This document shows a comparison of two versions (2022 and 2021) of European Copernicus DEM EEA10 (~10 meters ground sampling distance) and global GLO30 (~30 meters).

Fig.1 shows the updated tiles in the version 2022. The original footprint of the version 2019 is shown in white while the footprint of the latest version is shown in red. There is total of 125 updated tiles of 1° x 1°.

Fig.2 shows the difference between the version 2022 and the version 2021. This difference is rendered between -1 metre and +1 metre from blue to red. Most of the visible differences are located in Norway or in the Spanish Pyrenees.

Access to Copernicus DEM EEA-10 data is not public. To be able to view the hyperlooks in this document, you must request an authorization from the Copernicus Space Component Data Access PANDA Catalogue. Access to GLO30 is open.

Copernicus DEM releases 2022 vs. 2021

pile_2D

EEA10 - Overview

Fig.1: Global view of the Copernicus DEM 10 meters release 2022_1. 2D_view

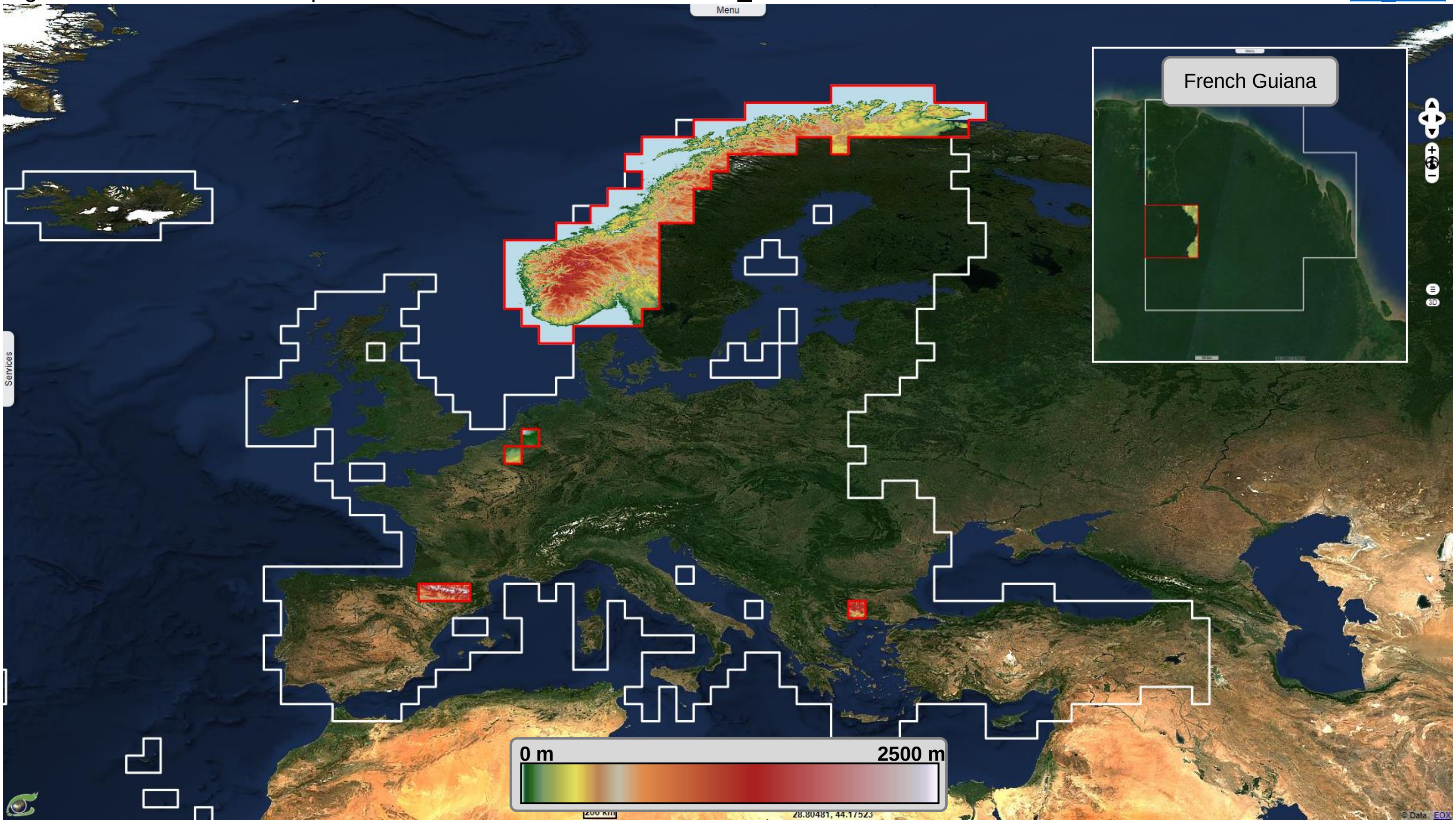
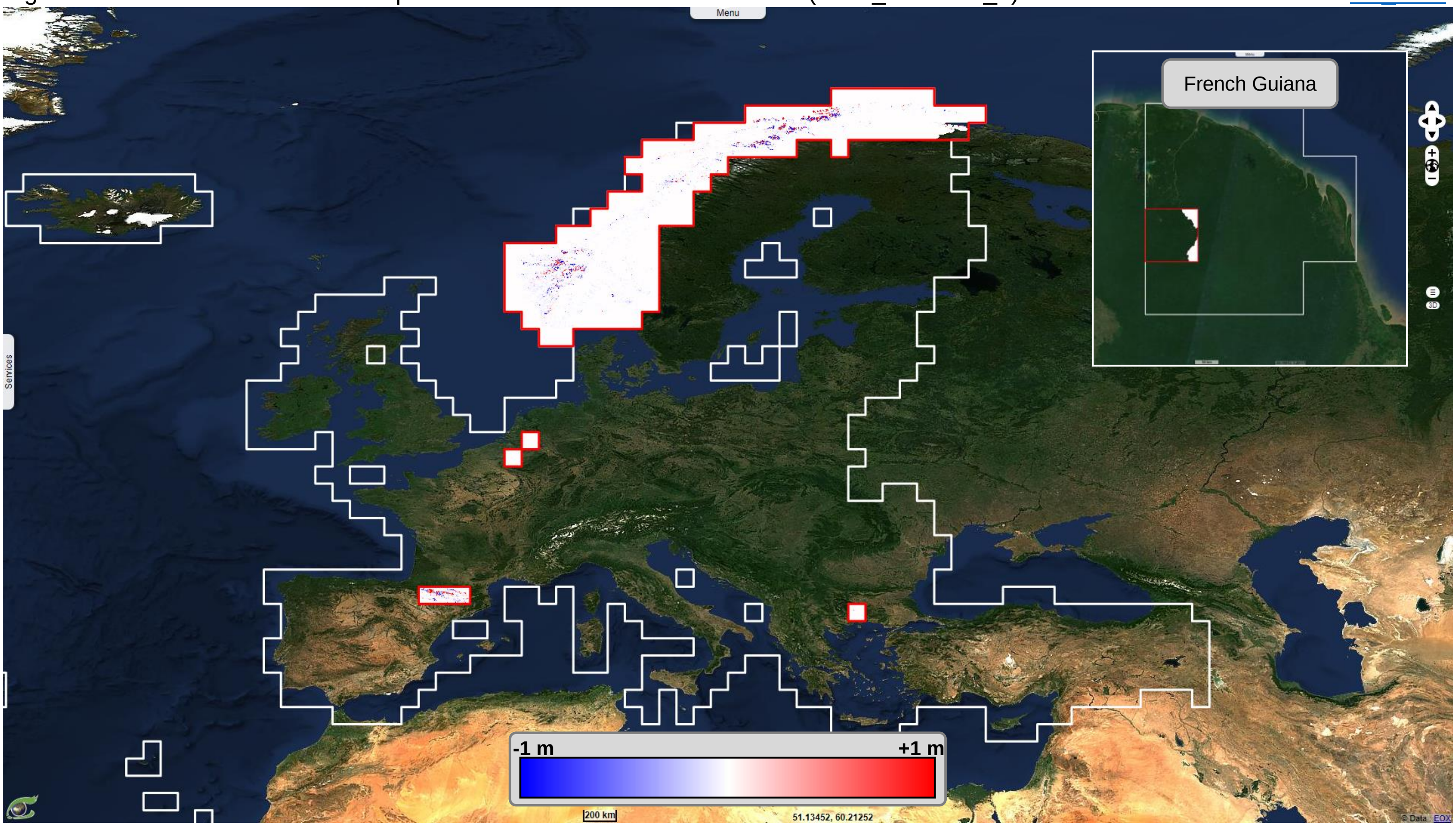


Fig.2: Global view of the difference performed between the two releases (2022_1 – 2021_1). 2D_view



EEA-10 comparison (1)

Pyrenees

The differences visible in the Pyrenees are due to the DEM used to infill the Copernicus DEM. It was SRTM or ASTER GDEM in the previous version and it has been replaced by a local DSM tagged as "**DSM05 Spain**" in the product handbook (available here).

Fig.3 shows an example of infilling update in one of the Rio Bellos river valley. The previously used ASTER GDEM has been replaced by the "DSM05 Spain". Fig.3a and Fig.3b show the DEM and the Filling mask (FLM) of the version 2021 of Copernicus DEM. Fig.3c and Fig.3d show the ones from the version 2022. Fig.3e shows the DEM difference between the two releases.

Fig.4 shows another example of the infilling base on the "DSM05 Spain" near the France border. This infilling improves the quality of the topography but introduces some discontinuity at the edge of the "DSM05 Spain" infilling.

DN	Class	Colour
0	Void (no data)	
1	Edited (except filled pixels)	
2	Not edited / not filled	
3	ASTER	
4	SRTM90	
5	SRTM30	
6	GMTED2010	
7	SRTM30plus	
8	TerraSAR-X Radargrammetric DEM	
9	AW3D30	
100	Norway DEM	
101	DSM05 Spain	
102	Norway DEM v2	

Fig.3: View of a valley where COP-DEM EEA-10 has been improved using the "DSM05 Spain". 2D_view

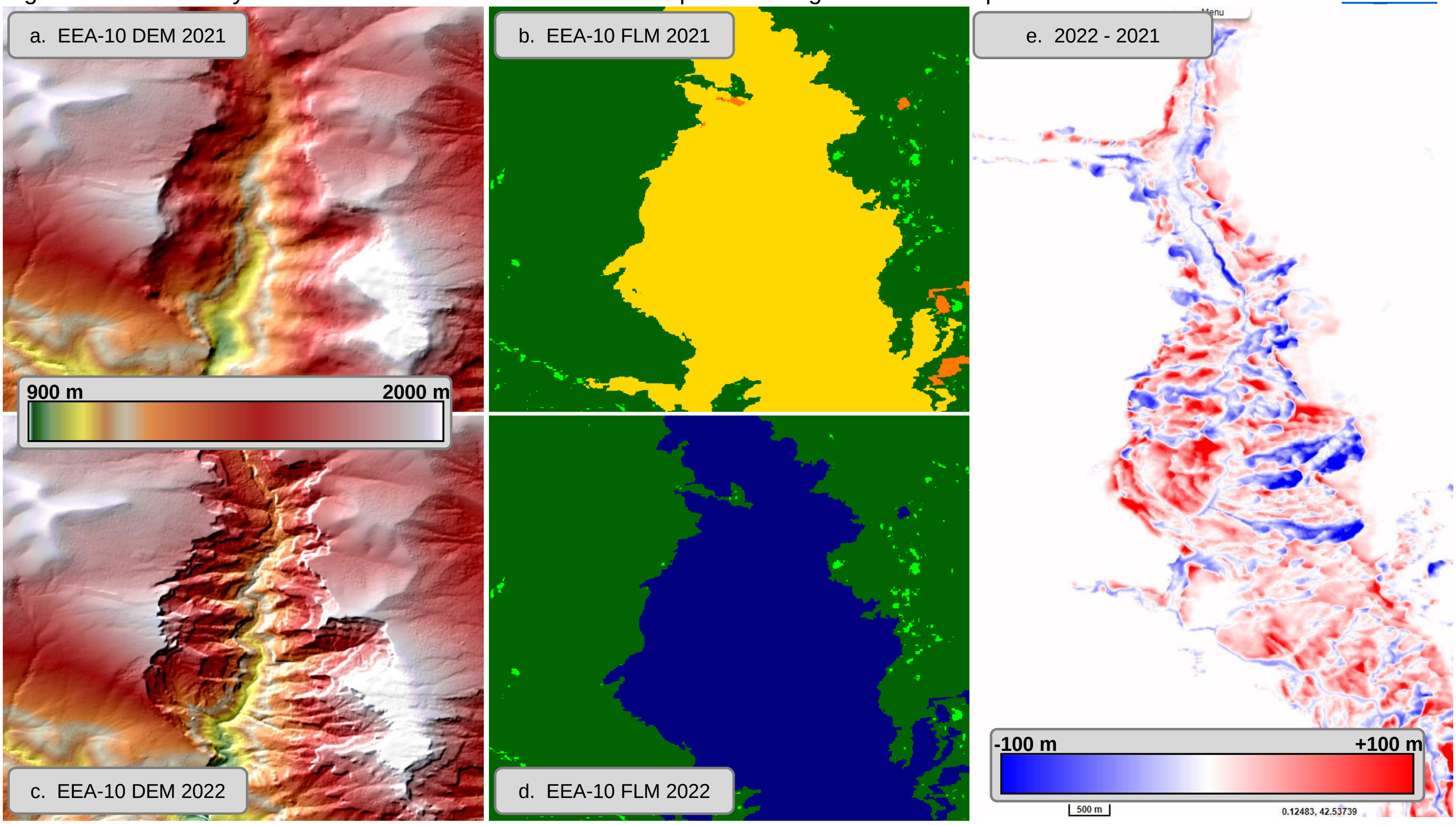
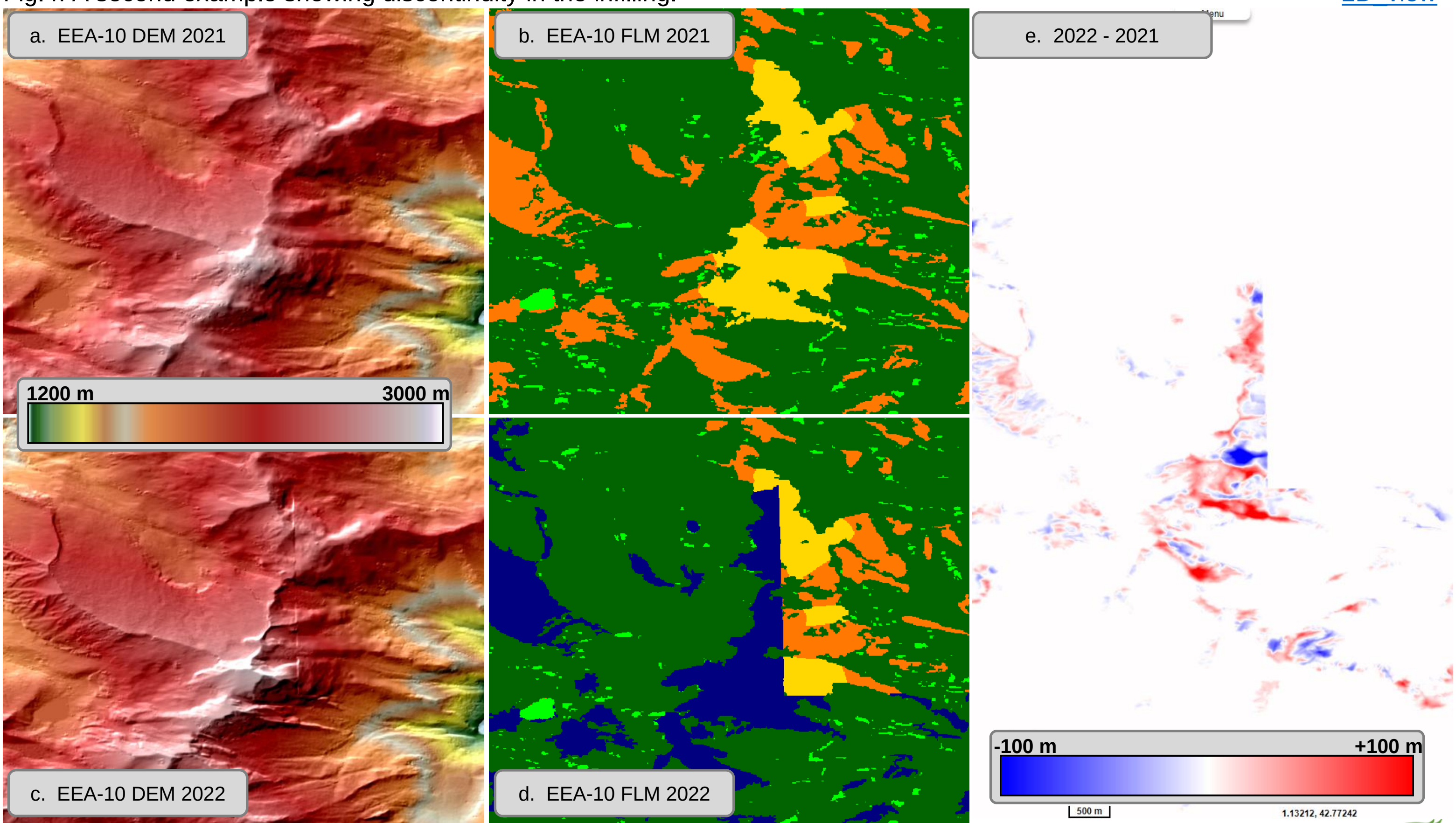


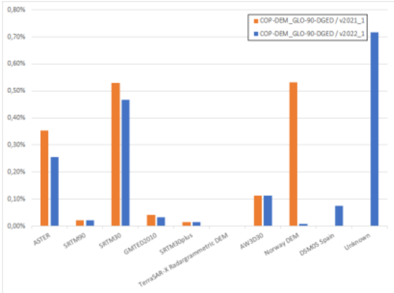
Fig.4: A second example showing discontinuity in the infilling. 2D_view



The infilling done in Norway has been updated. The new DEM "**Norway DEM v2**" is used to infill most of the previous areas covered by the "**Norway DEM**". The histogram here aside shows the distribution of infilling DEM used in the version 2022_1 vs. 2021_1 for the area of the 2022_1 update. The "**Norway DEM**" goes from 0.53% to 0.01% while the "**Norway DEM v2**" amount to 0.72% in the version 2022_1. Fig.5 shows the difference induced by this update (between -1 and +1 metre). One may see the correction of a grid pattern present in the "**Norway DEM**" since the version 2020_1.

Fig.6 shows another infilling update where "**ASTER GDEM**", "**GMTED 2010**" and "**Norway DEM**" are replaced by the "**Norway DEM v2**". The absolute difference is greater than 100 m is some area.

Other DEMs are replaced: -ASTER GDEM (0.35% → 0.25%), -SRTM30 (0.53% → 0.47%), -GMTED2010 (0.04% → 0.03%)



EEA-10 comparison (2)

Norway

Fig.5: View of the Gurskøy Island where the previous infilling has been updated (Norway DEM vs Norway DEM v2). 3D view

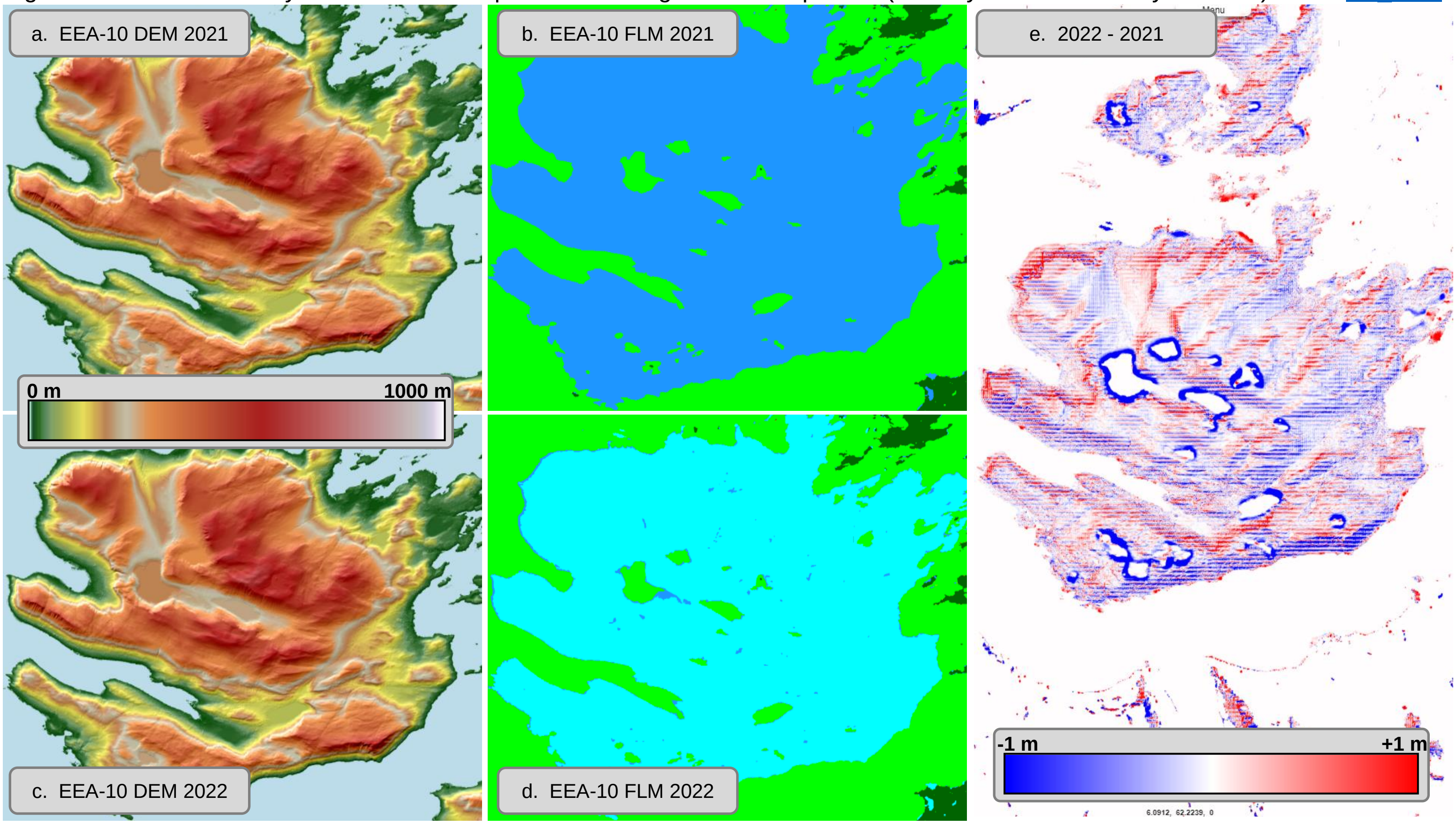
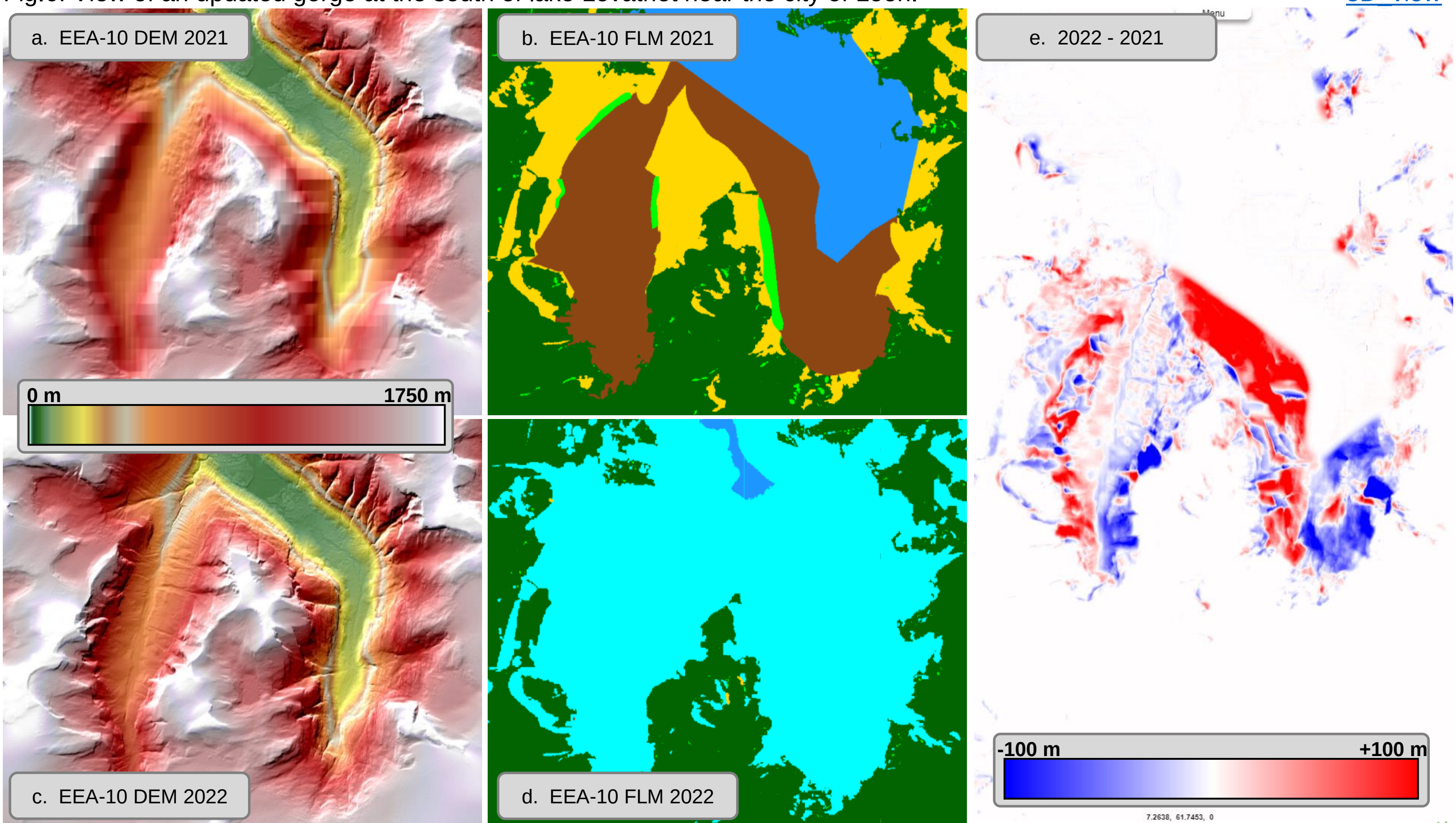


Fig.6: View of an updated gorge at the south of lake Lovatnet near the city of Loen. 3D view



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Here is illustrated the comparison between the two versions (2022 and 2021) of Global Copernicus DEM GLO30 (30 meters vertical sampling distance).

Fig.7 shows the updated tiles in the version 2022. The original footprint of the version 2019 is shown in white while the footprint of the latest version is shown in red. There is total of 188 updated tiles of 1° x 1°.

Fig.8 shows the difference between the version 2022 and the version 2021. This difference is rendered between -1 metre and +1 metre from blue to red. As for EEA10, most of the visible differences are located in Norway or in the Spanish Pyrenees, but some other areas have been updated like Indonesia, Colombia, …

The remaining differences are located along rivers and shores. Some water bodies height has been updated as well as the Great Nicobar Island that has been lowered in the new release.

GLO-30 comparison (1)

Overview

Fig.7: Global view of the updated tiles in the version 2022_1. [2D_view]

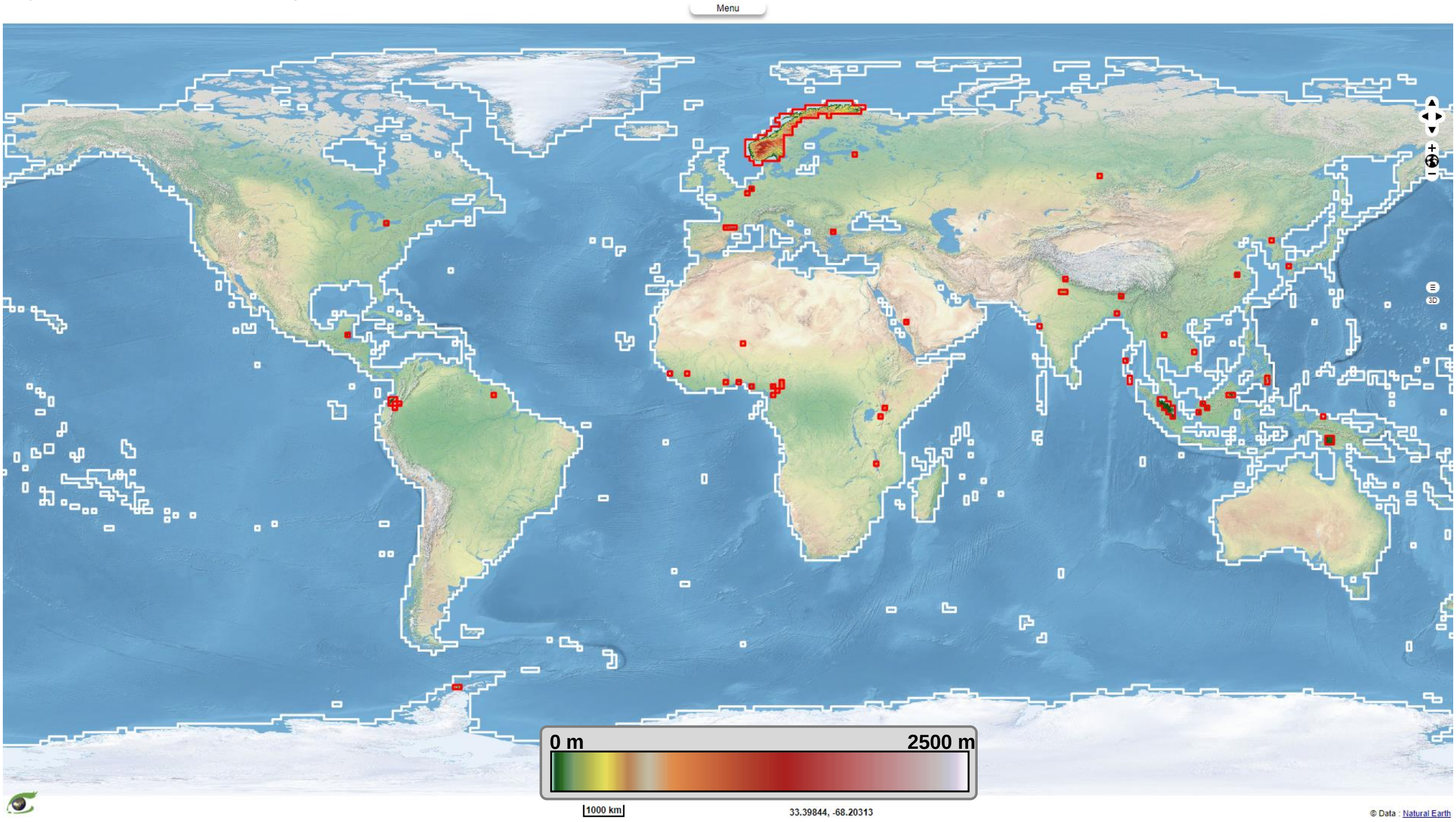
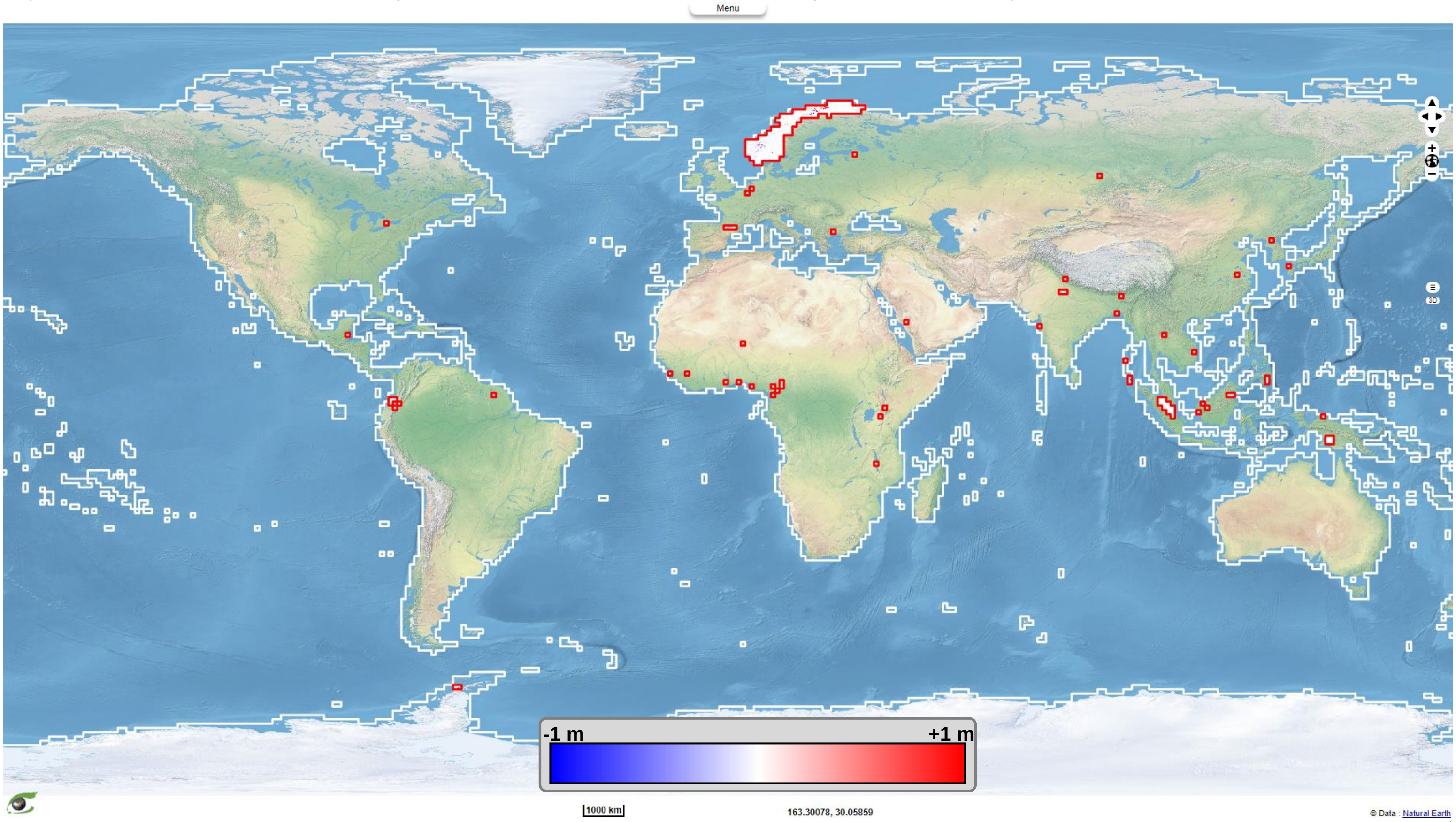


Fig.8: Global view of the difference performed between the two releases (2022_1 – 2021_1). [2D_view]



GLO-30 comparison (2)

Great Nicobar & Water bodies

Fig.9 shows the Great Nicobar Island, one of the major islands of the Nicobar Islands archipelago in the Bay of Bengal. As highlighted by the difference between 2022 and 2021, this island has been globally lowered by 10 metres. The Editing Mask (EDM) and its associated legend (here aside) has been updated from "**Not edited**" / "**Smoothed pixel**" (respectively 44% and 15% of the yellow area) to "**Shifted pixels**" (60% of the yellow area).

Fig.10 shows a water level adjustment in seven (7) water bodies located in Indonesia, in the East of Riau province. The difference between 2022 and 2021 (fig e) illustrates the levelling done. (a) / (c) and (b) / (d) display the GLO-30 in version 2021_1 and 2022_1 respectively. It could be noted that the Editing Mask (EDM) and the Filling Mask (FLM) is unchanged.

DN	Class	Colour
1	Not edited	
2	Infill of external elevation data	
3	Interpolated pixels	
4	Smoothed pixels	
5	Airport editing	
6	Raised negative elevation pixels	
7	Flattened pixels	
8	Ocean pixels	
9	Lake pixels	
10	River pixels	
11	Shoreline pixels	
12	Morphed pixels	
13	Shifted pixels	

Fig.9: View of Great Nicobar island in the two releases, their Editing Mask and the difference. 2D_view

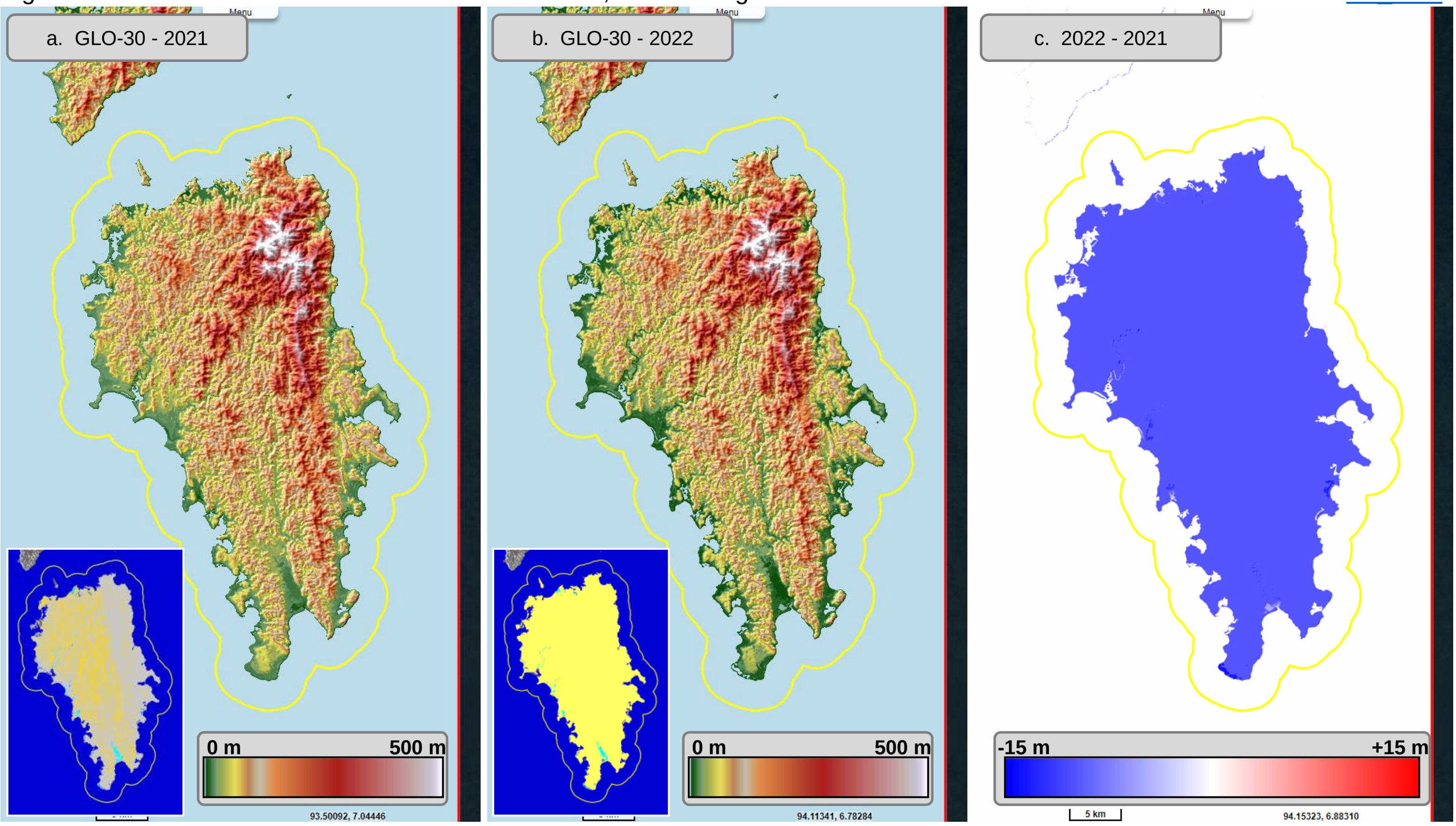


Fig.10: View of 7 water bodies where the water level has been updated, in the Riau province (Indonesia) 2D_view

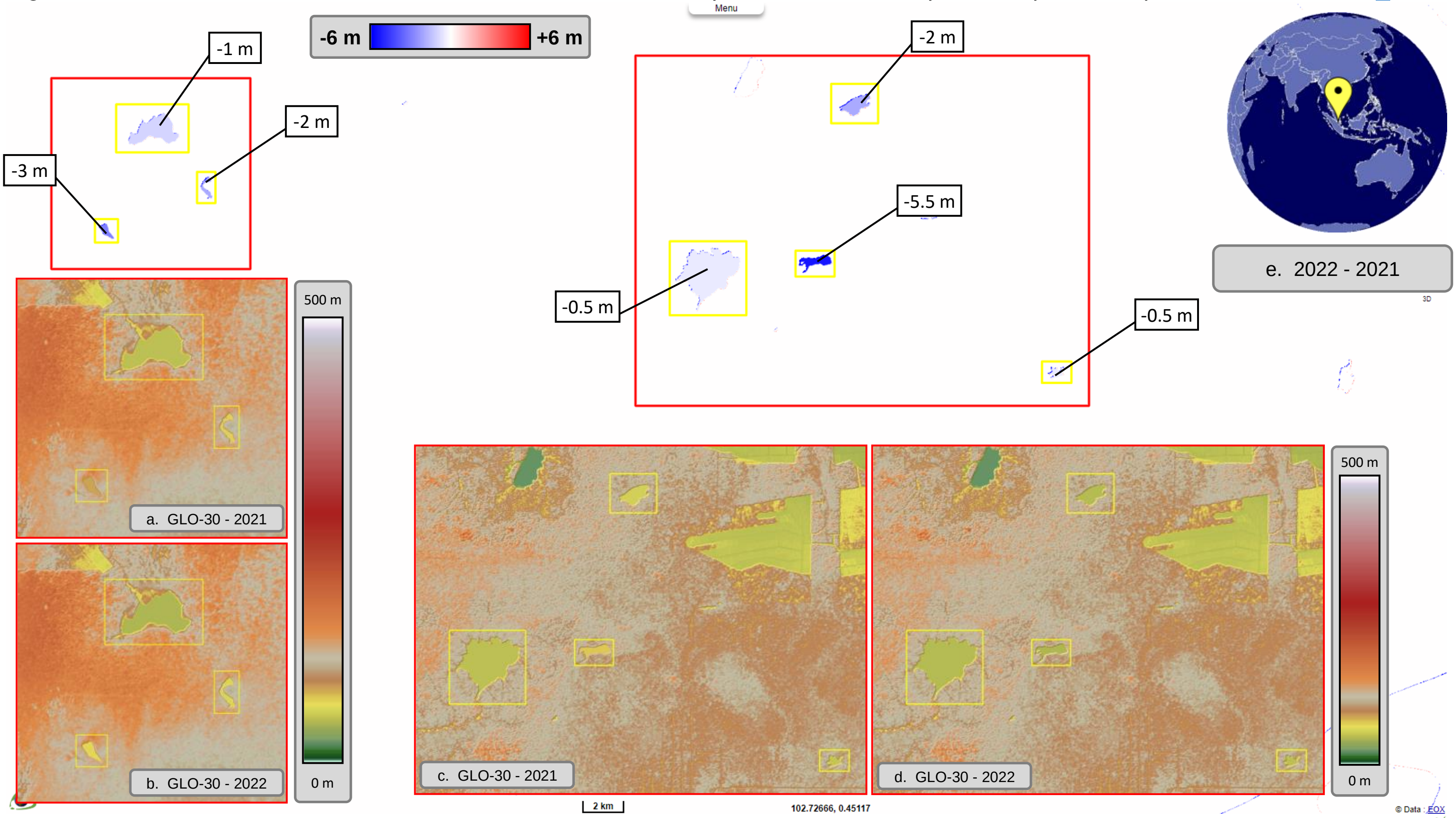


Fig.11 shows the Niagara Falls located at the border of United States (New York state) and the Canada (Ontario state). These falls have been updated in the version 2022_1 to better render their real position. Here, the difference of elevation is rendered between -5 m and +5 m but the absolute difference is higher than 60 m.

Fig.12 shows an updated area in the south of Bulgaria, near the town of Teshel. The area was previously set with “Smooth pixels” and is now infilled with external data (see EDM legend above Fig.9). The infilling is done in the version 2022 using SRTM30 and ASTER GDEM (see FLM legend above Fig.3). The third column shows the difference between the two versions as followed:

- GLO-30 – the difference between -50 m and +50 m,
- EDM / FLM – the difference between each mask version showing the changing classes.

Part of the “Smoothed pixels” has been replace by “Not edited” pixels.

GLO-30 comparison (3)

Niagara Falls & Bulgaria

Fig.11: View of Niagara Falls (Canada / United States).

2D_view

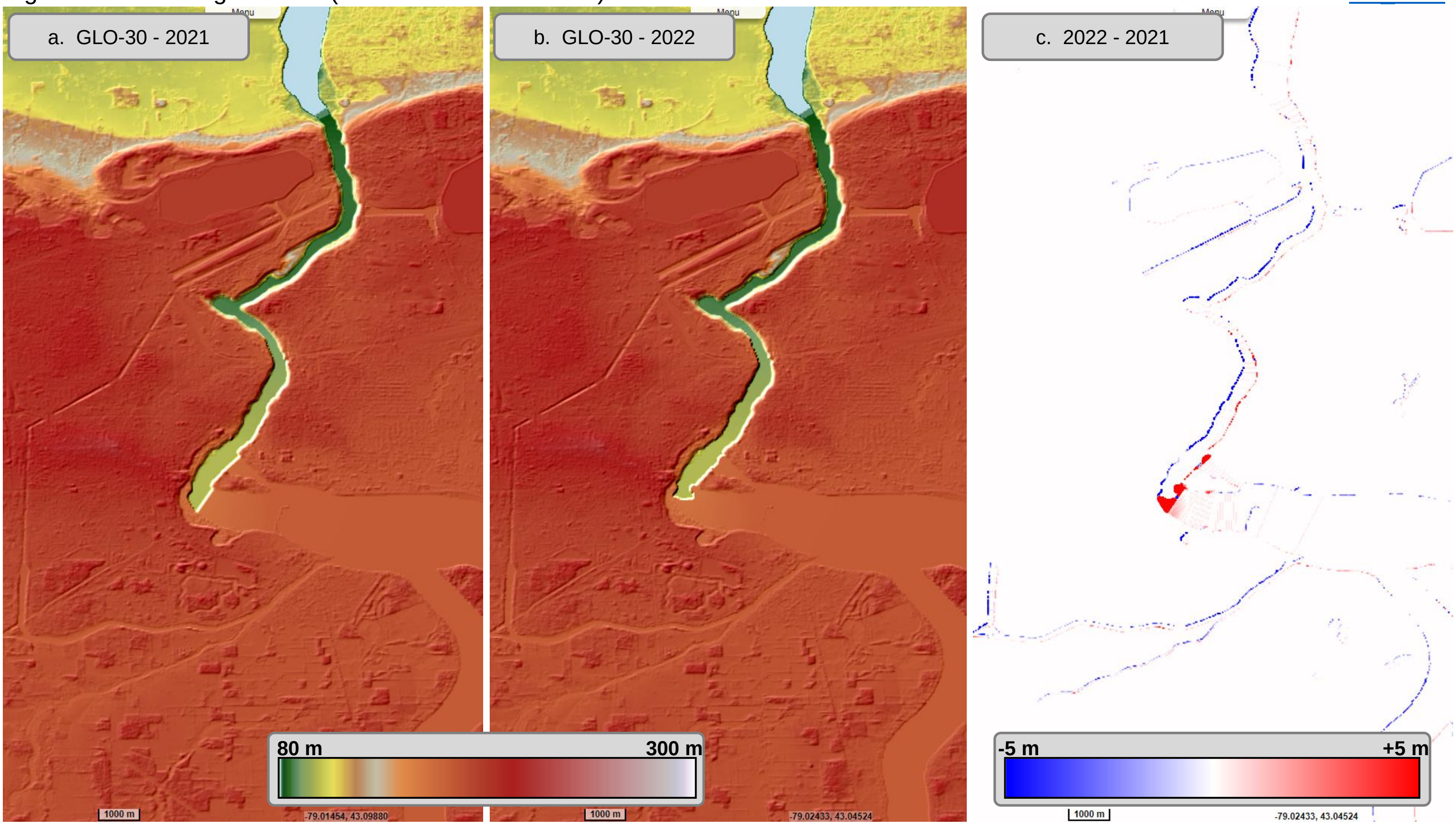


Fig.12: View of infilling update in Bulgaria in the south of Teshel town.

2D_view

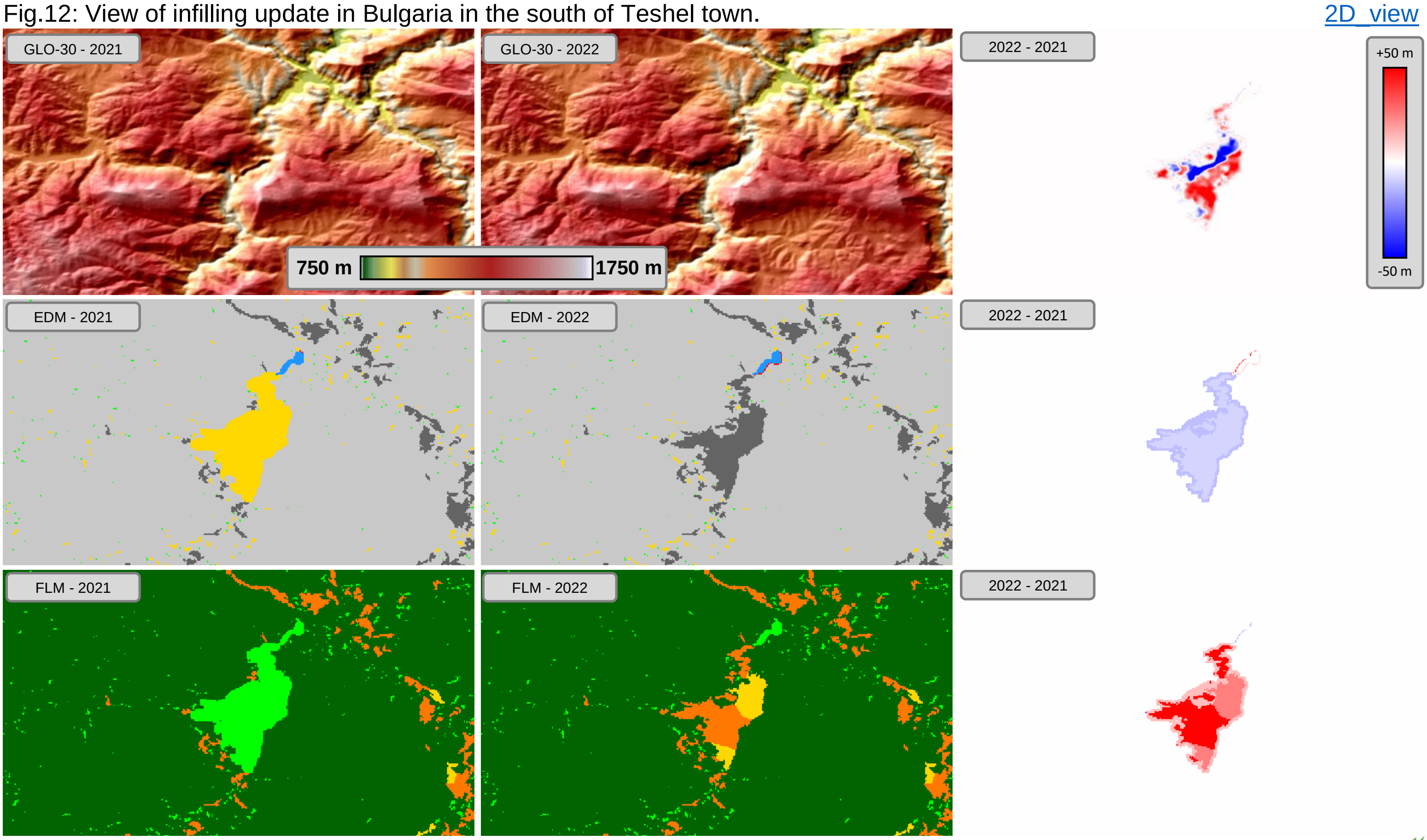


Fig.13 shows the western coast of the Borneo Island where a red/blue pattern is visible in the difference image. This pattern is visible on almost all the tiles updated in the version 2022_1. The differences are quite small, here the colour map goes from -1 m to +1 m.

Fig.14 shows the tree masks, -Editing Mask (EDM), -Filling Mask (FLM) and -Water Body Mask (WBM), for each version (2021 and 2022).

One may notice that the pattern visible in the DEM difference is also visible in the masks, in particular in the Water Body Mask (legend here aside) where the north-west side of the river change from "River" to "No water" (red line) while the south-east side of the rivers change from "No water" to "River" (blue line).

DN	Class	Colour
0	No data	
1	No water	
2	Ocean	
3	Lake	
4	River	

GLO-30 comparison (4)

River borders & shores

Fig.13: View of the western coast of Borneo Island.

2D_view

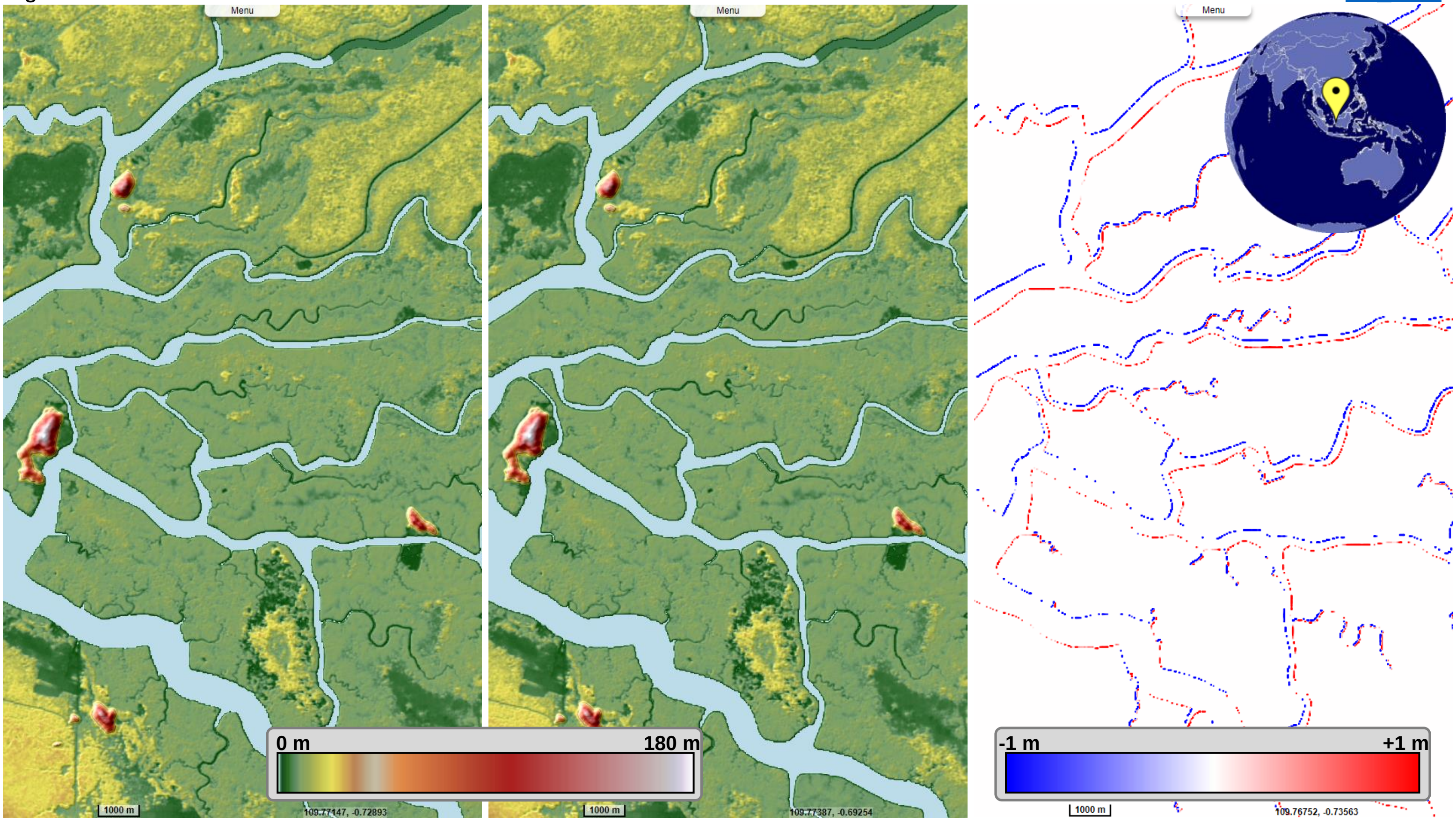


Fig.14: View of the 3 availables masks over the same area.

2D_view