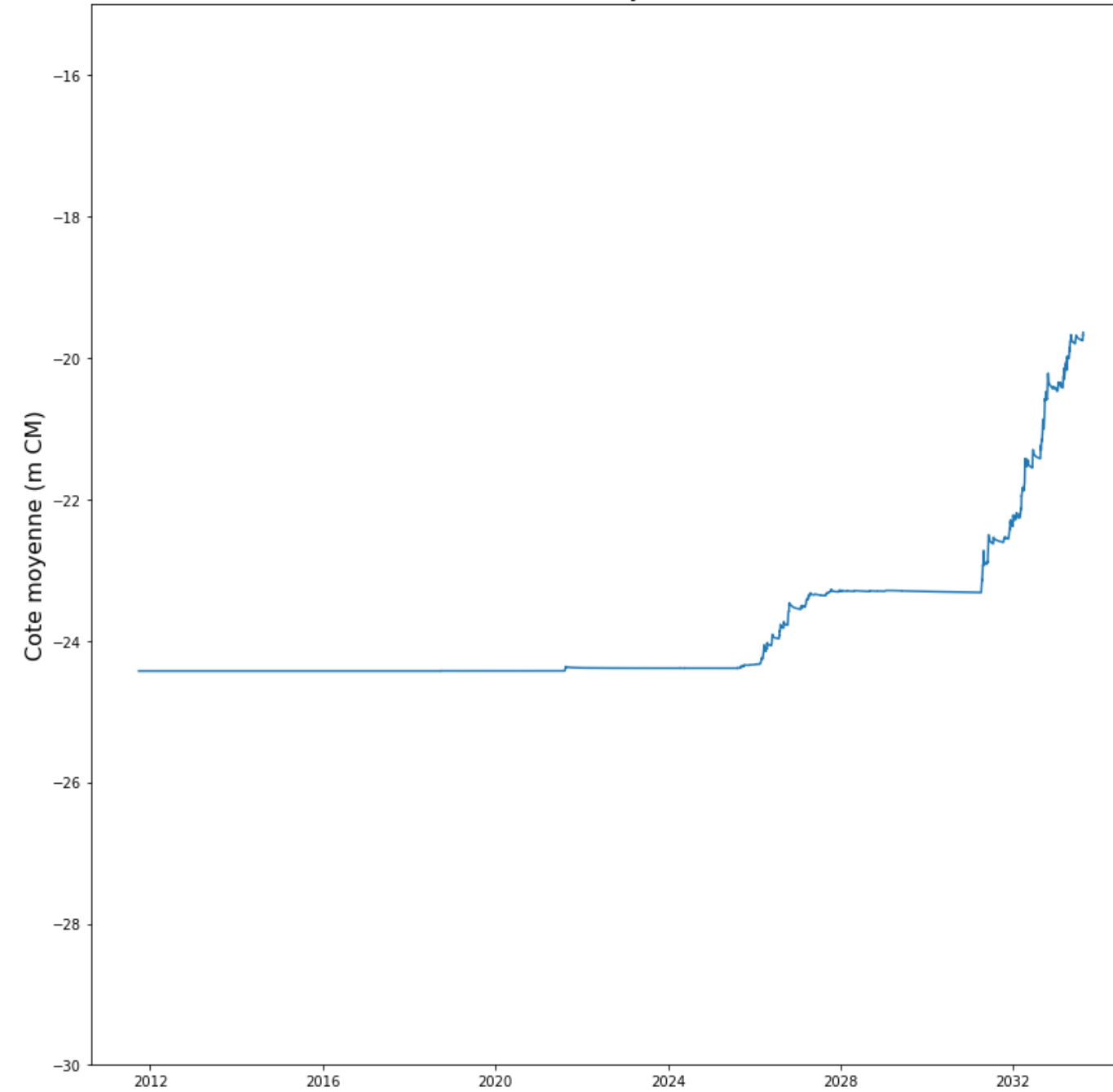
Evolution de la cote moyenne de la zone 27

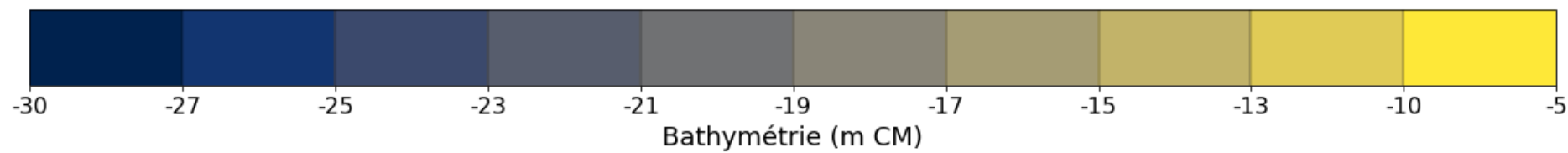
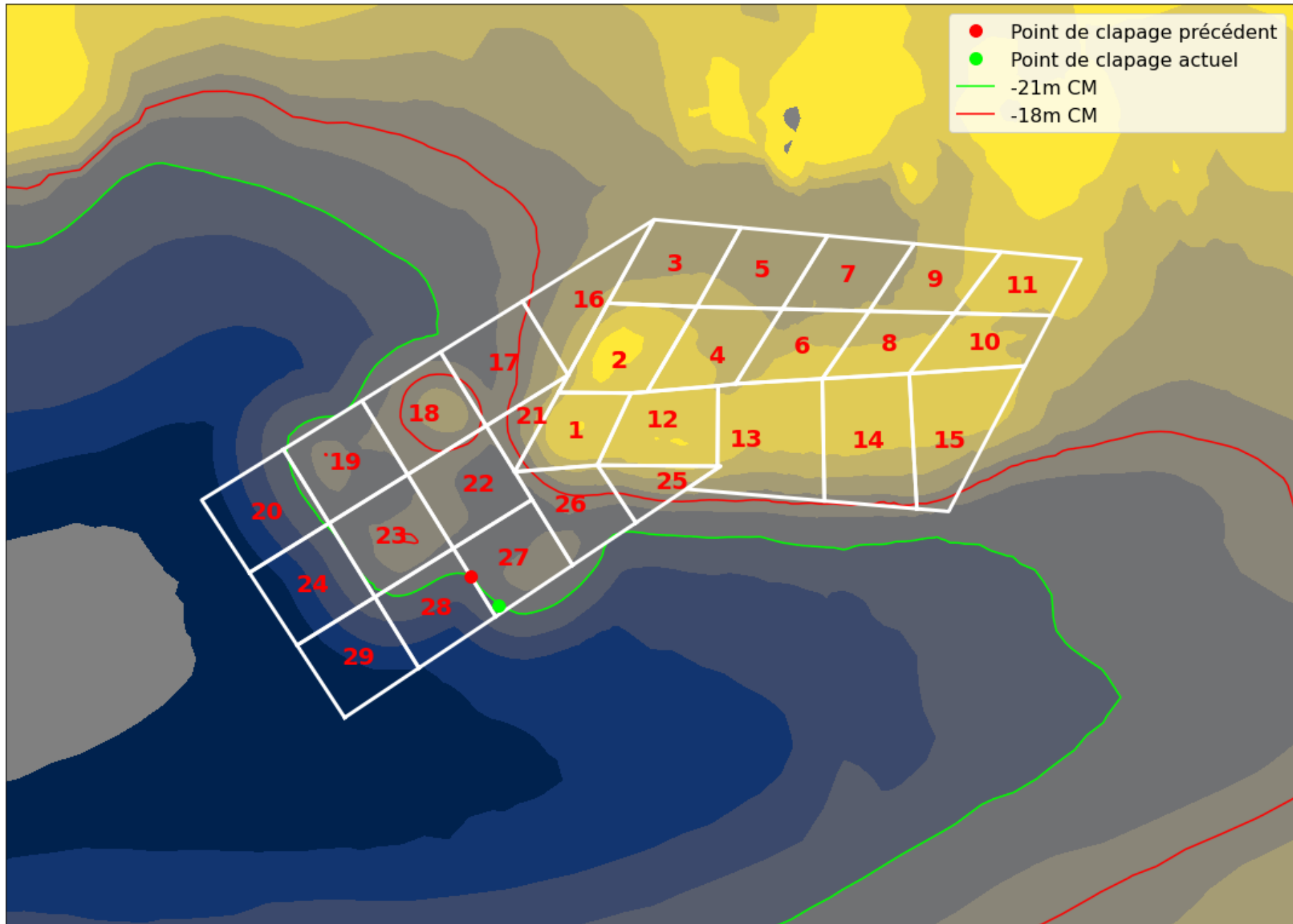




Date de changement de point : 17-08-2033

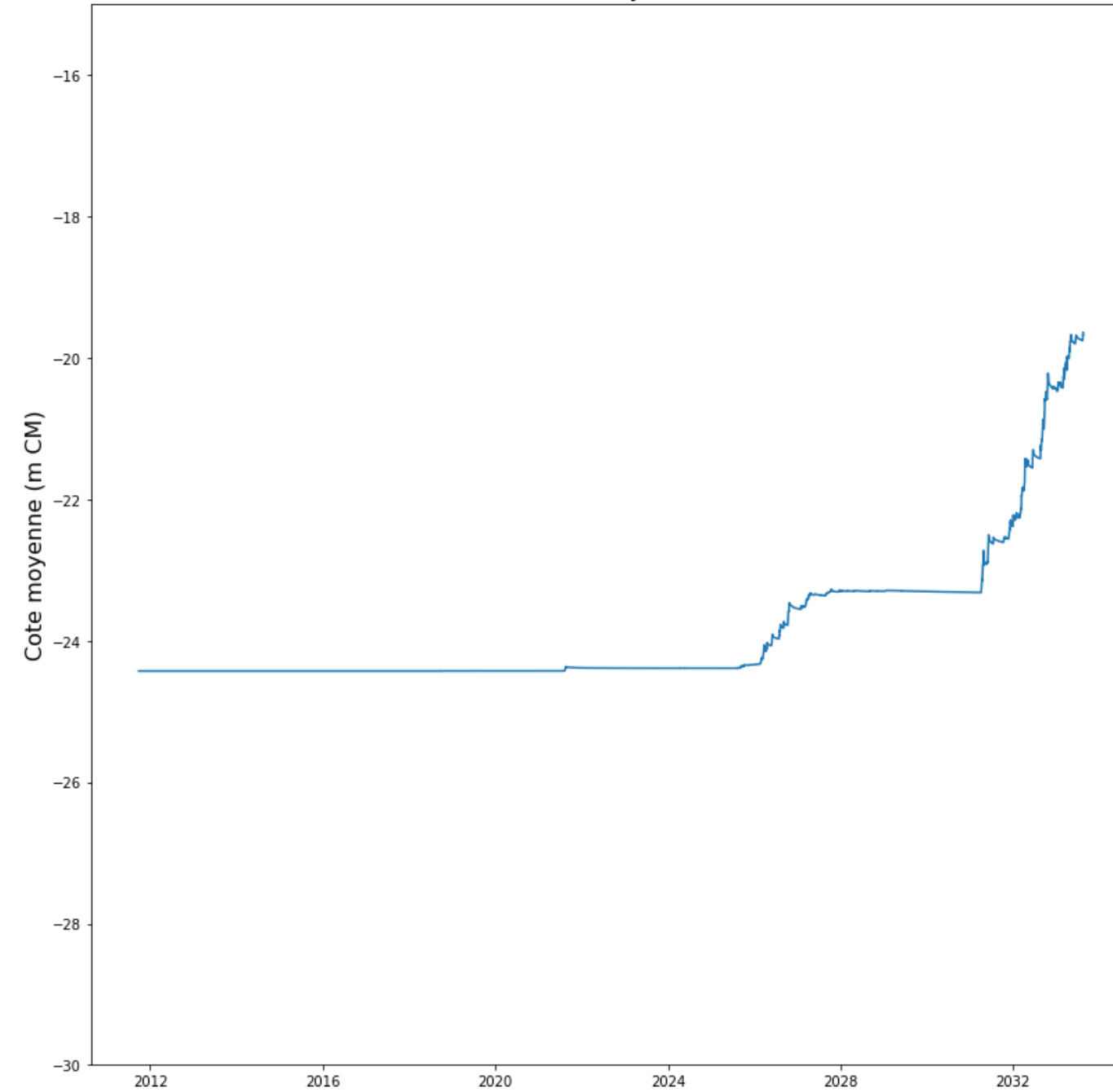
Evolution de la cote moyenne de la zone 27

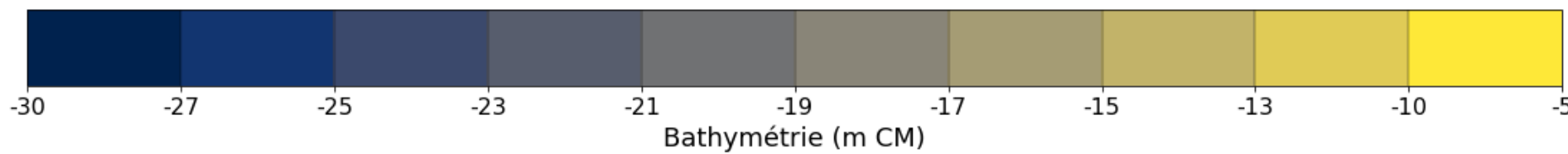
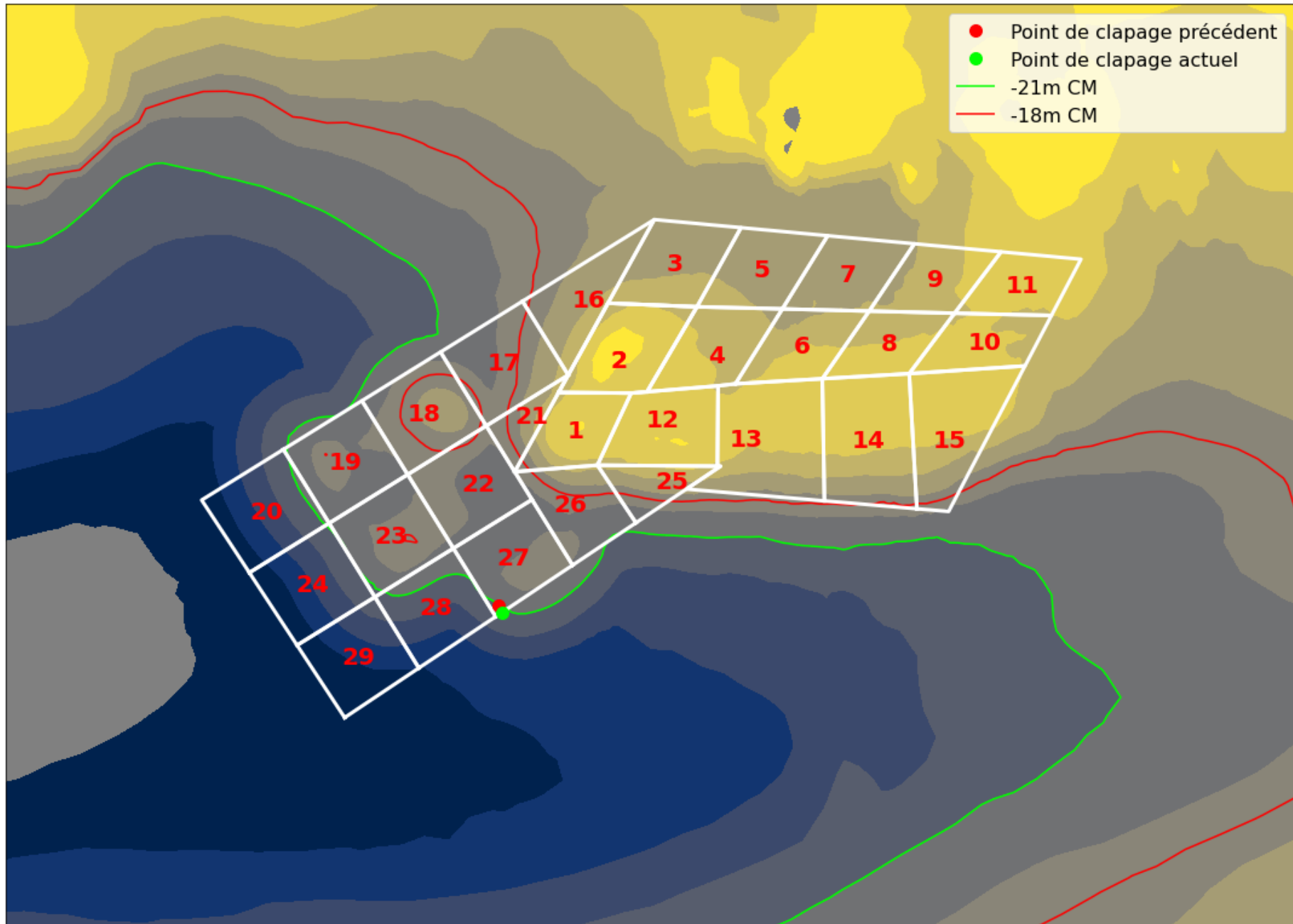




Date de changement de point : 17-08-2033

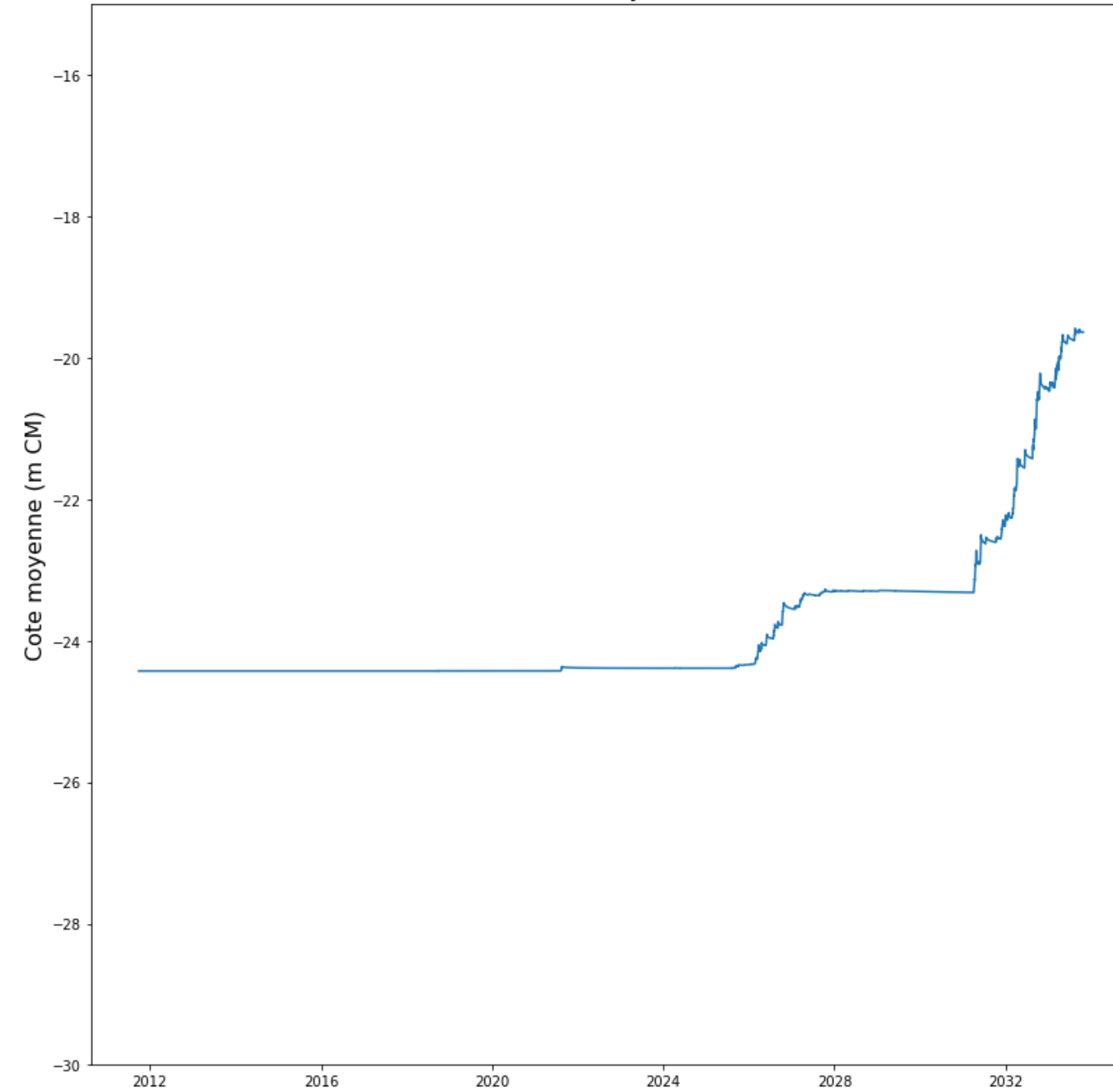
Evolution de la cote moyenne de la zone 27

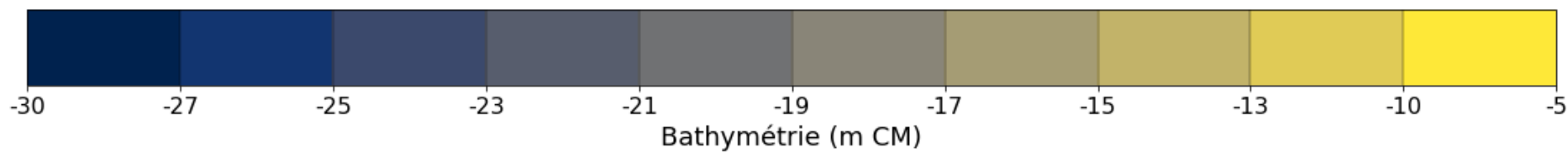
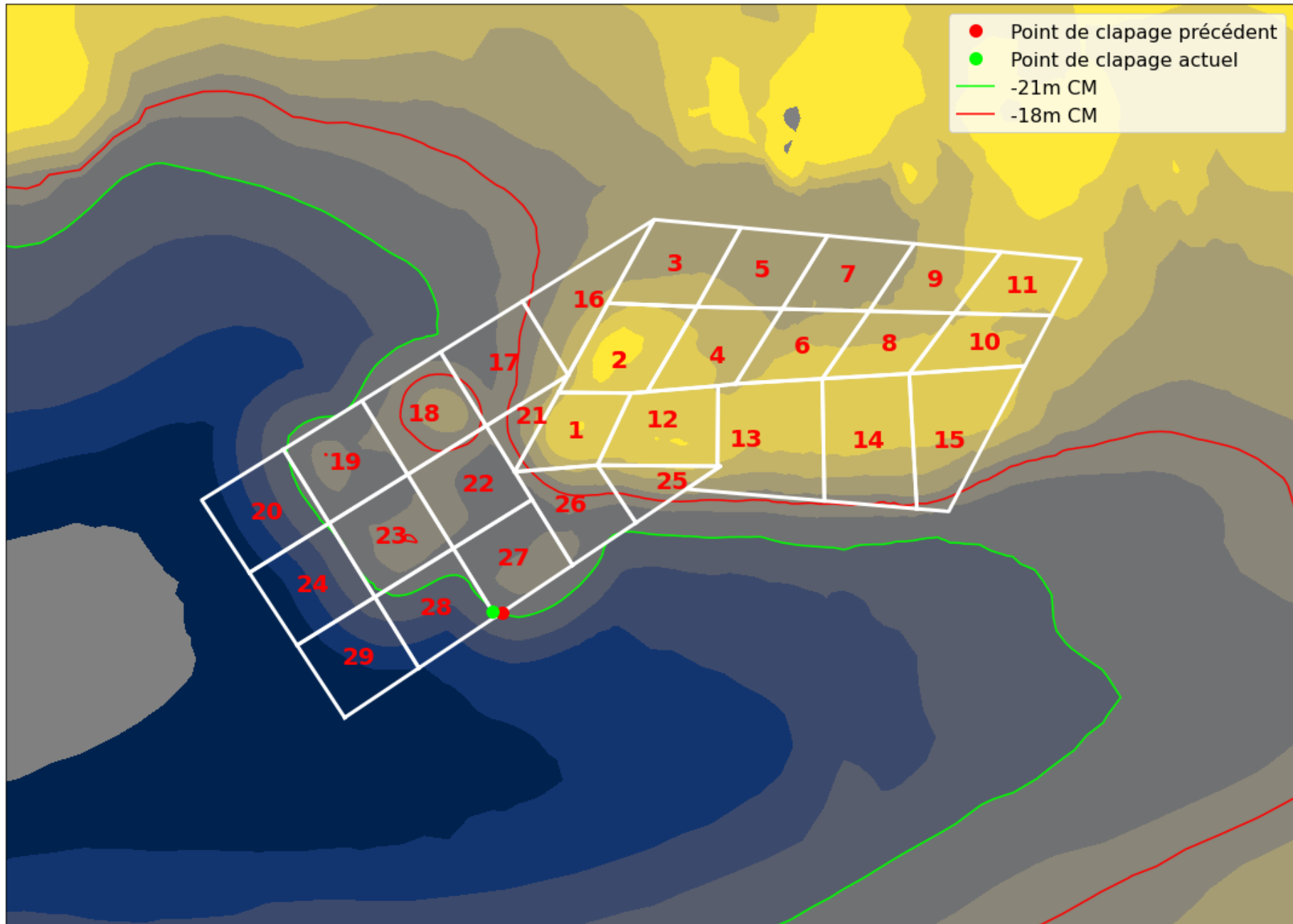




Date de changement de point : 27-10-2033

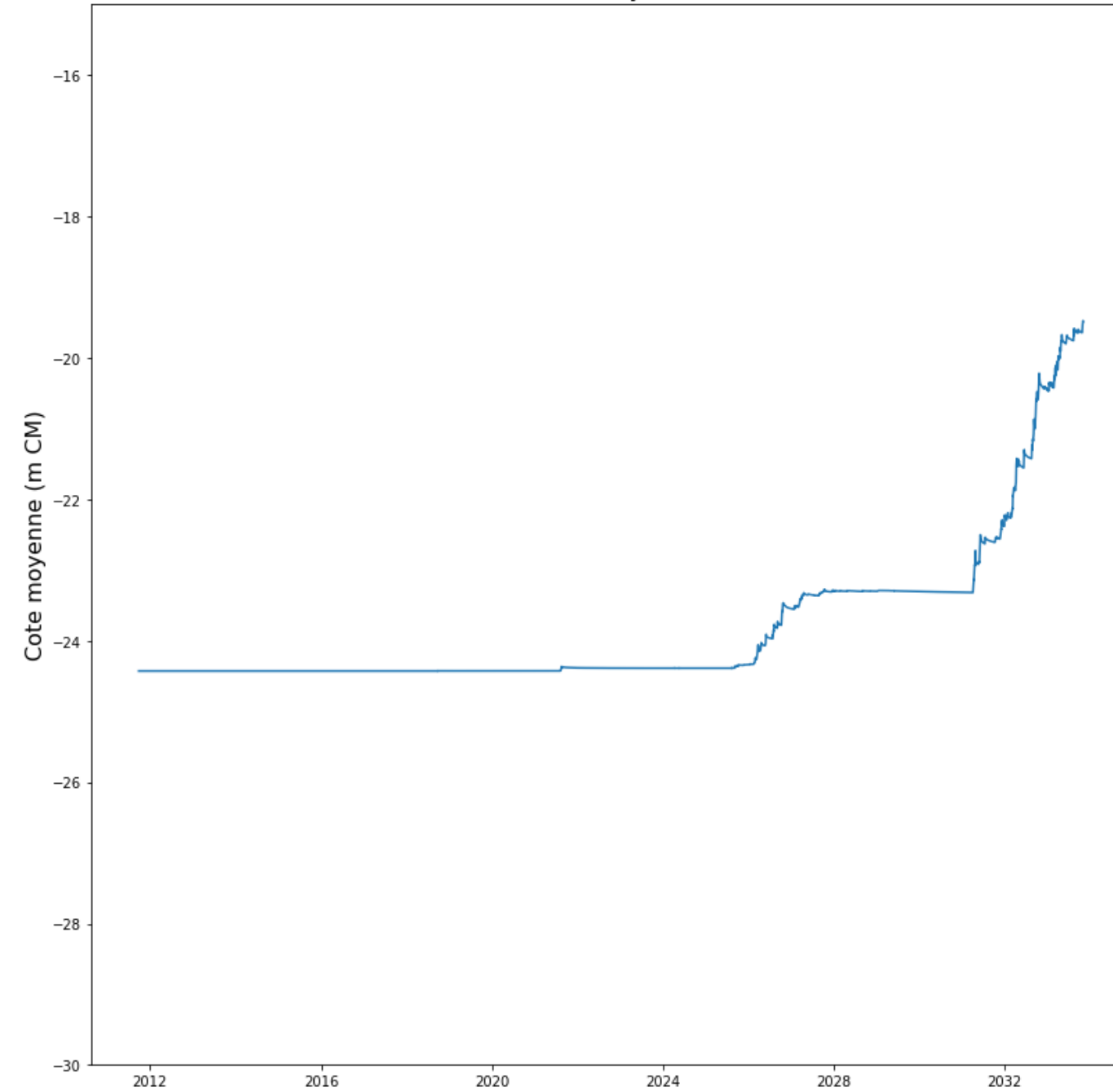
Evolution de la cote moyenne de la zone 27

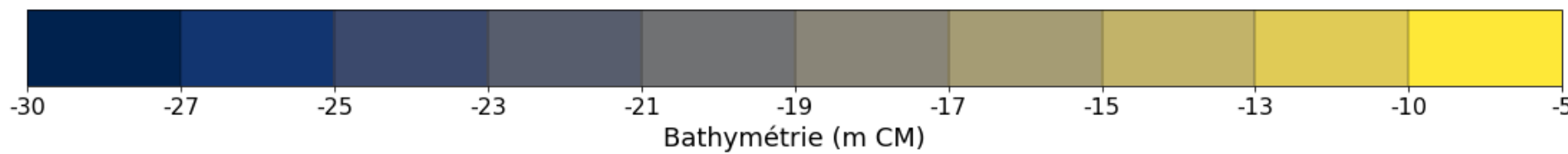
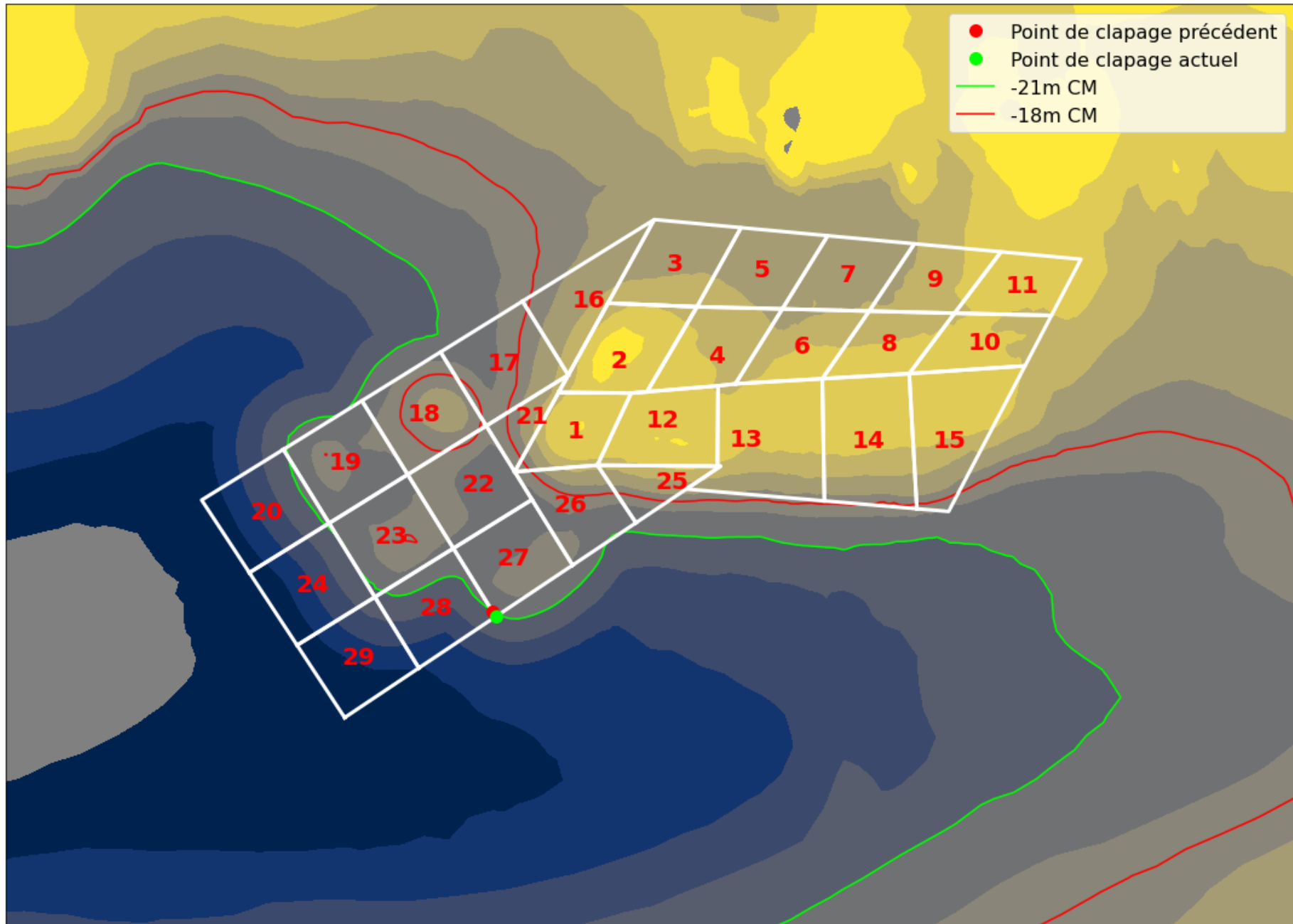




Date de changement de point : 04-11-2033

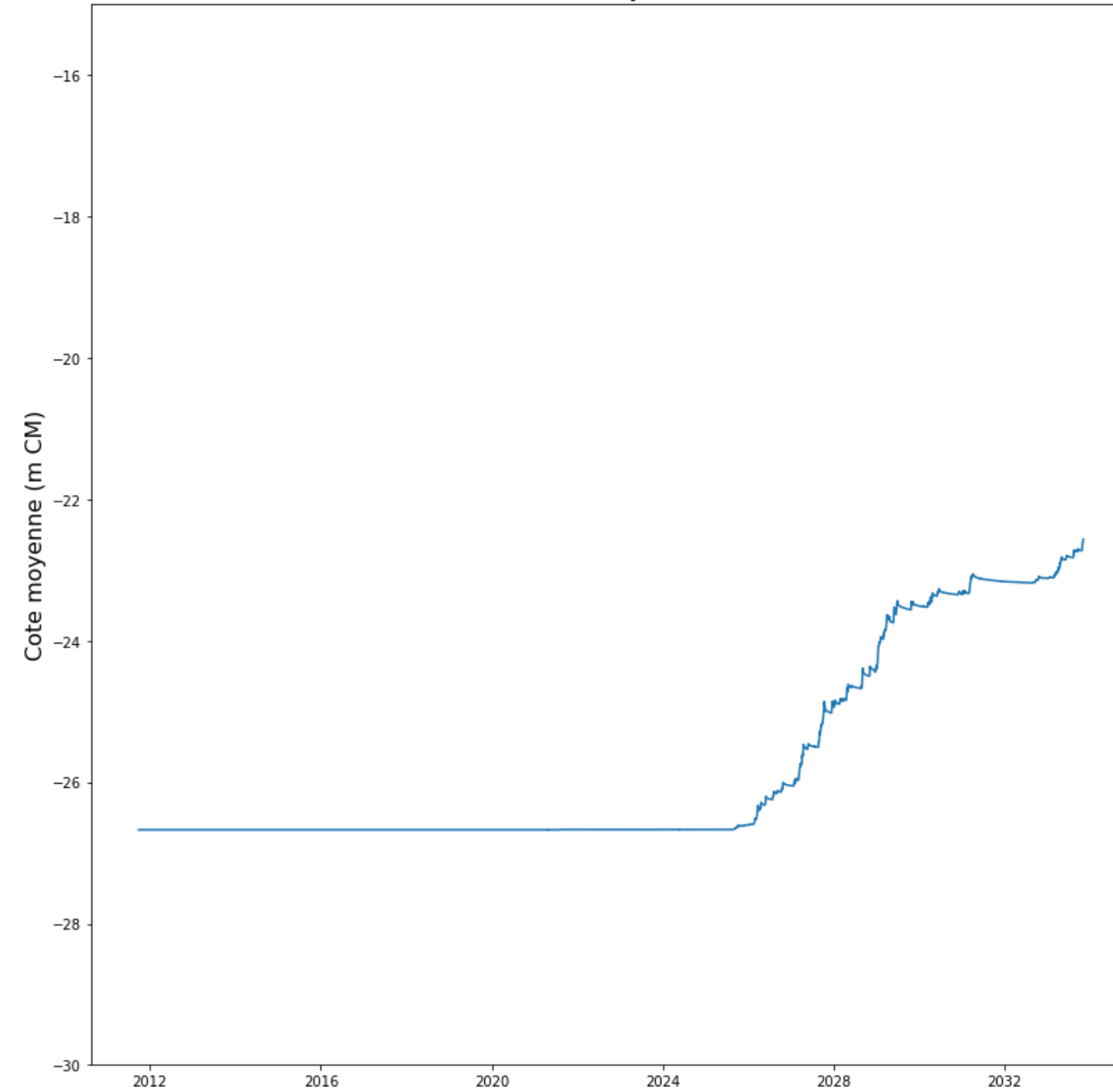
Evolution de la cote moyenne de la zone 27



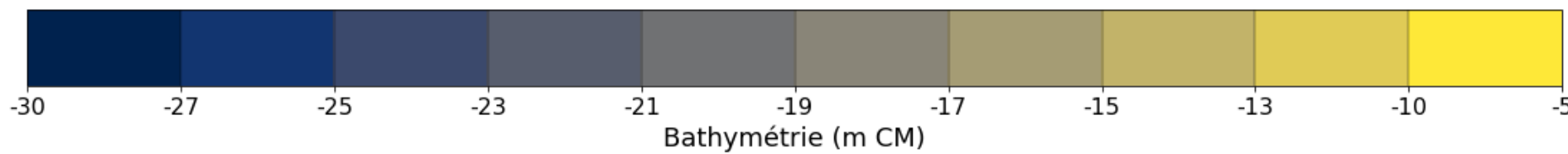
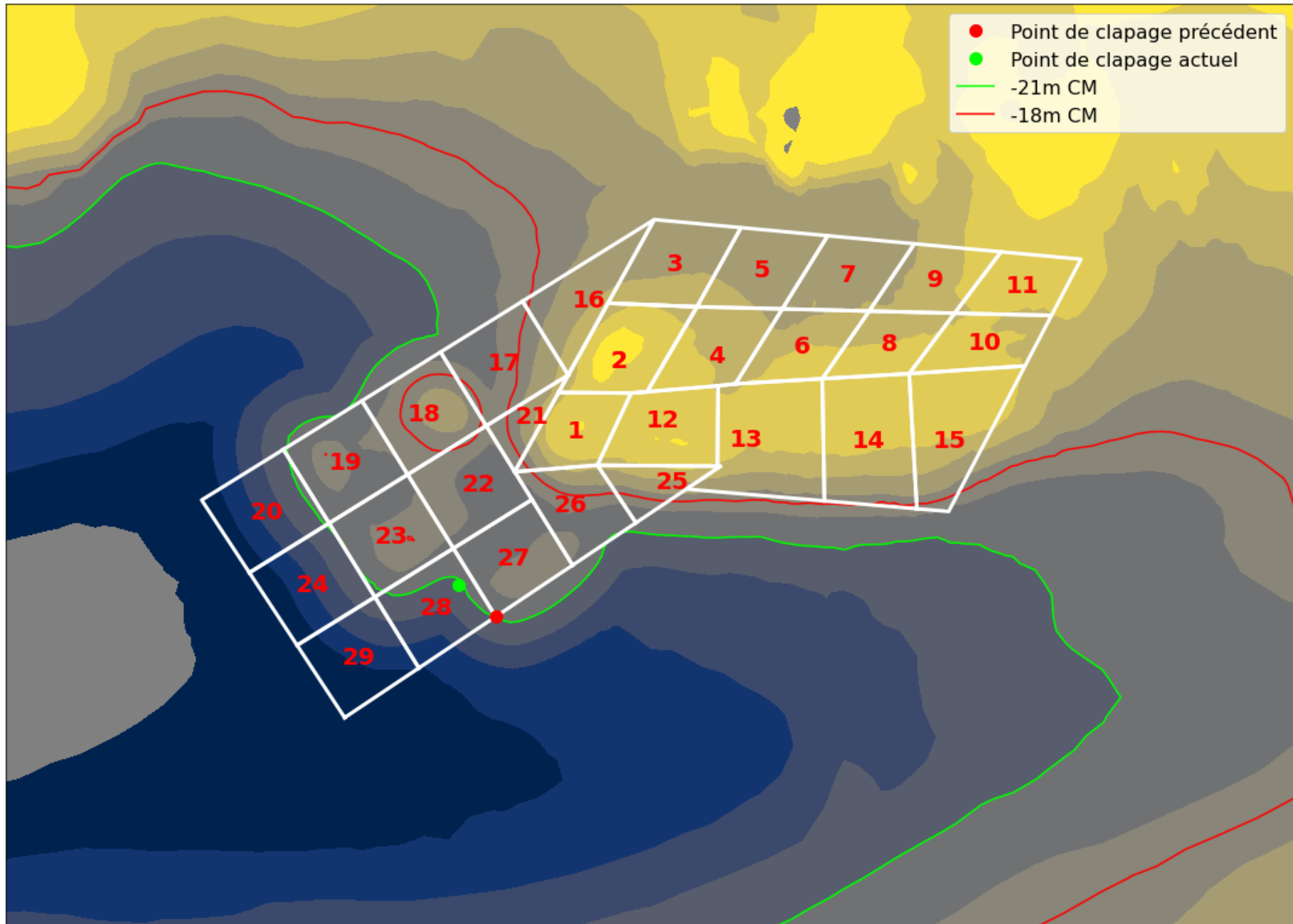


Date de changement de point : 06-11-2033

Evolution de la cote moyenne de la zone 28

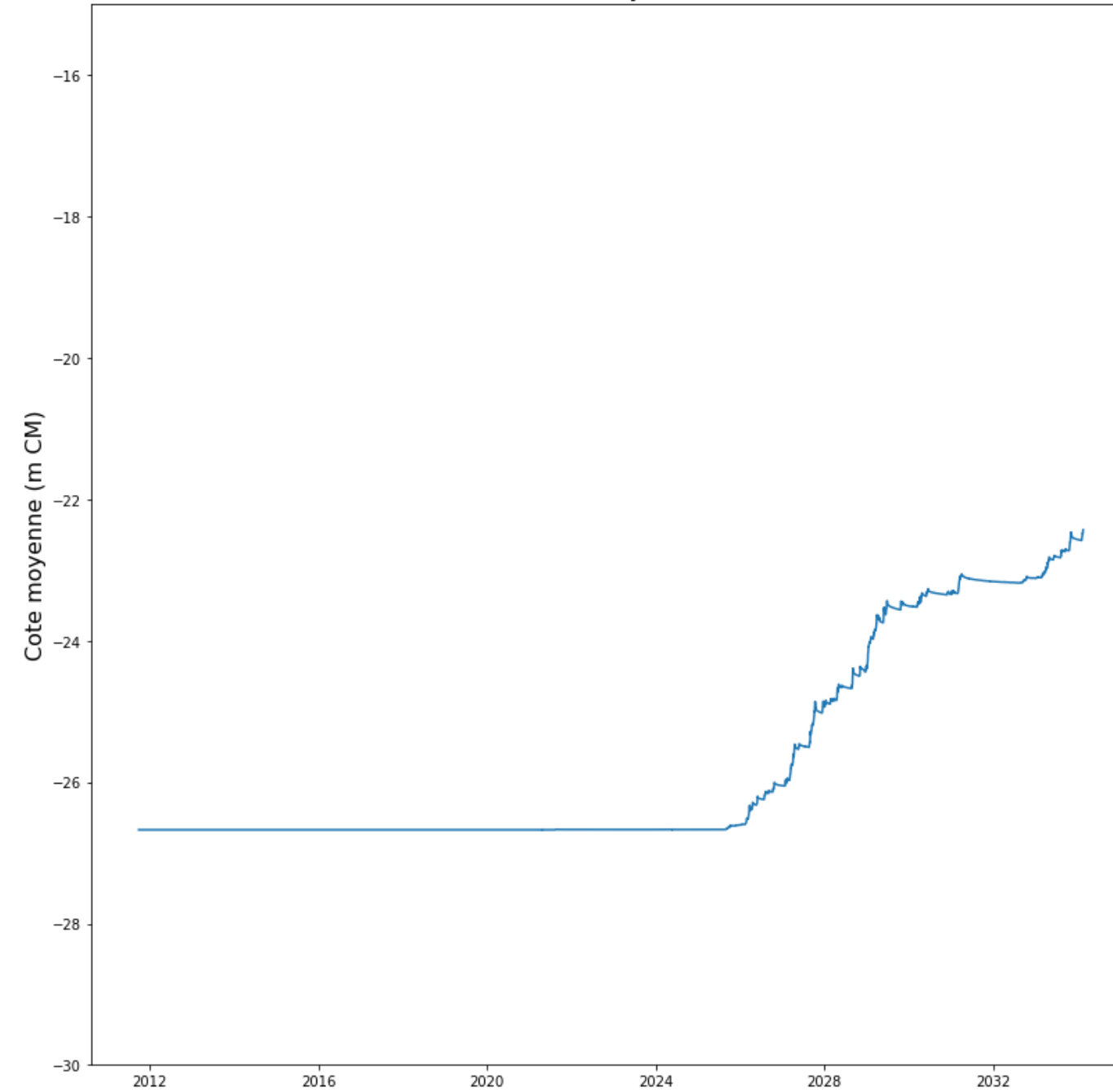


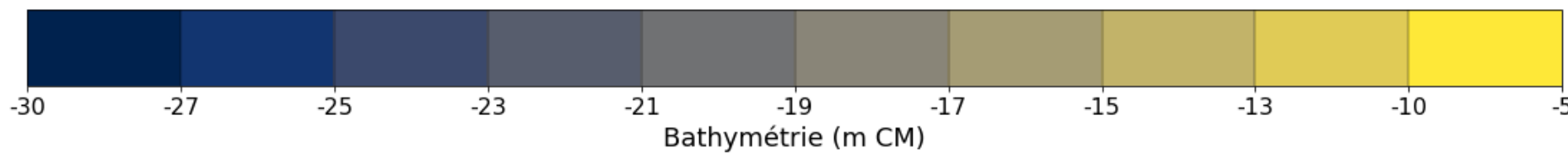
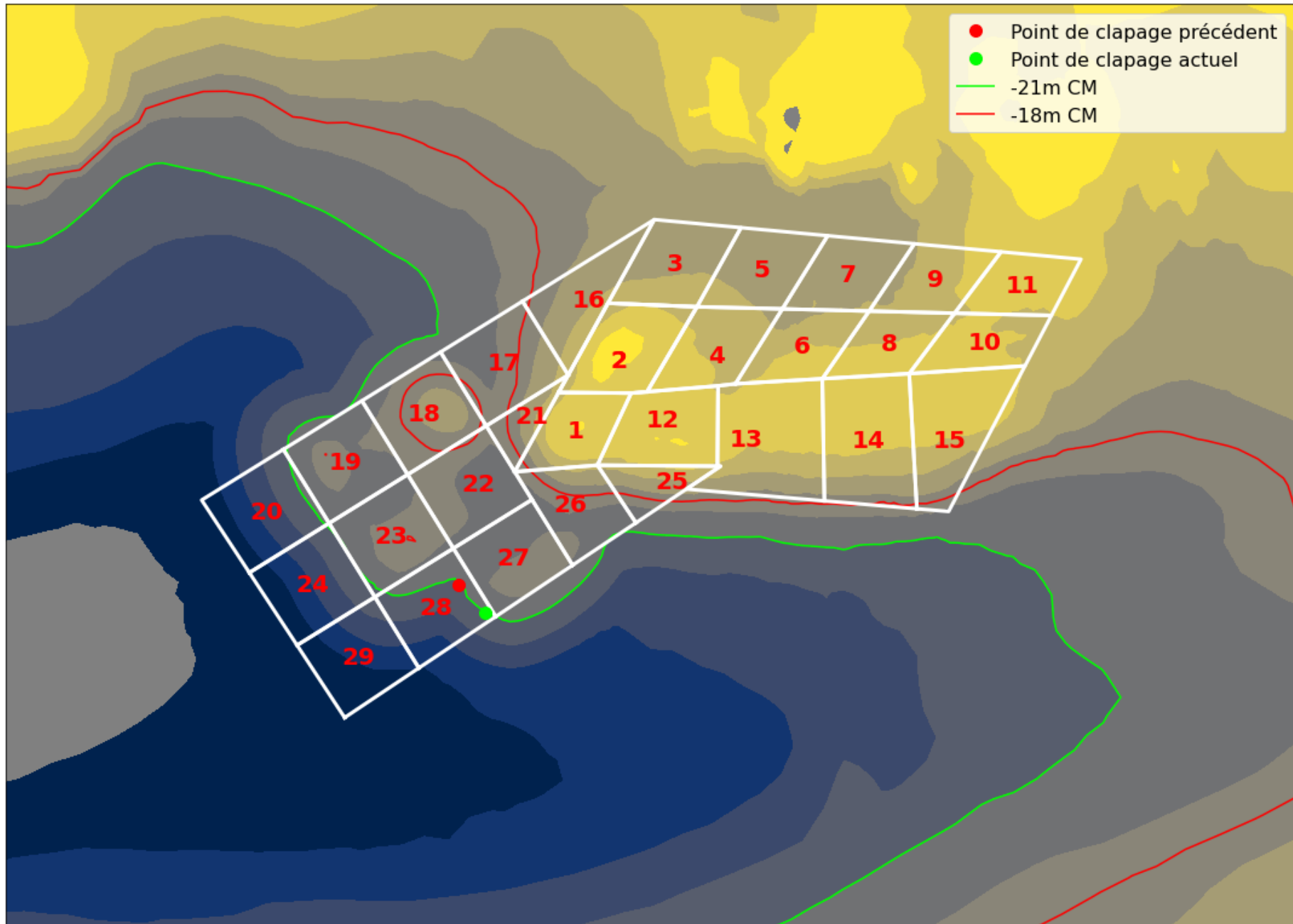




Date de changement de point : 24-02-2034

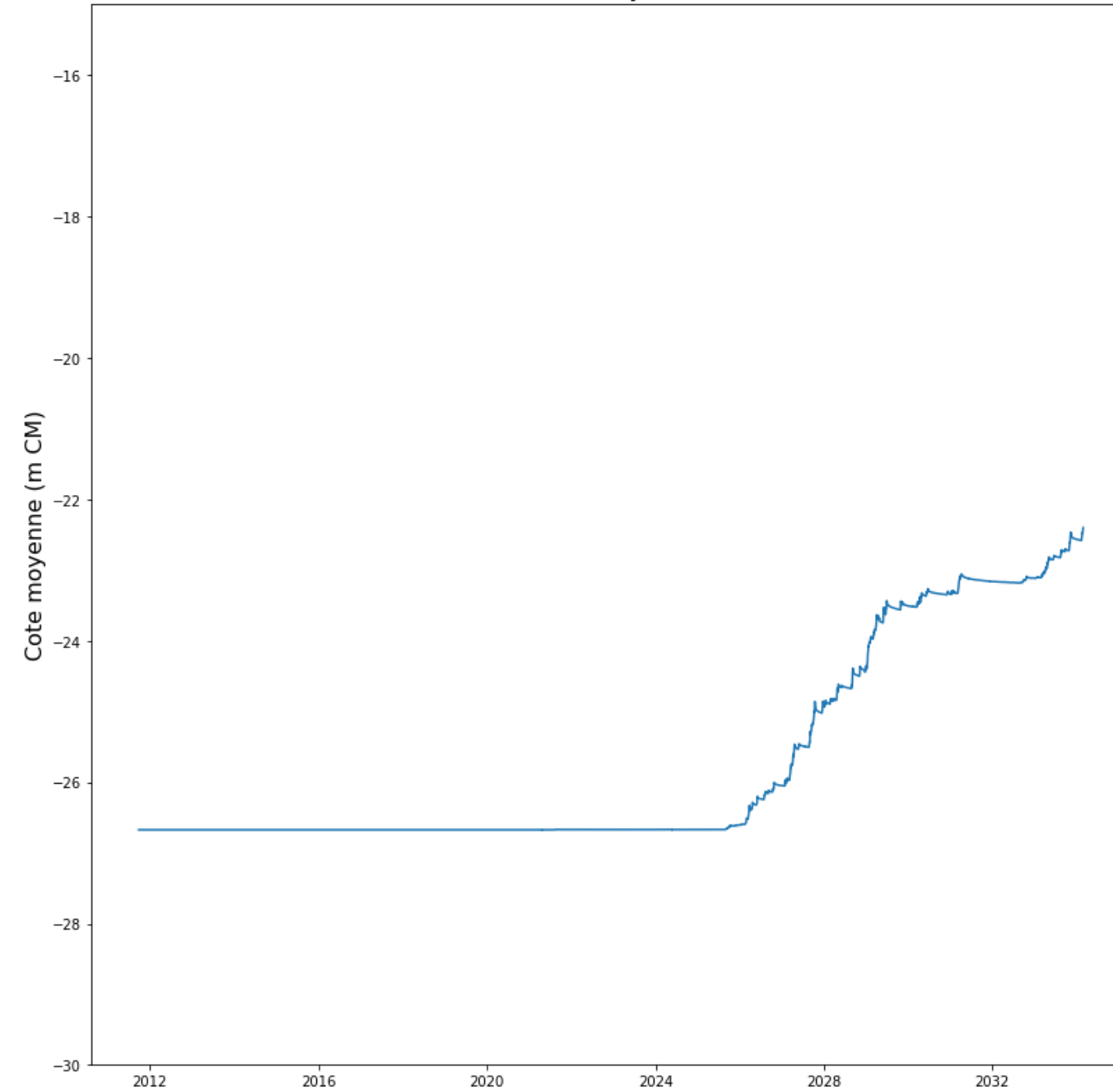
Evolution de la cote moyenne de la zone 28

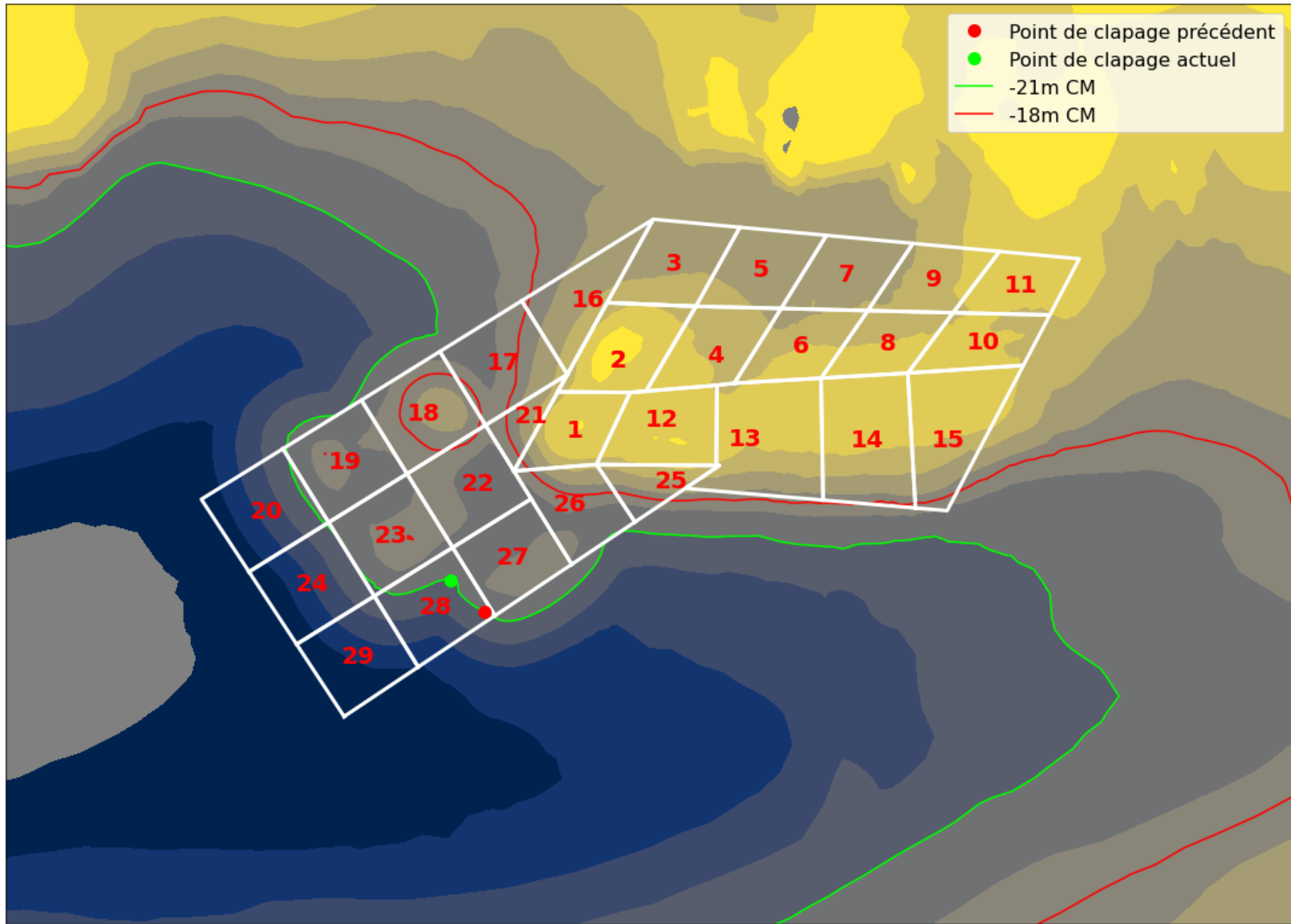




Date de changement de point : 26-02-2034

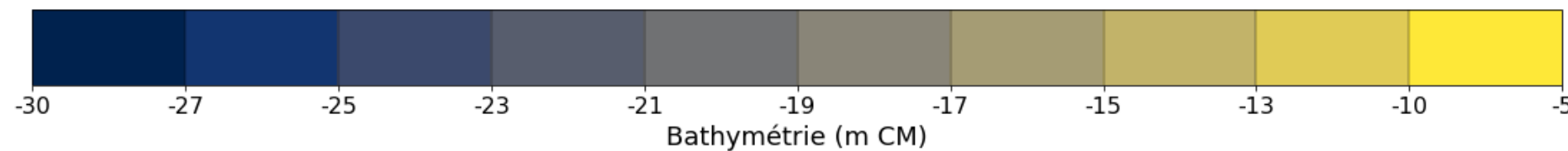
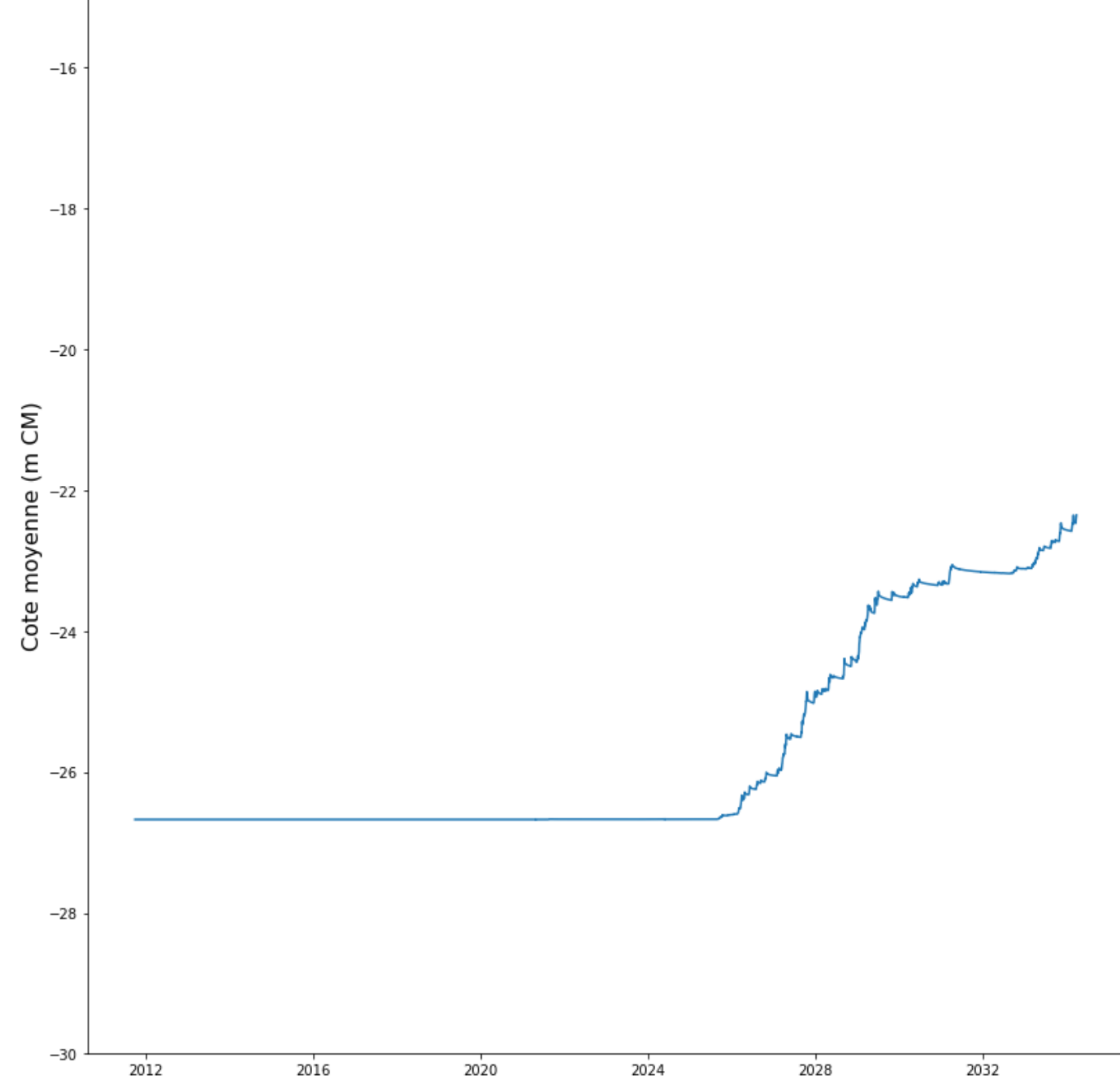
Evolution de la cote moyenne de la zone 28

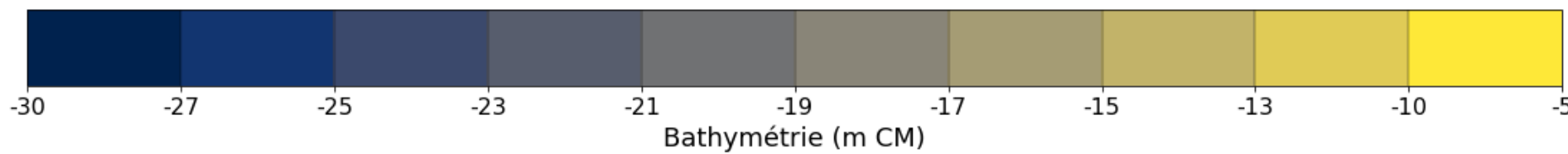
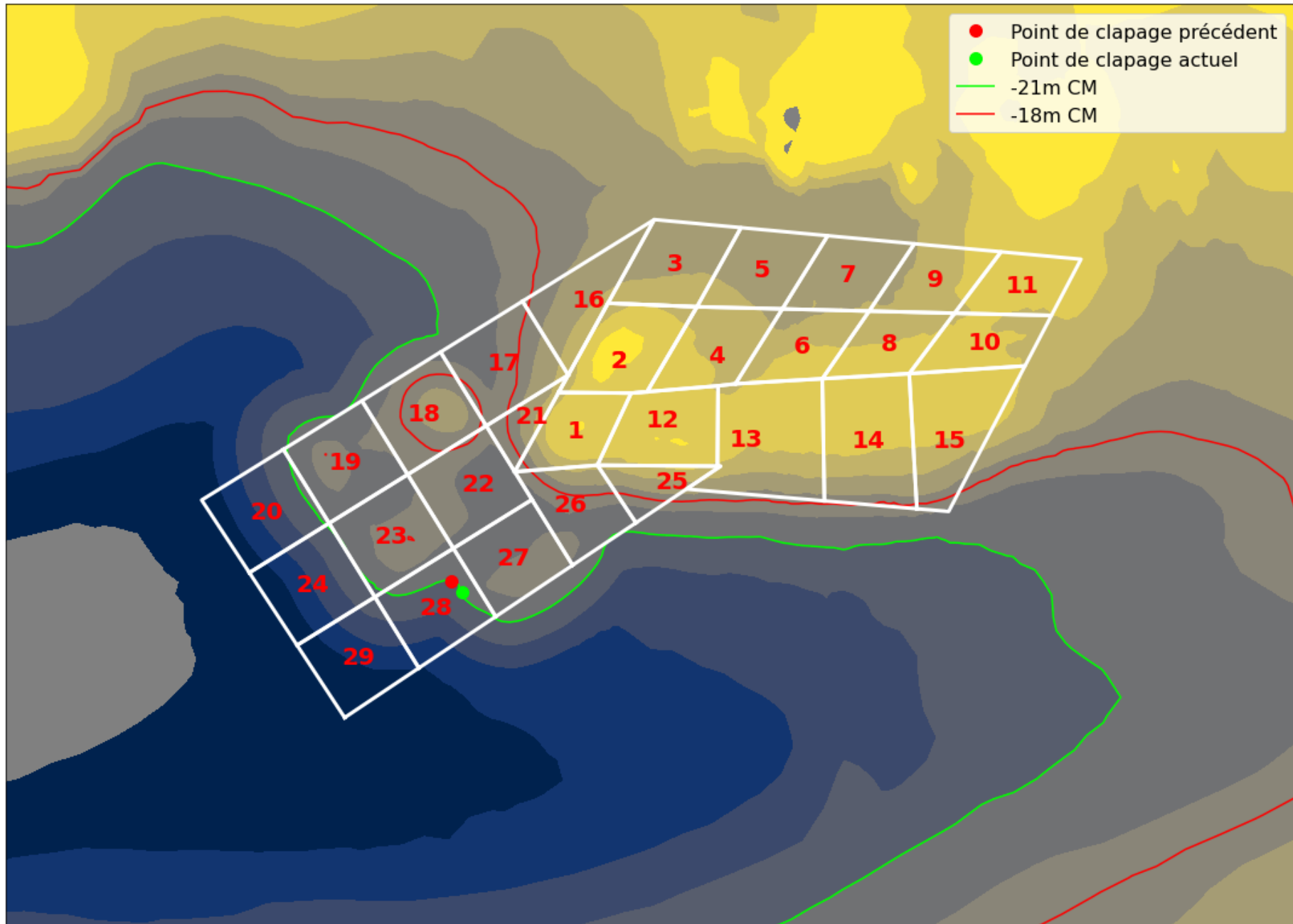




Date de changement de point : 25-03-2034

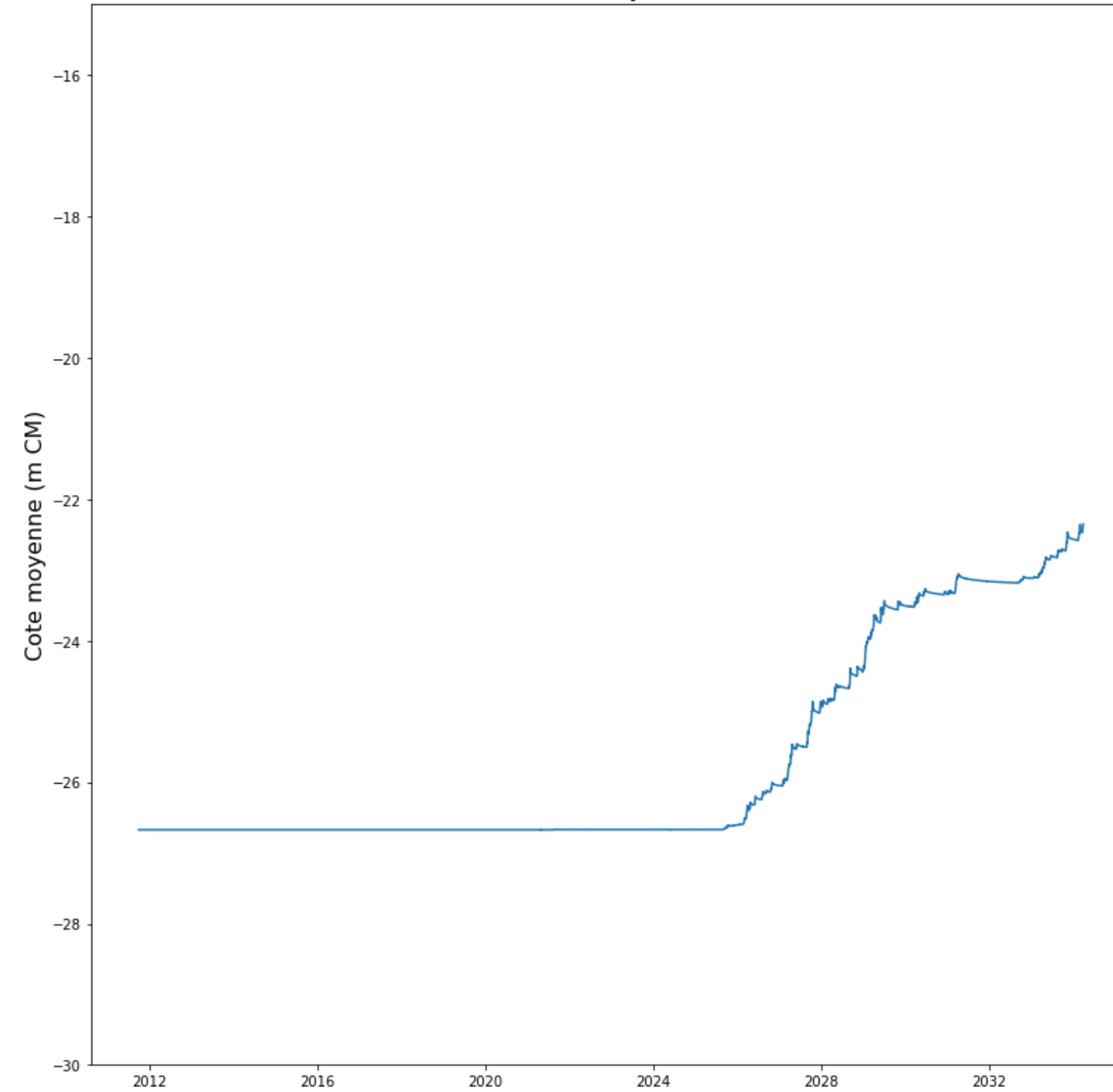
Evolution de la cote moyenne de la zone 28

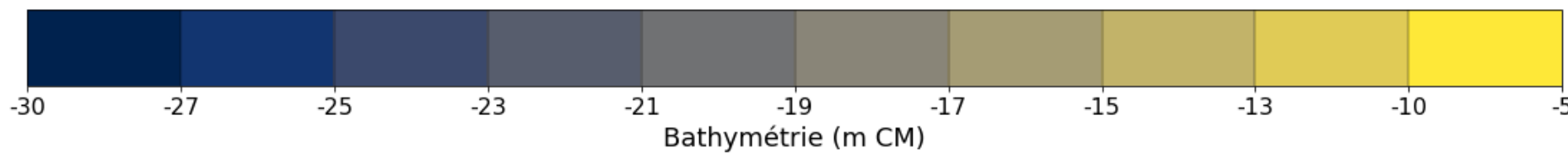
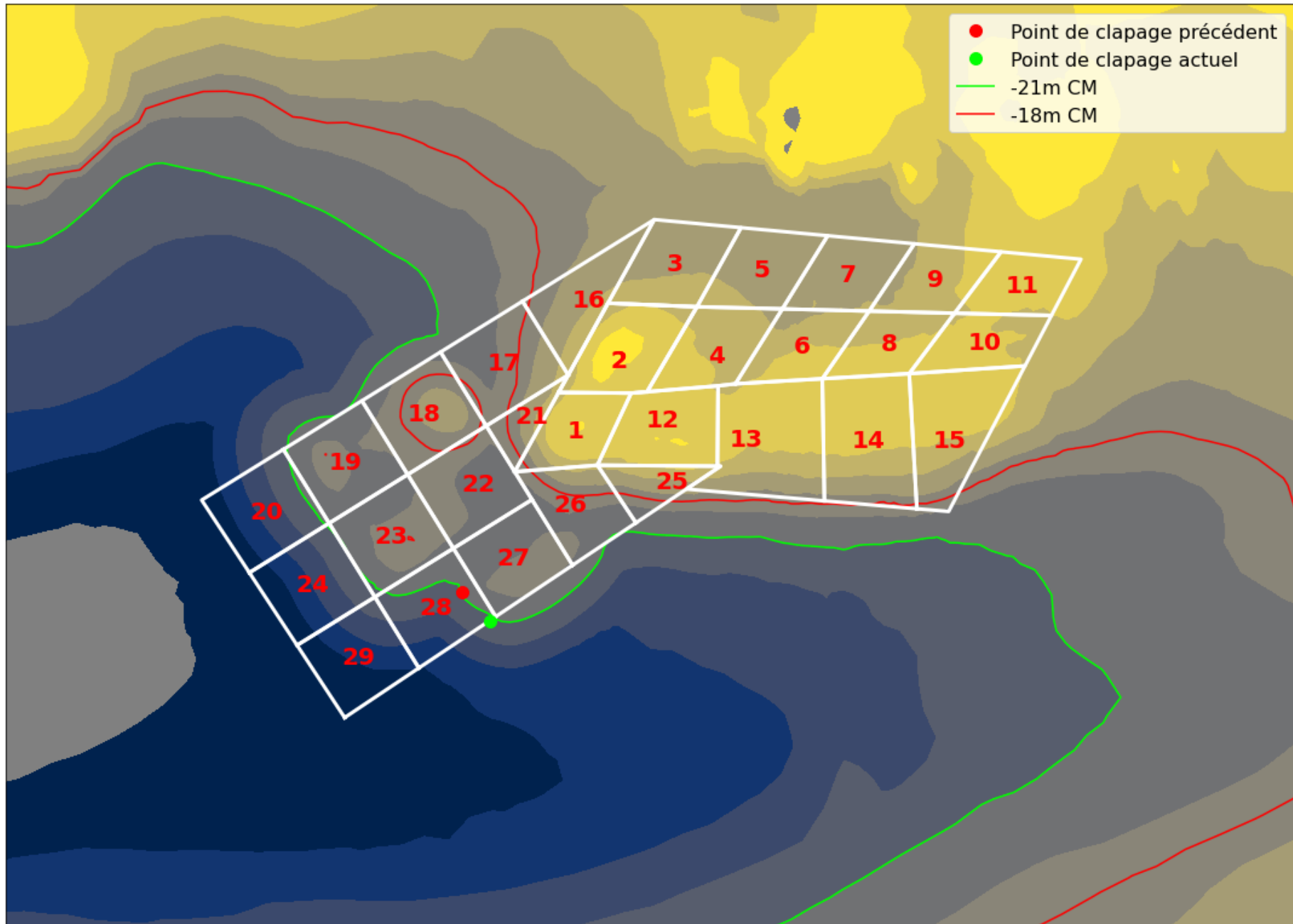




Date de changement de point : 25-03-2034

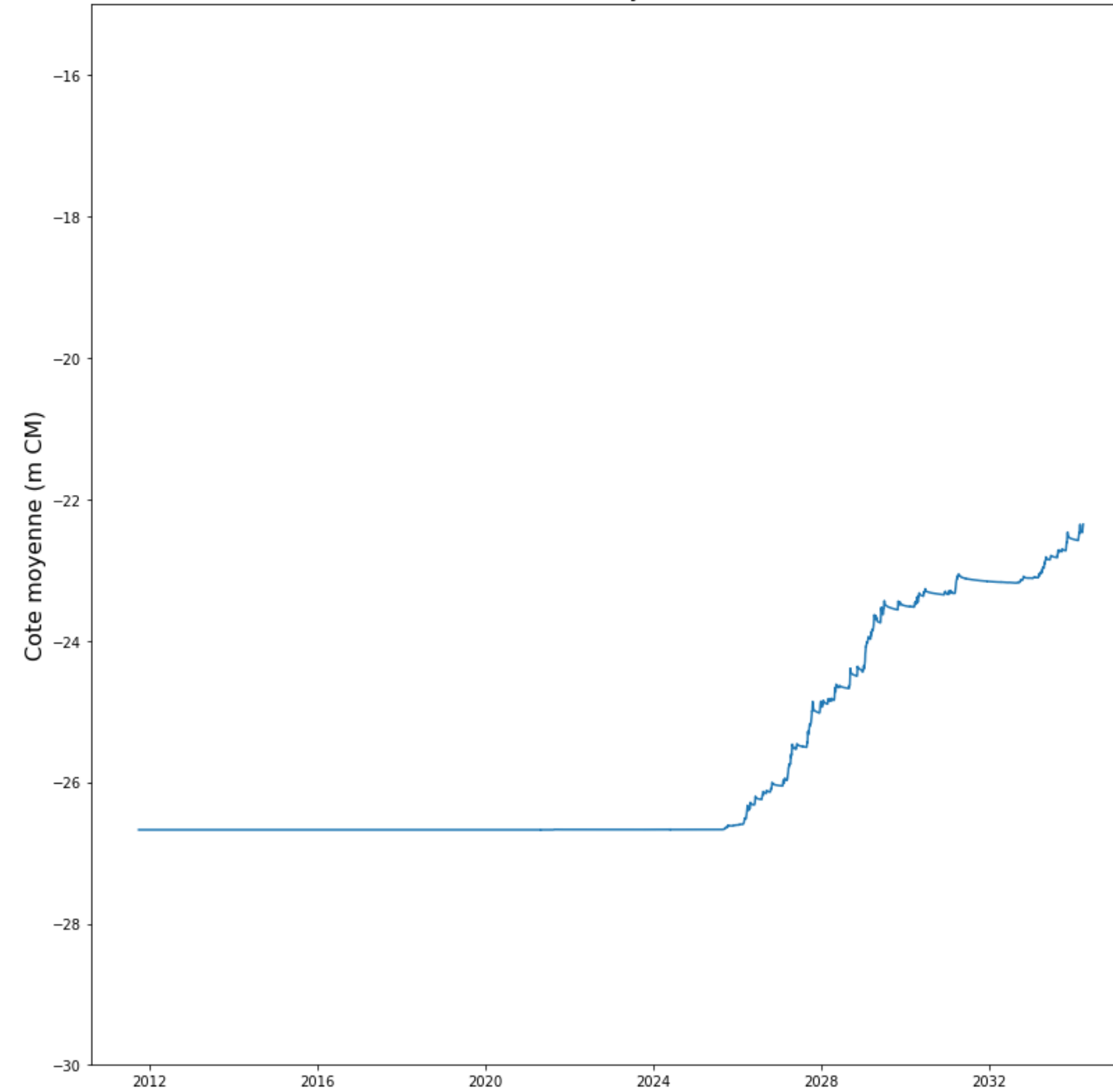
Evolution de la cote moyenne de la zone 28

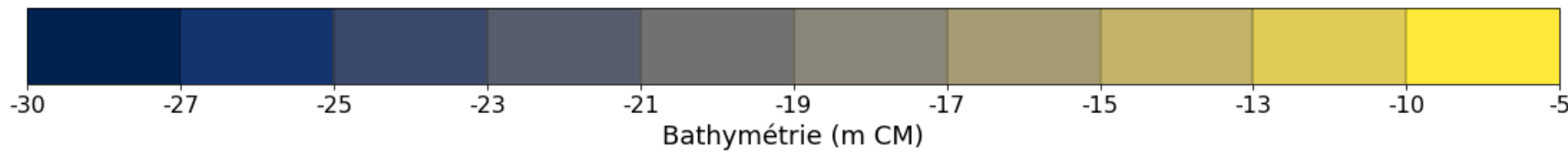
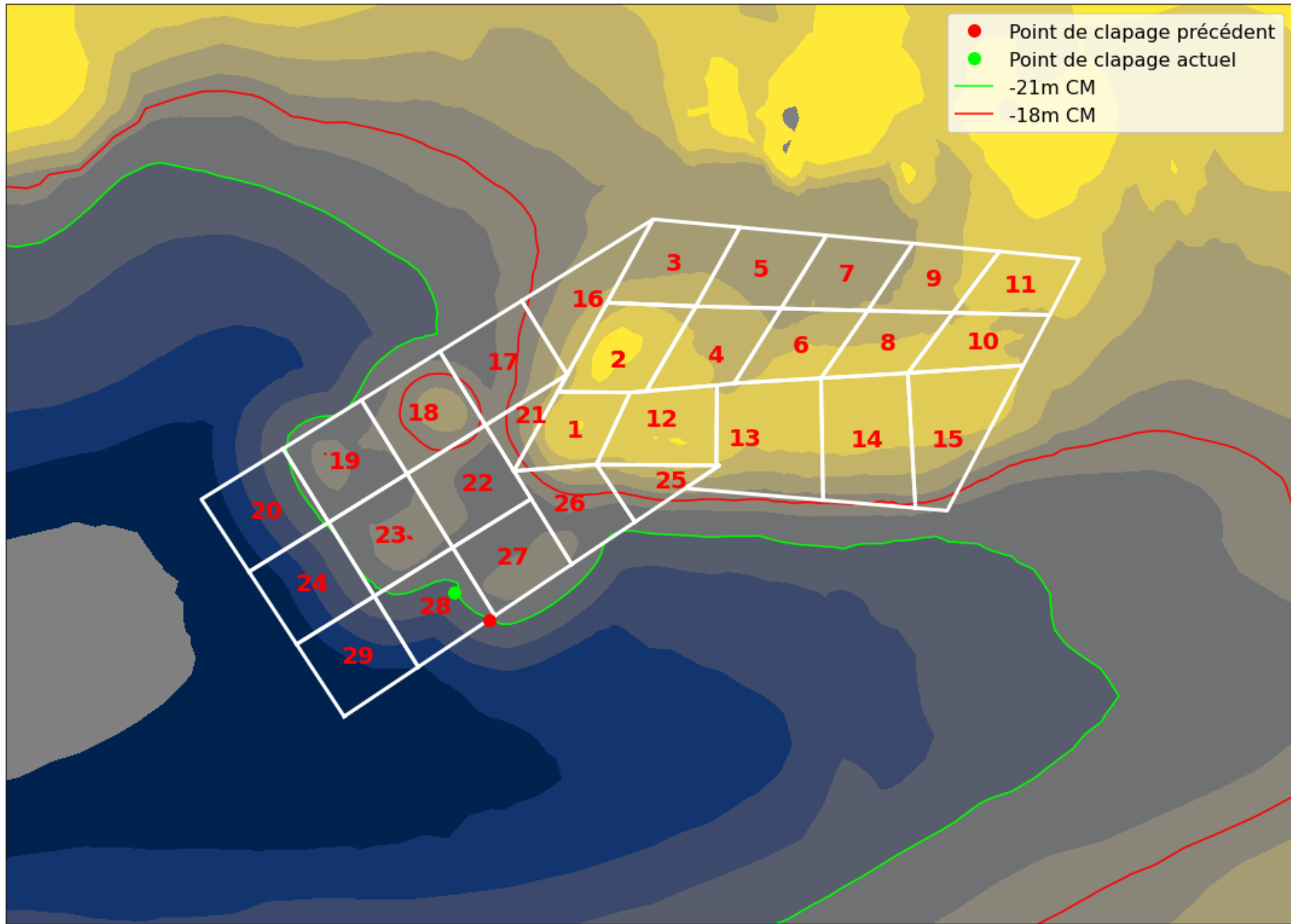




Date de changement de point : 26-03-2034

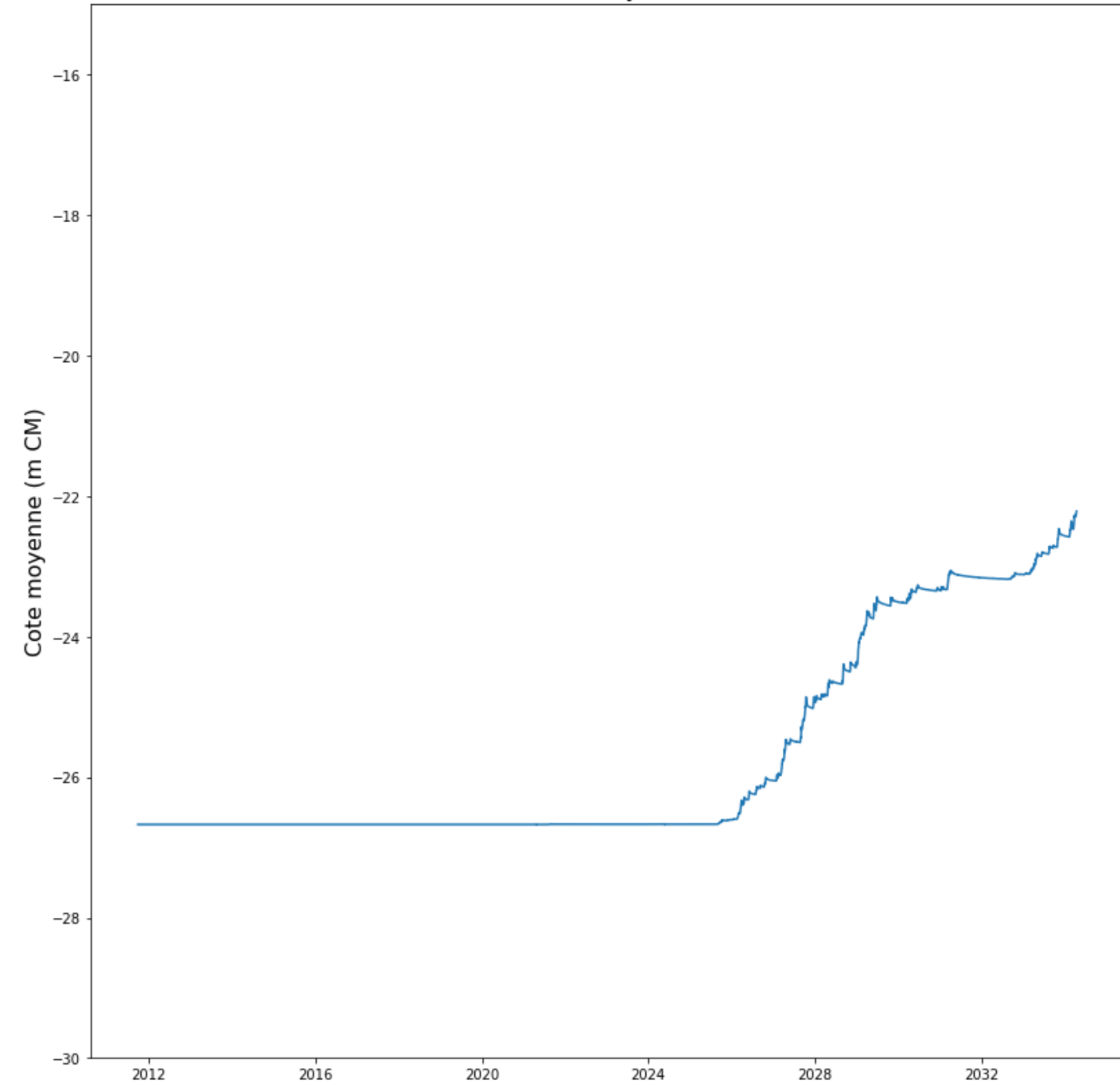
Evolution de la cote moyenne de la zone 28



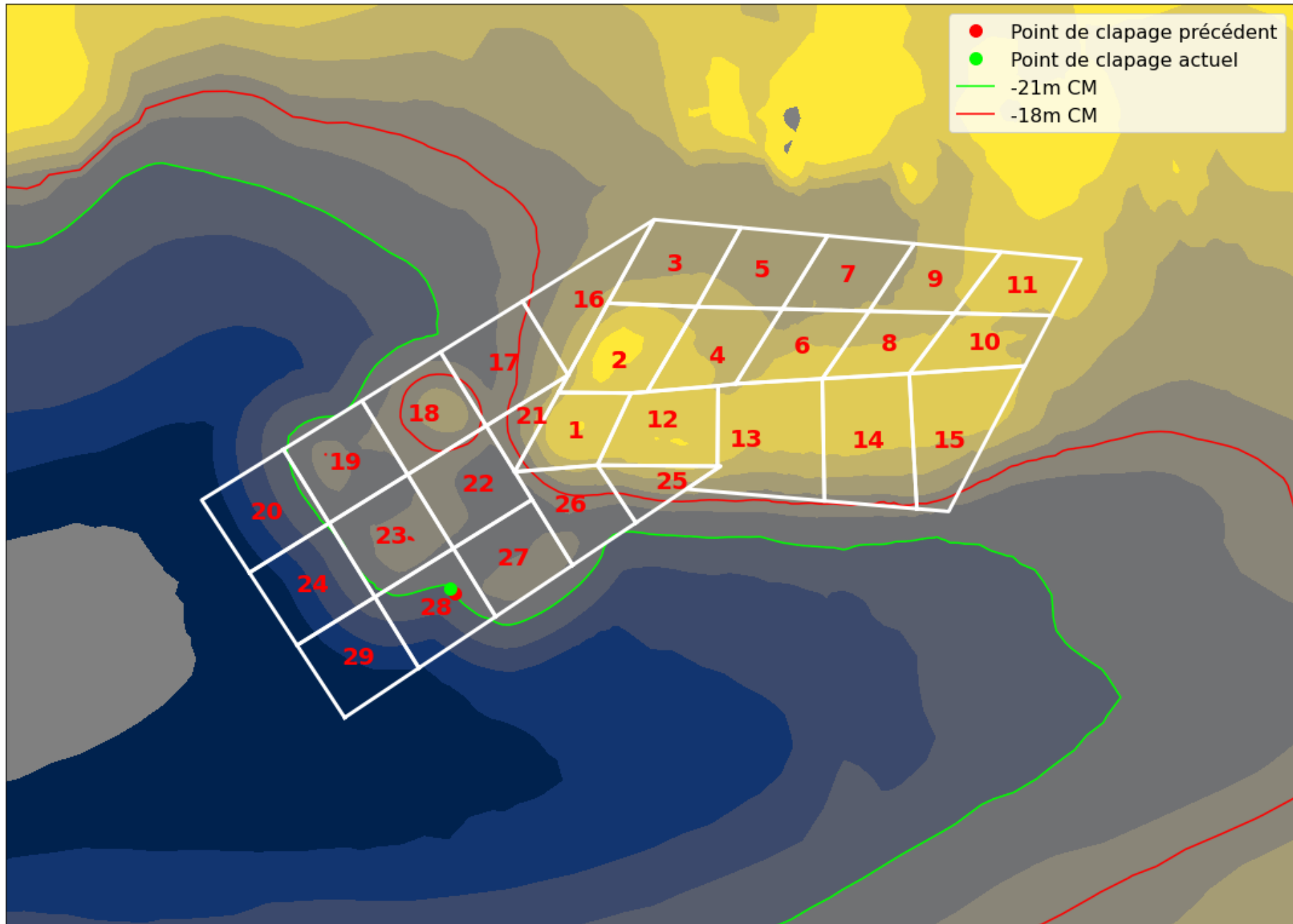


Date de changement de point : 14-04-2034

Evolution de la cote moyenne de la zone 28

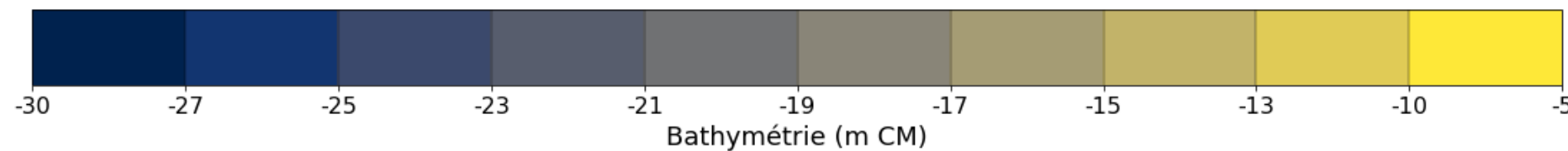
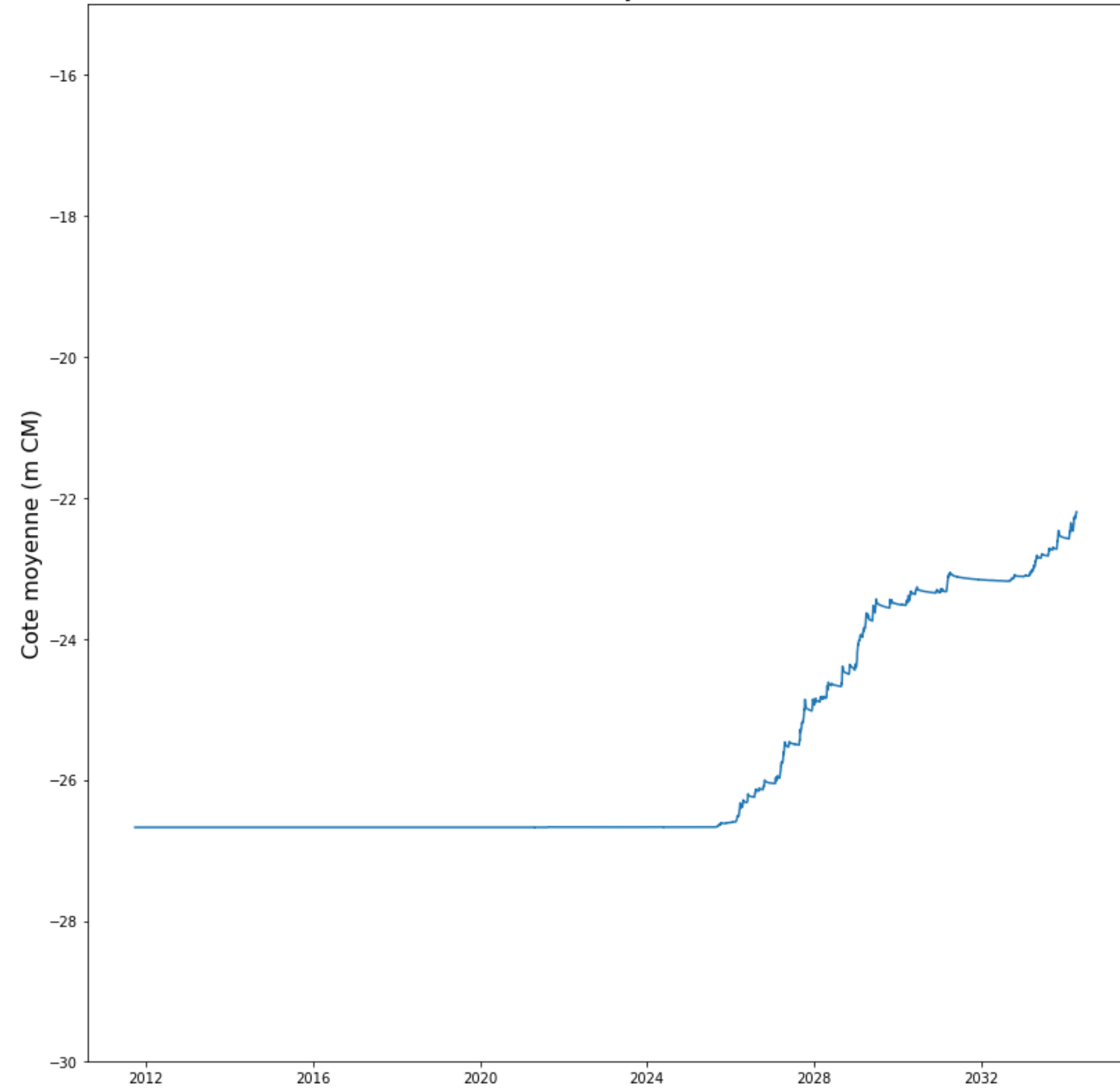


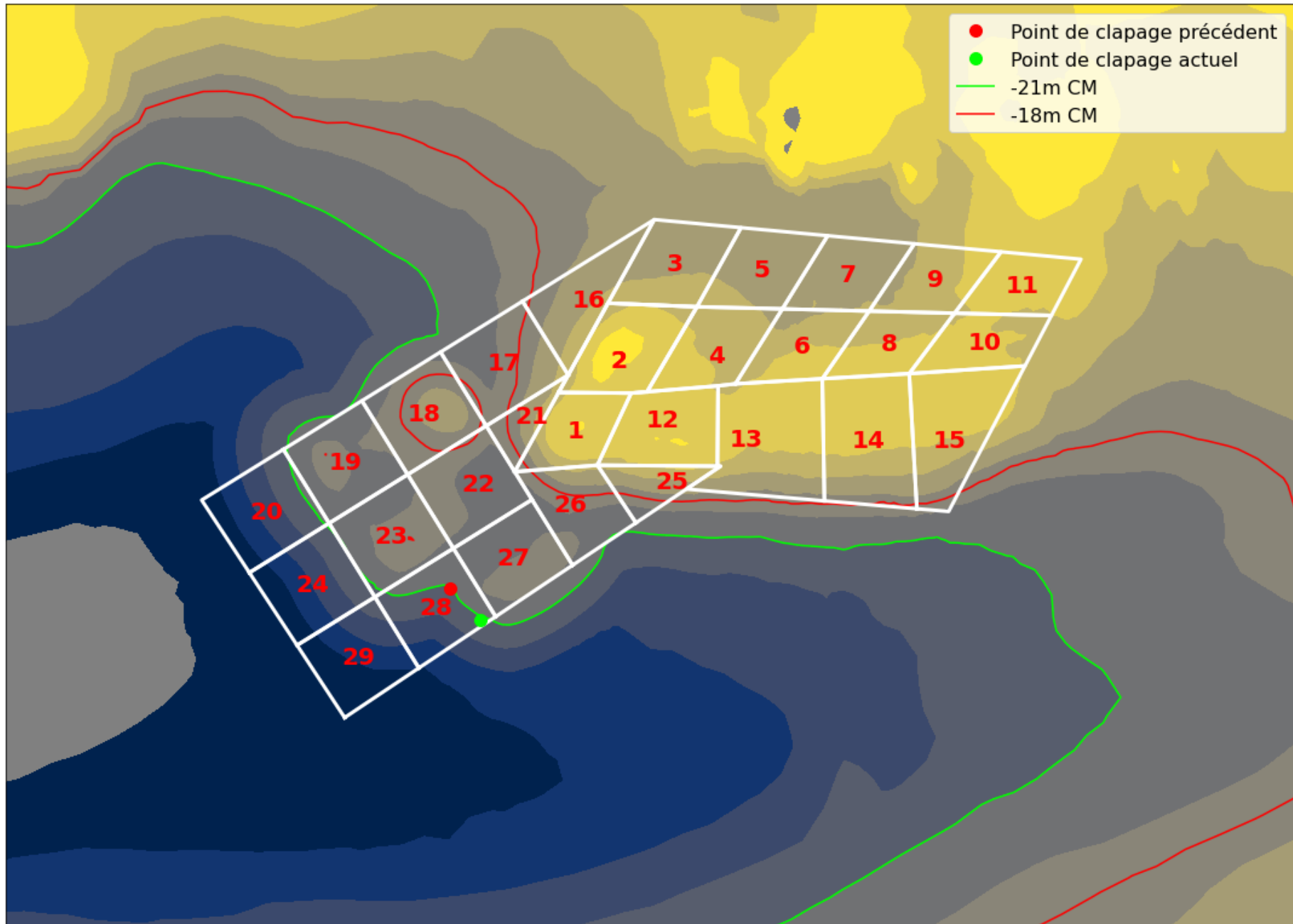




Date de changement de point : 16-04-2034

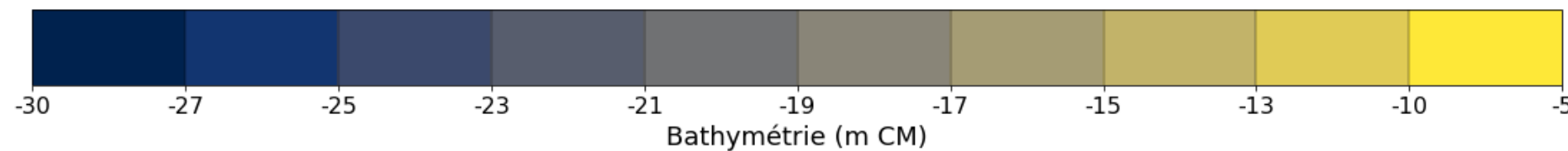
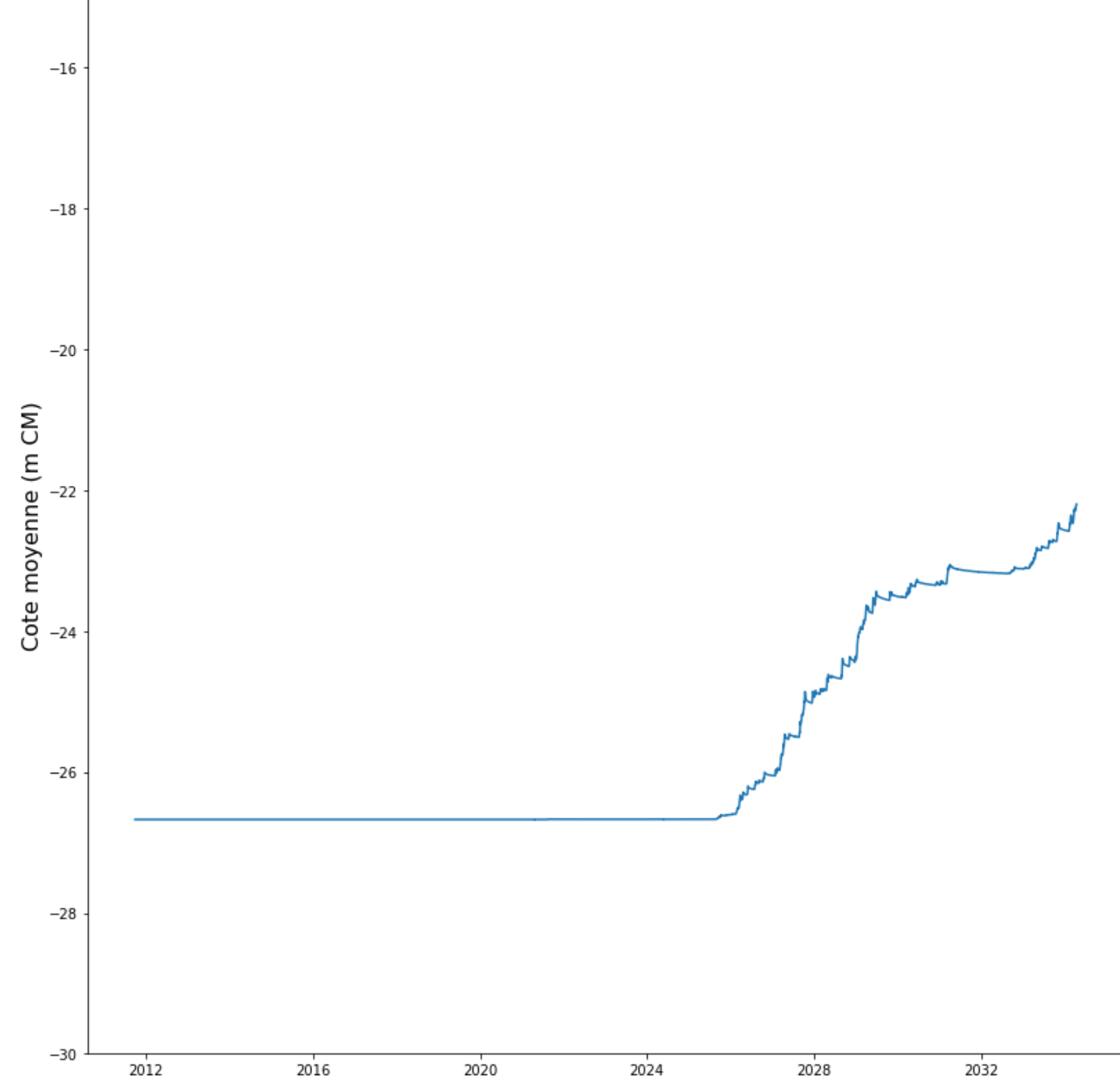
Evolution de la cote moyenne de la zone 28

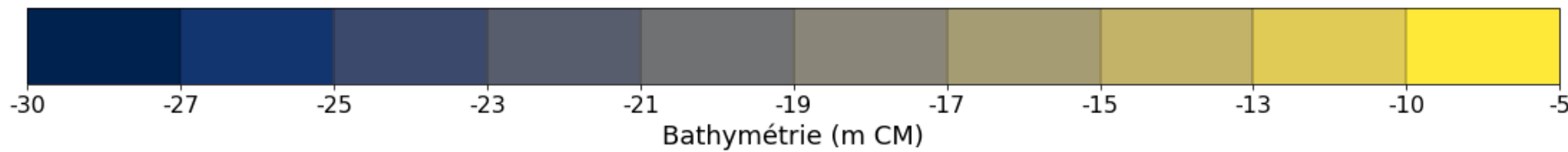
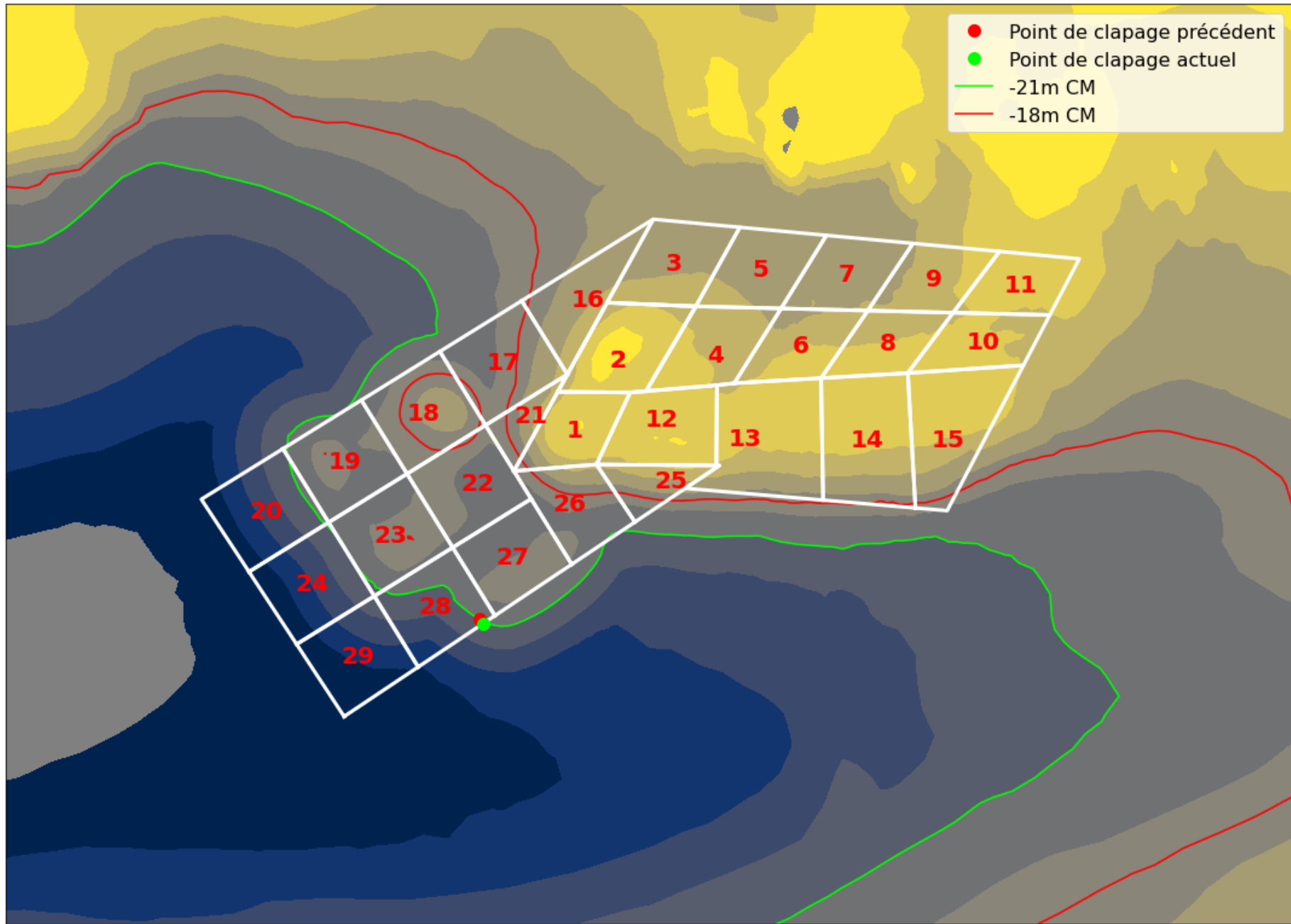




Date de changement de point : 17-04-2034

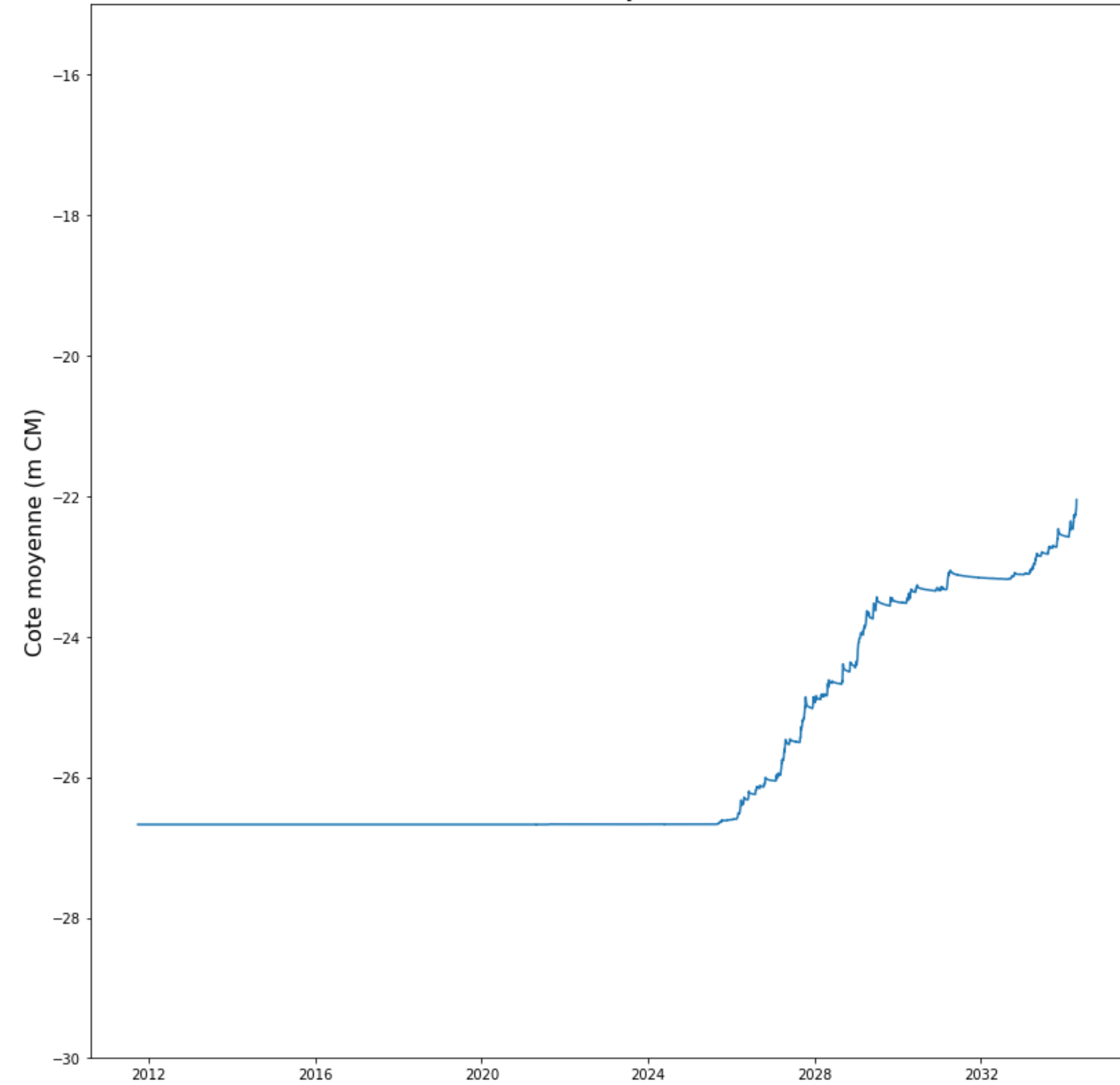
Evolution de la cote moyenne de la zone 28

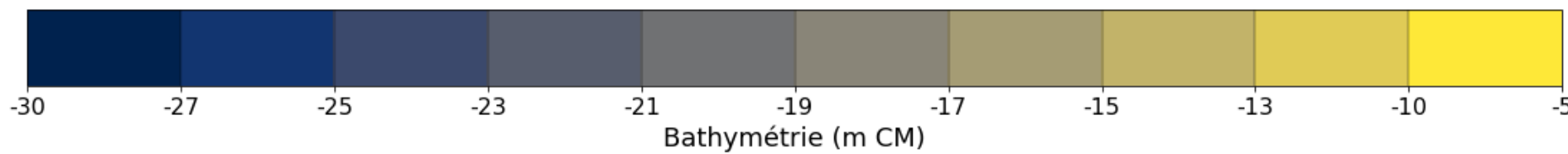
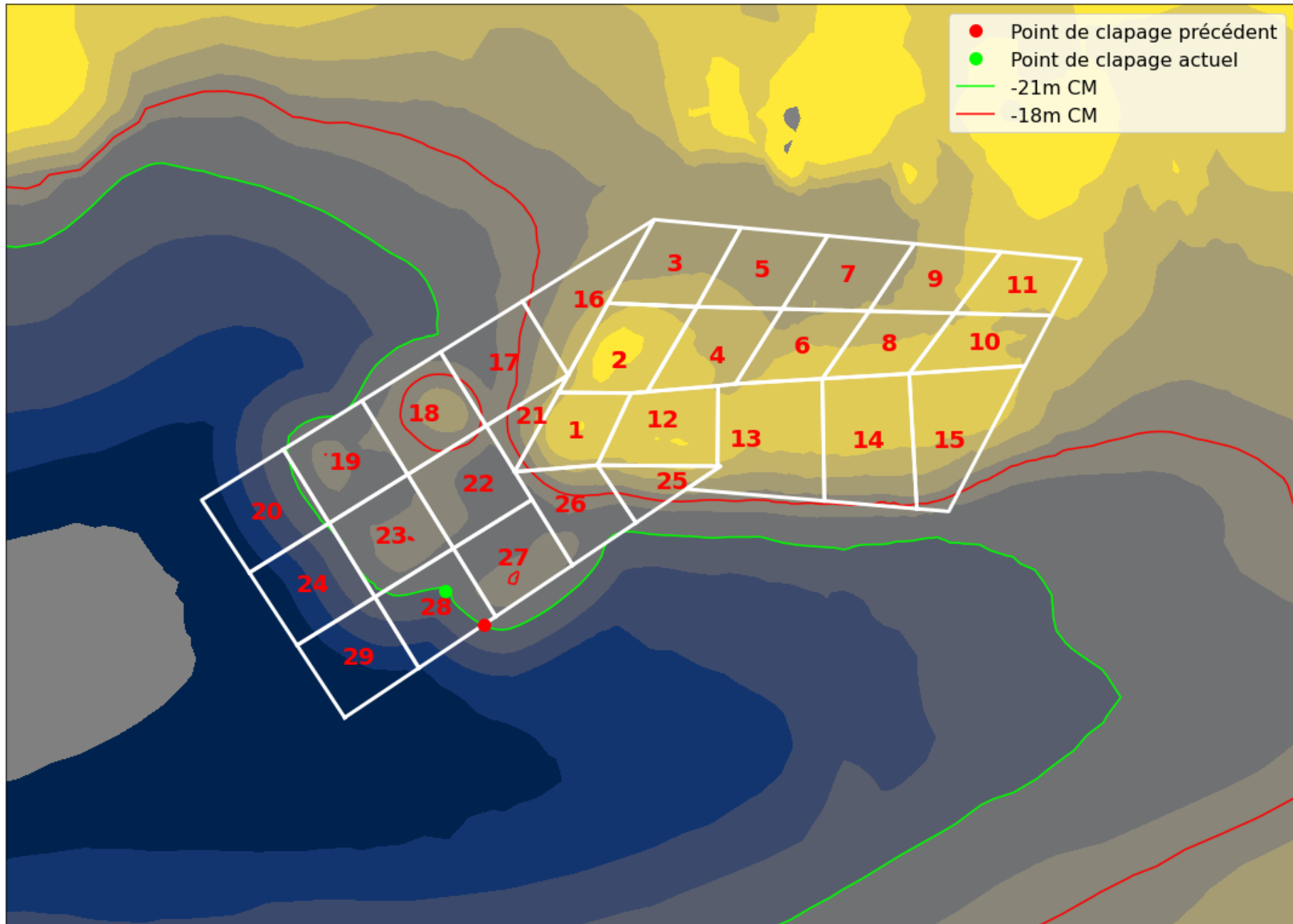




Date de changement de point : 20-04-2034

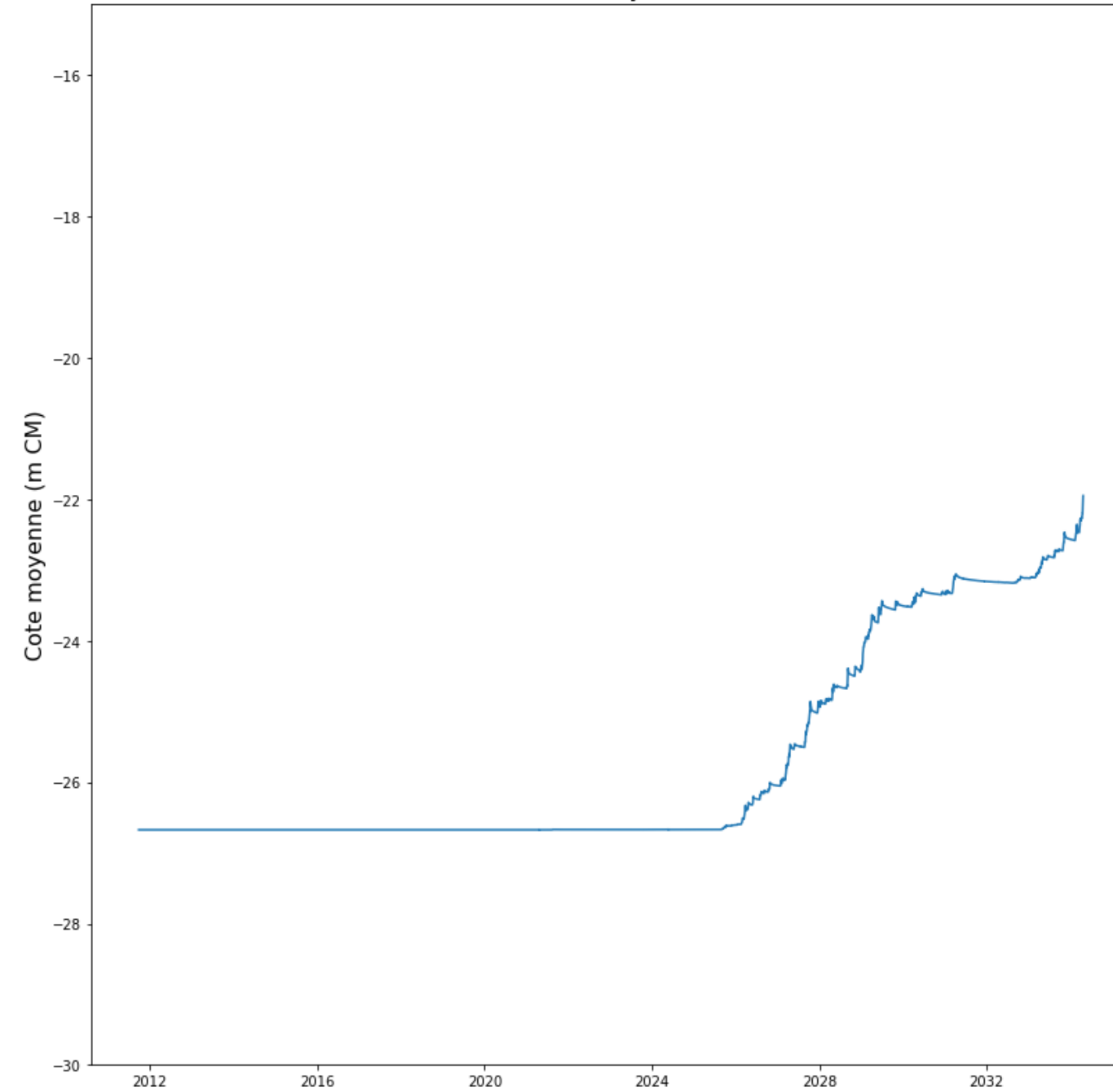
Evolution de la cote moyenne de la zone 28

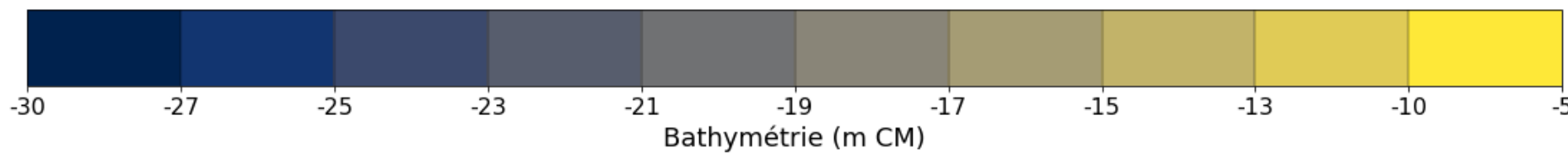
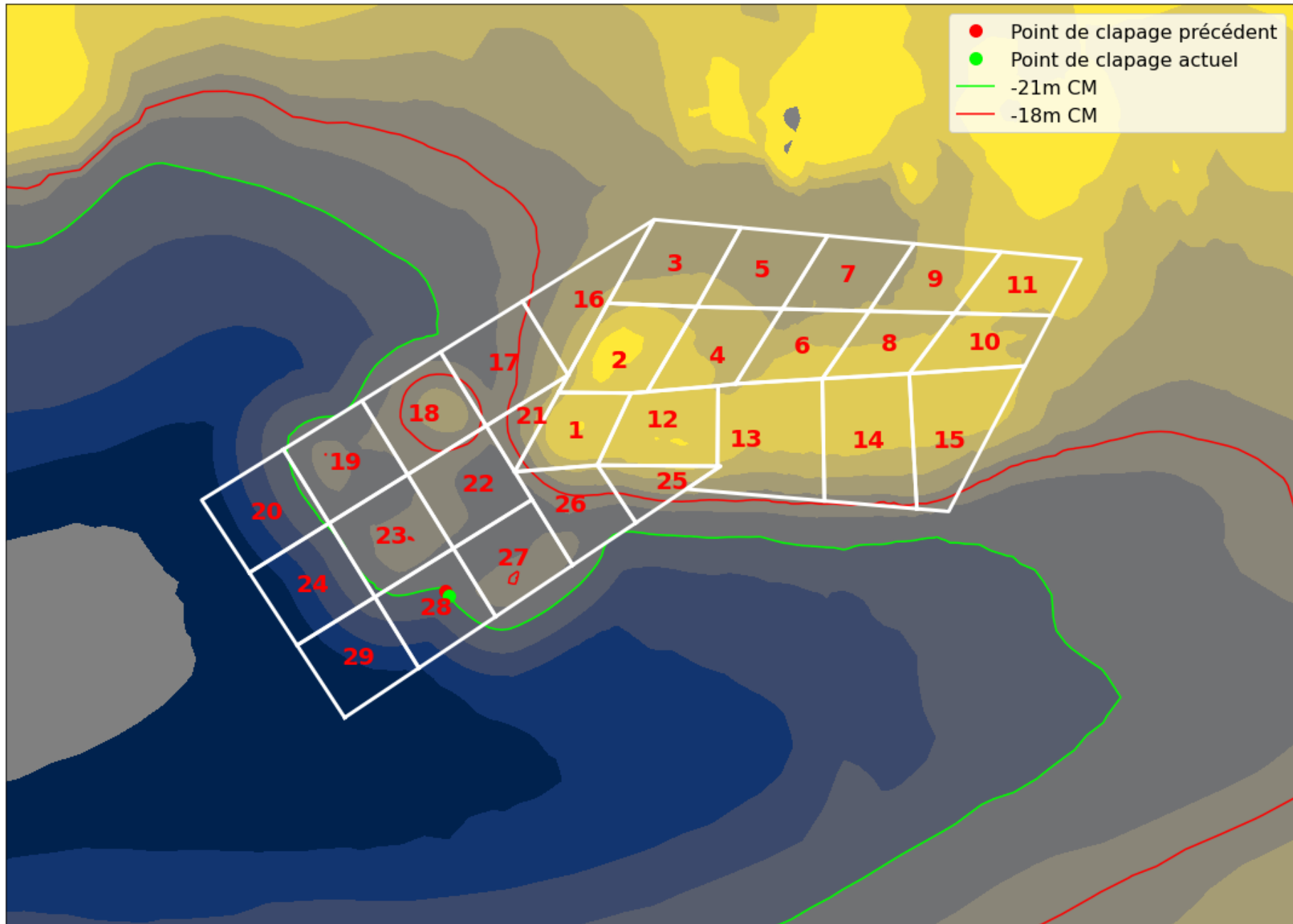




Date de changement de point : 22-04-2034

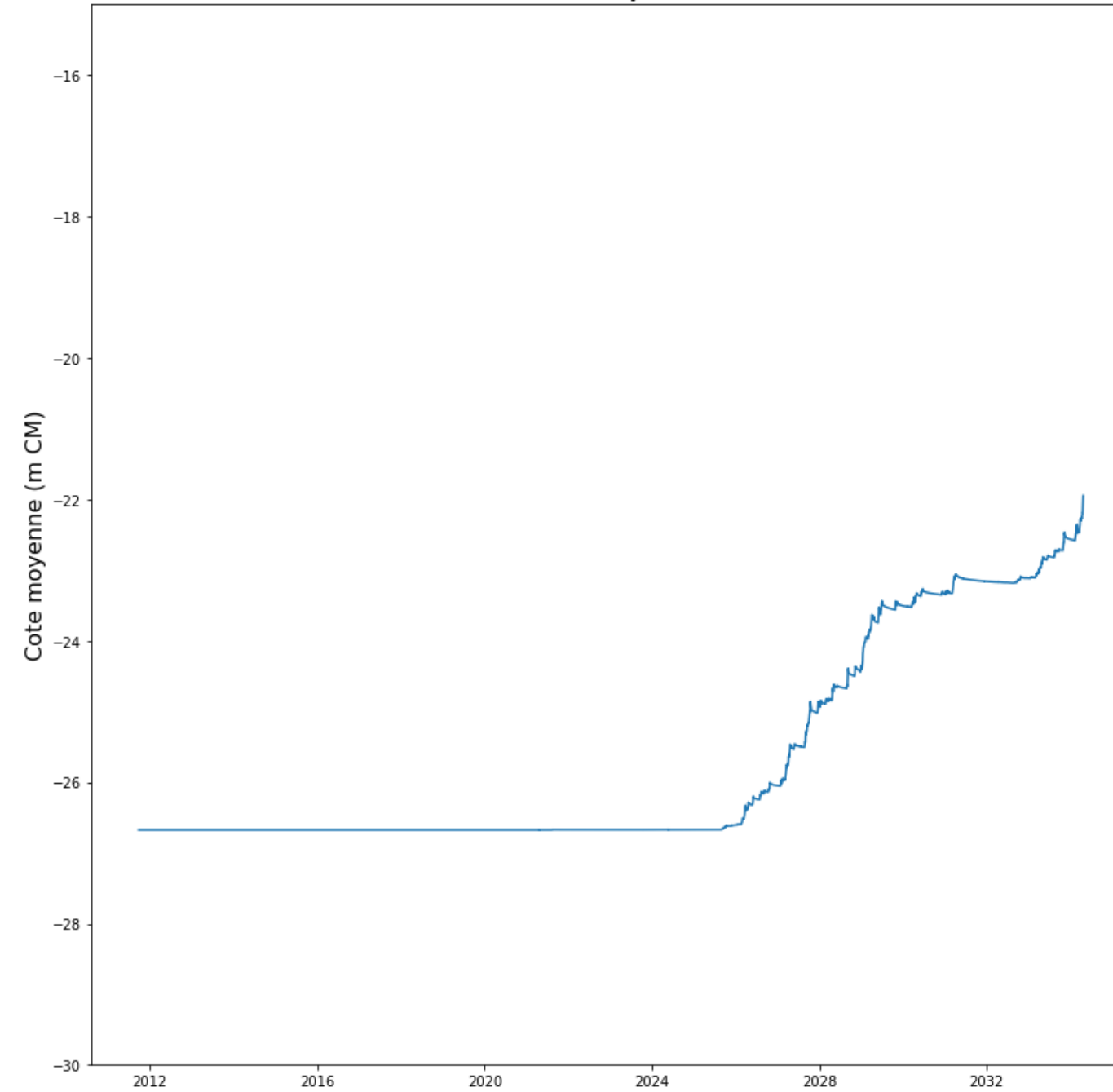
Evolution de la cote moyenne de la zone 28

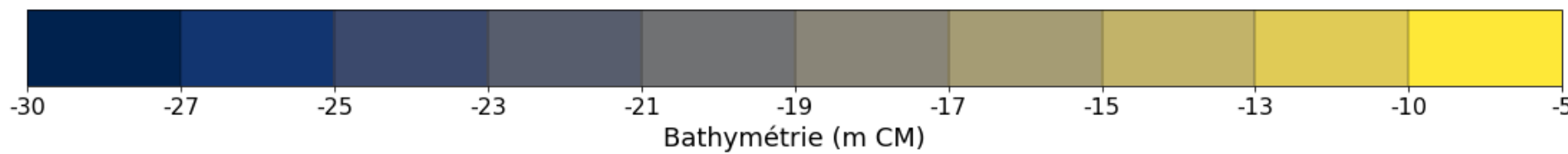
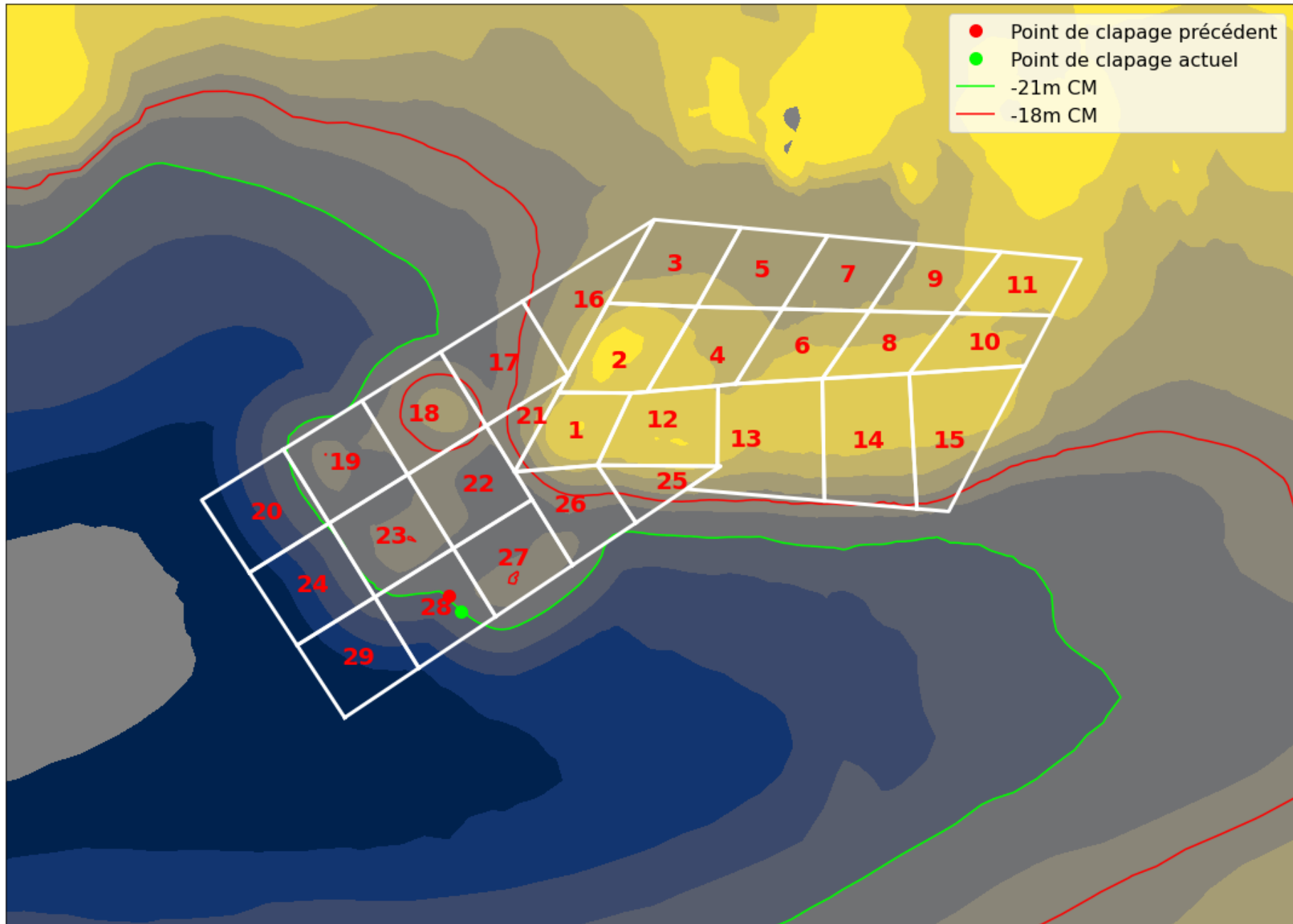




Date de changement de point : 22-04-2034

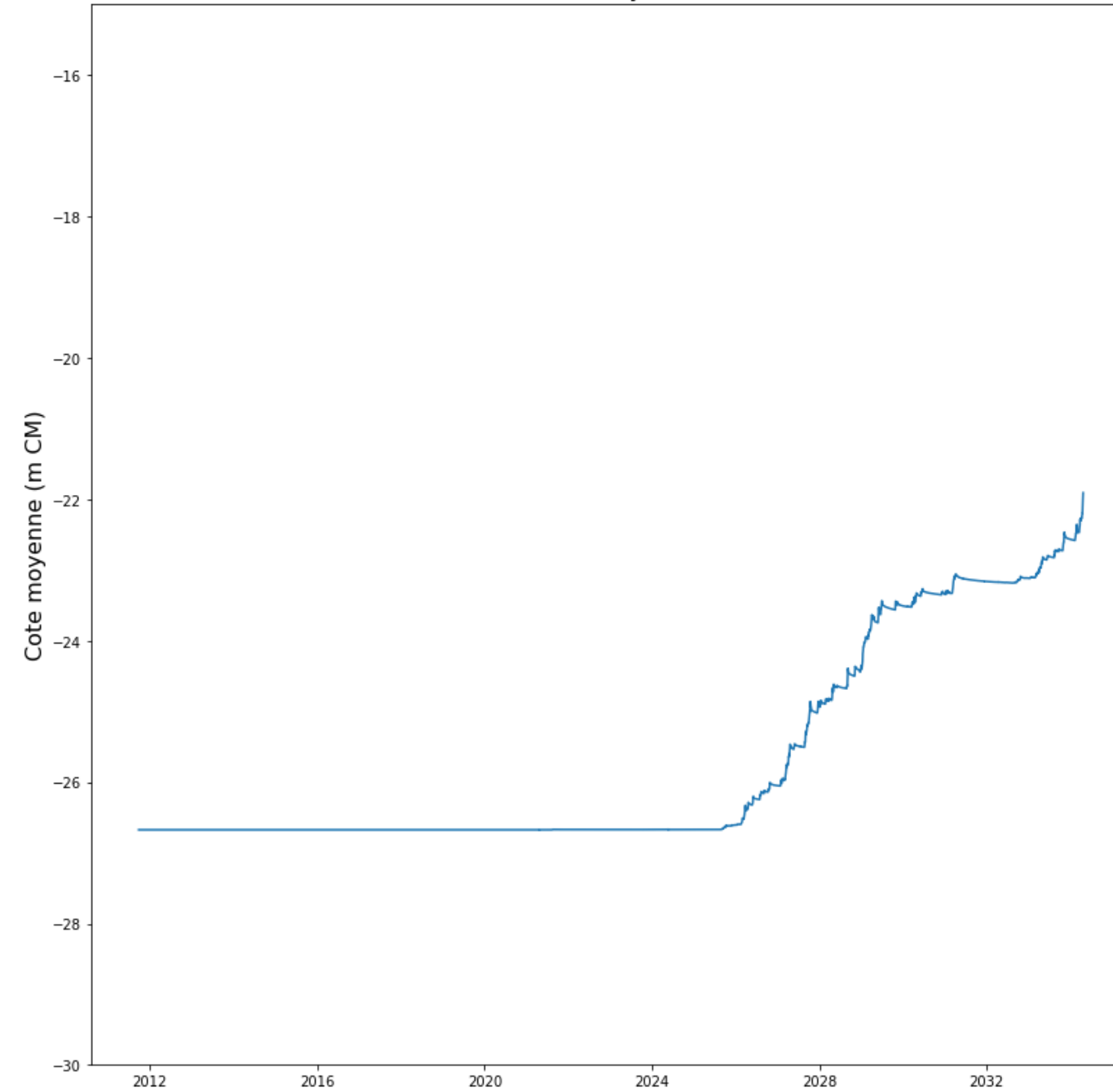
Evolution de la cote moyenne de la zone 28



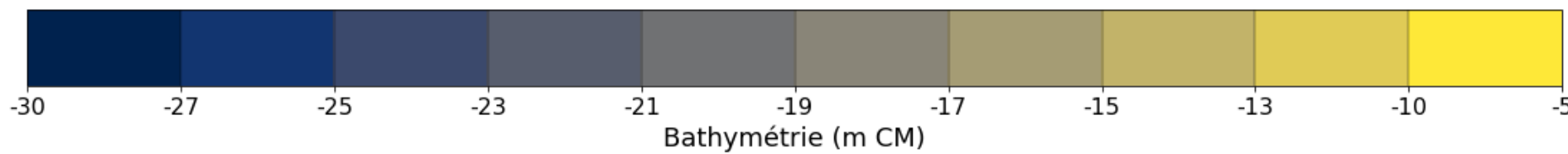
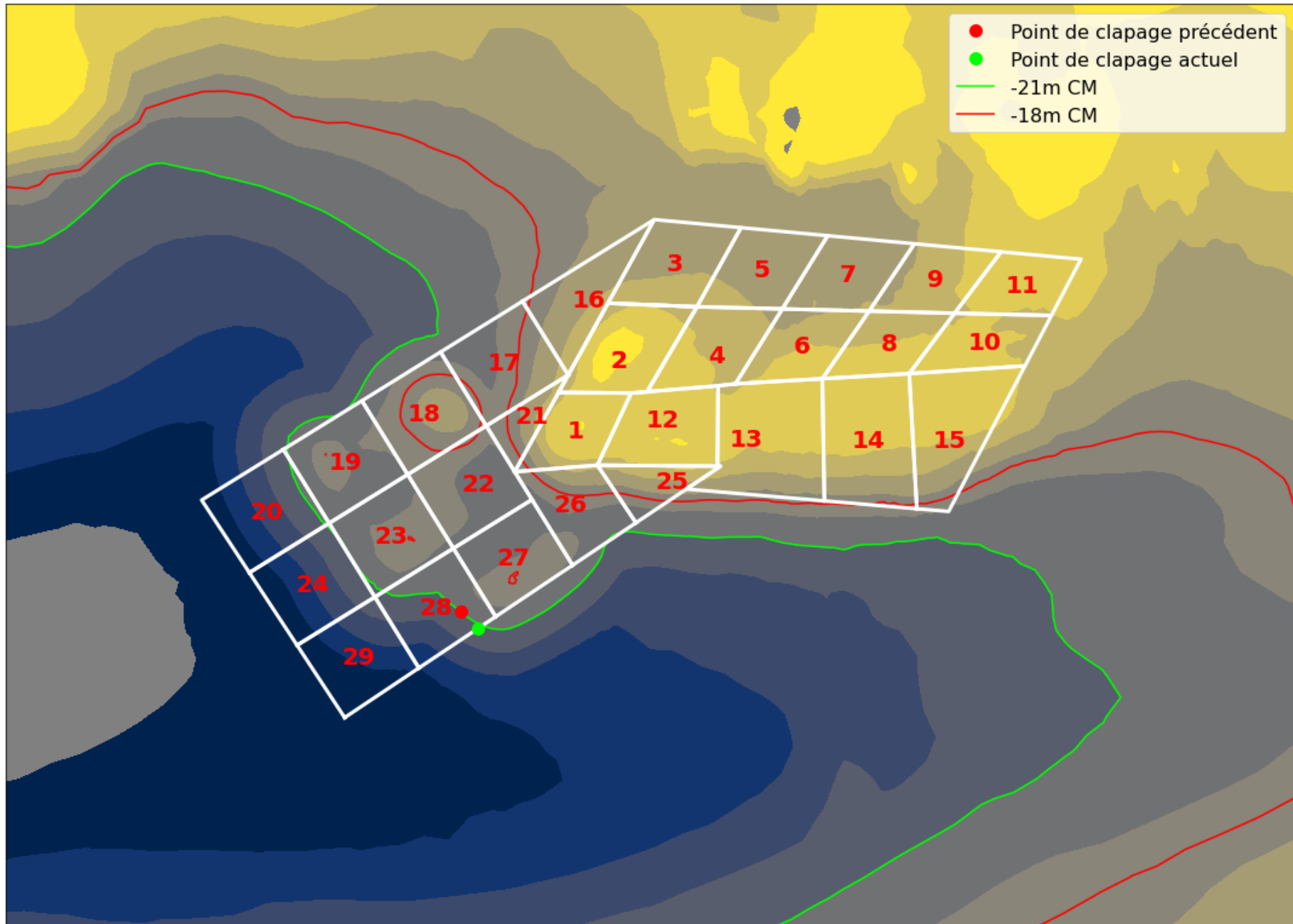


Date de changement de point : 22-04-2034

Evolution de la cote moyenne de la zone 28







Date de changement de point : 25-04-2034

Evolution de la cote moyenne de la zone 28

