Swell/current interaction in the Agulhas current and determination of dangerous seas index

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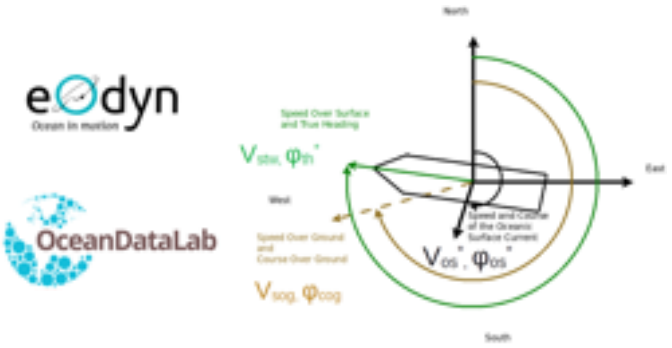
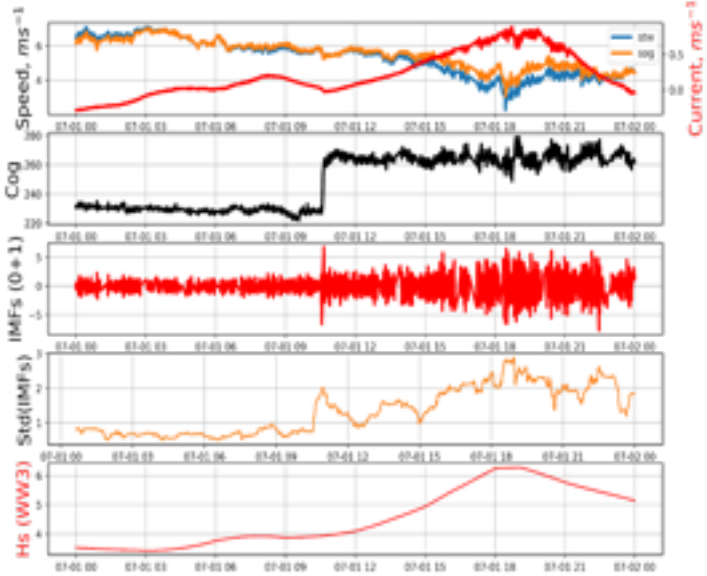
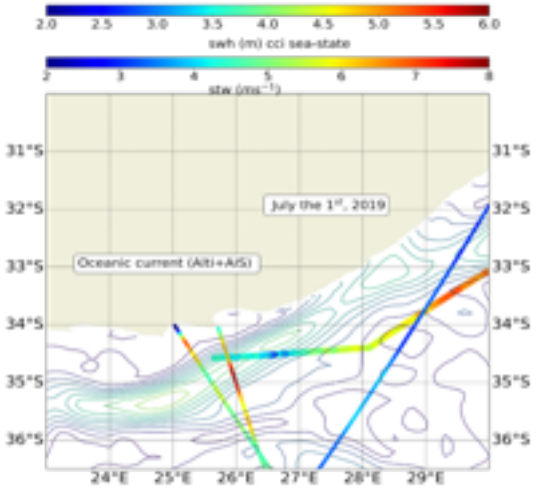


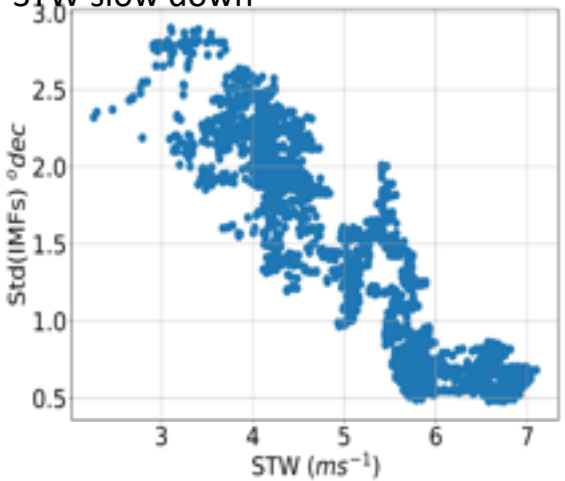
Empirical Mode Decomposition

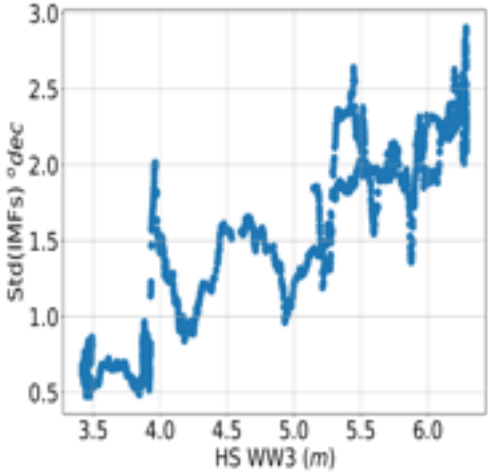


- Vessels want to keep a course over ground constant
- When sailing difficulties appear (Waves) the COG fluctuate and Vessel (speed through water STW slow down

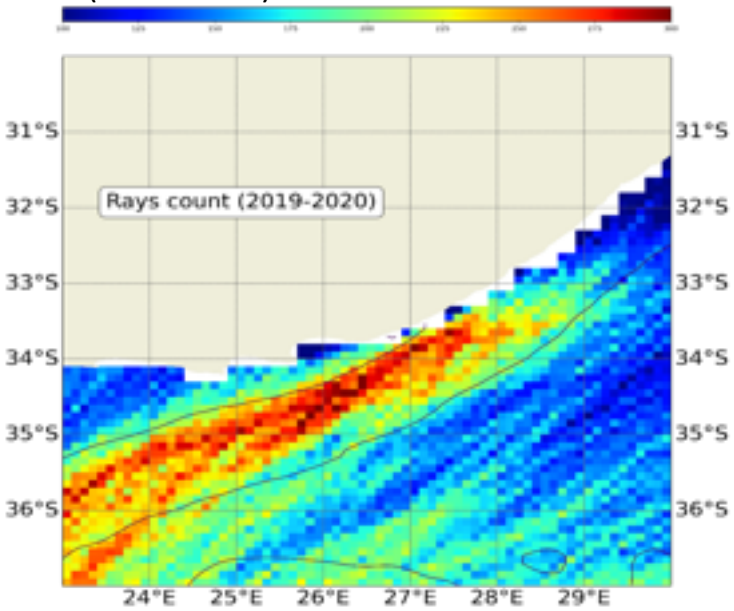


Example of one Vessel going weswart with the assiocated STW in color

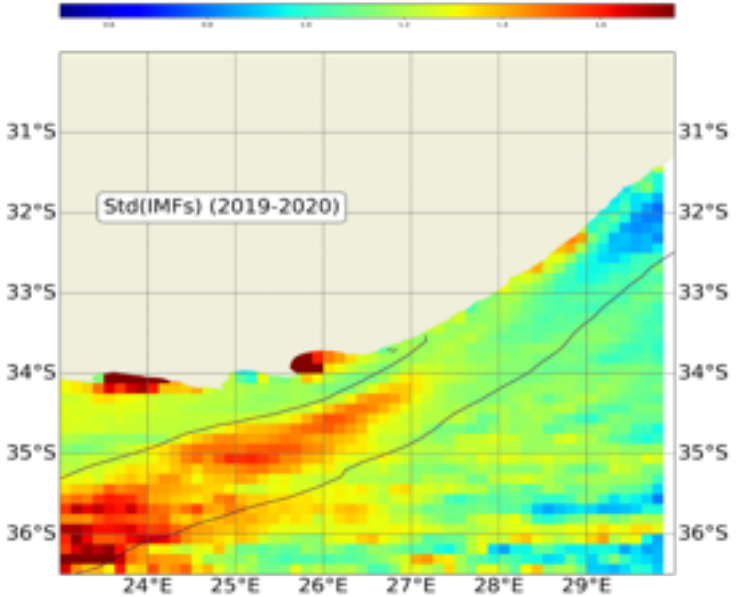




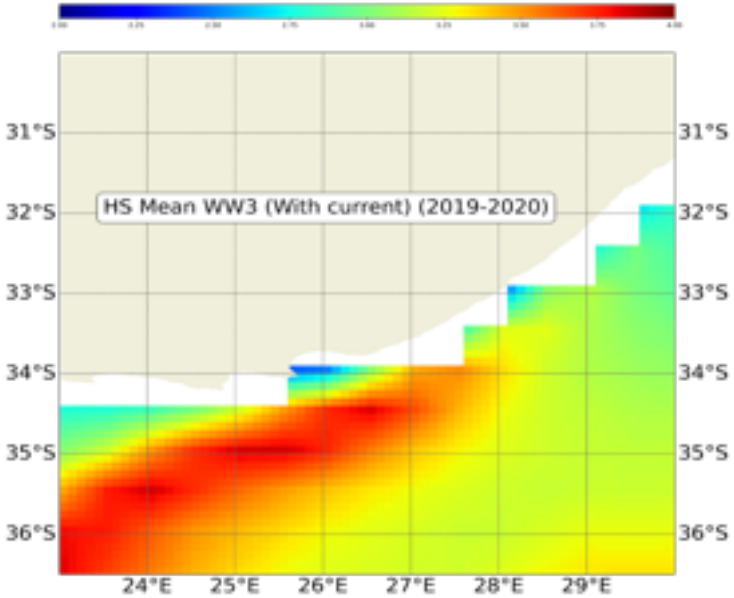
Plot of the wave rays count during two years, using WW3 boundary conditions (2019-2020)



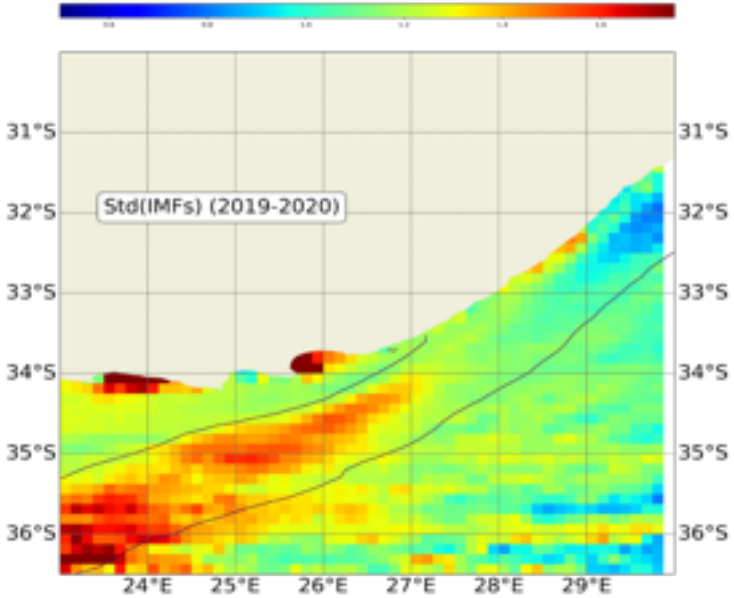
Plot of the mean fluctuation of the Course over ground during two years (2019-2020)

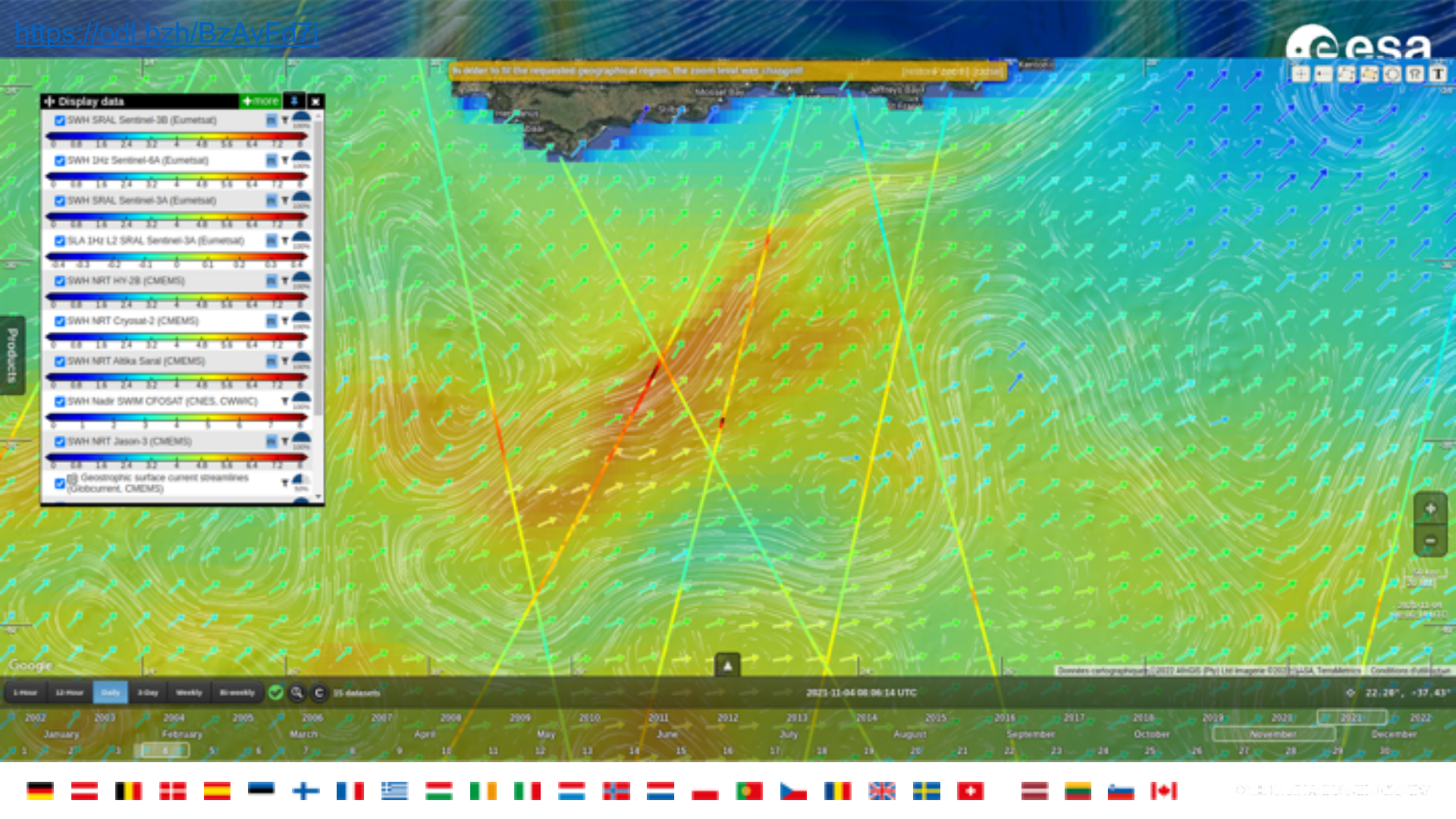


Plot of the mean HS (WW3) with the current forcing during two years (2019-2020



Plot of the mean fluctuation of the Course over ground during two years (2019-2020

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SWH Nadir SWIM CFOSAT (CNES, CWWIC)
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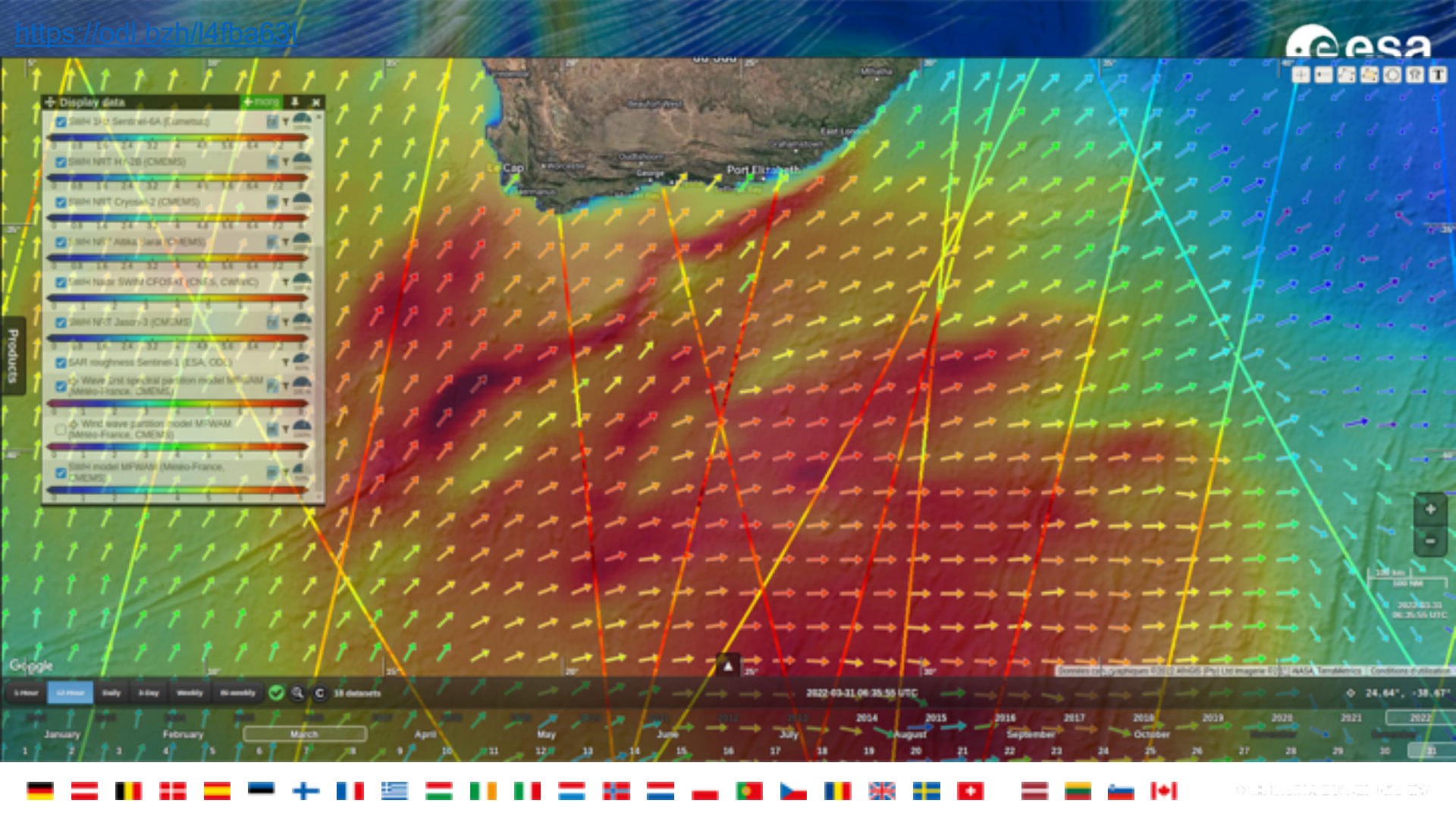
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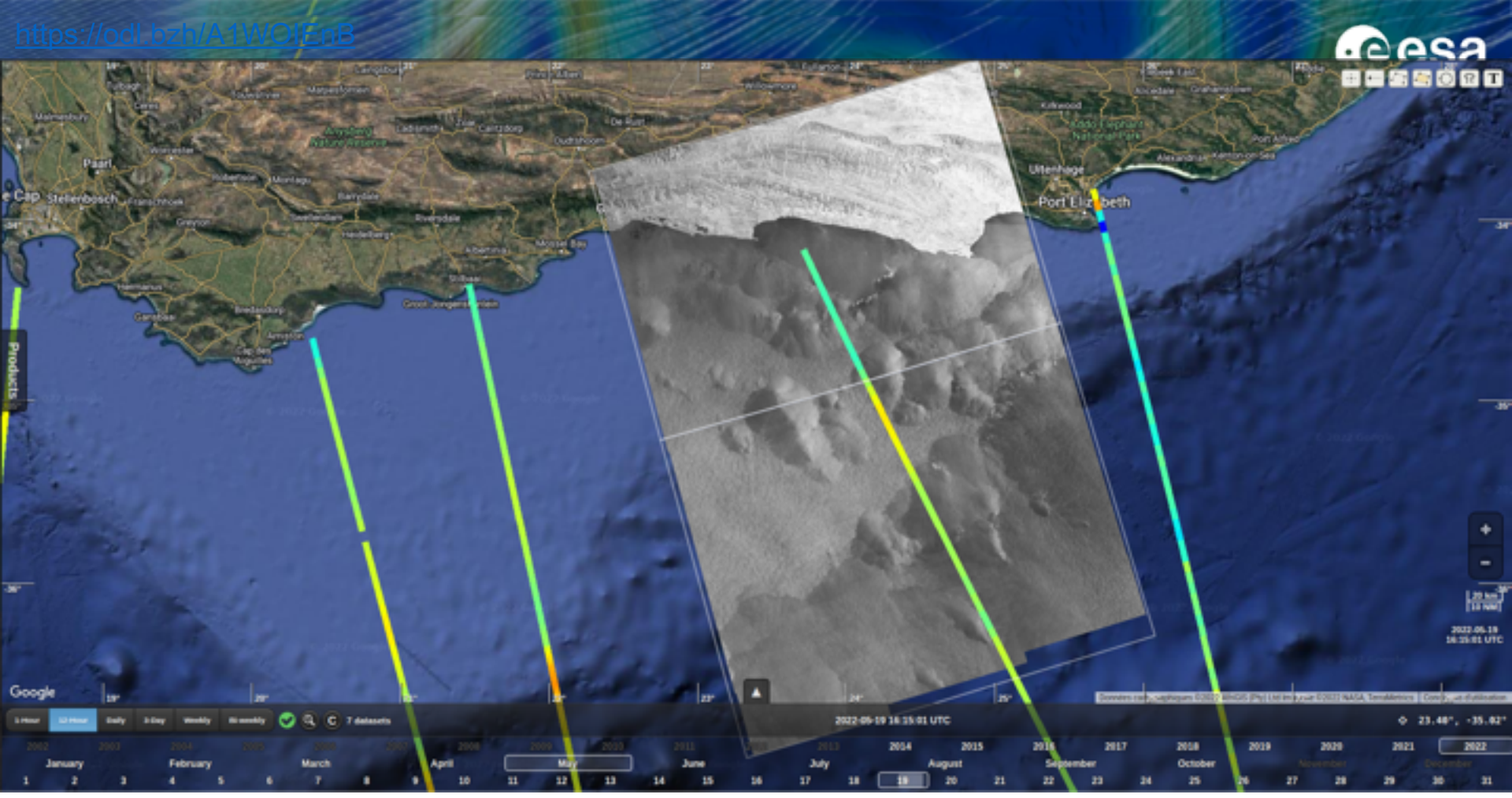

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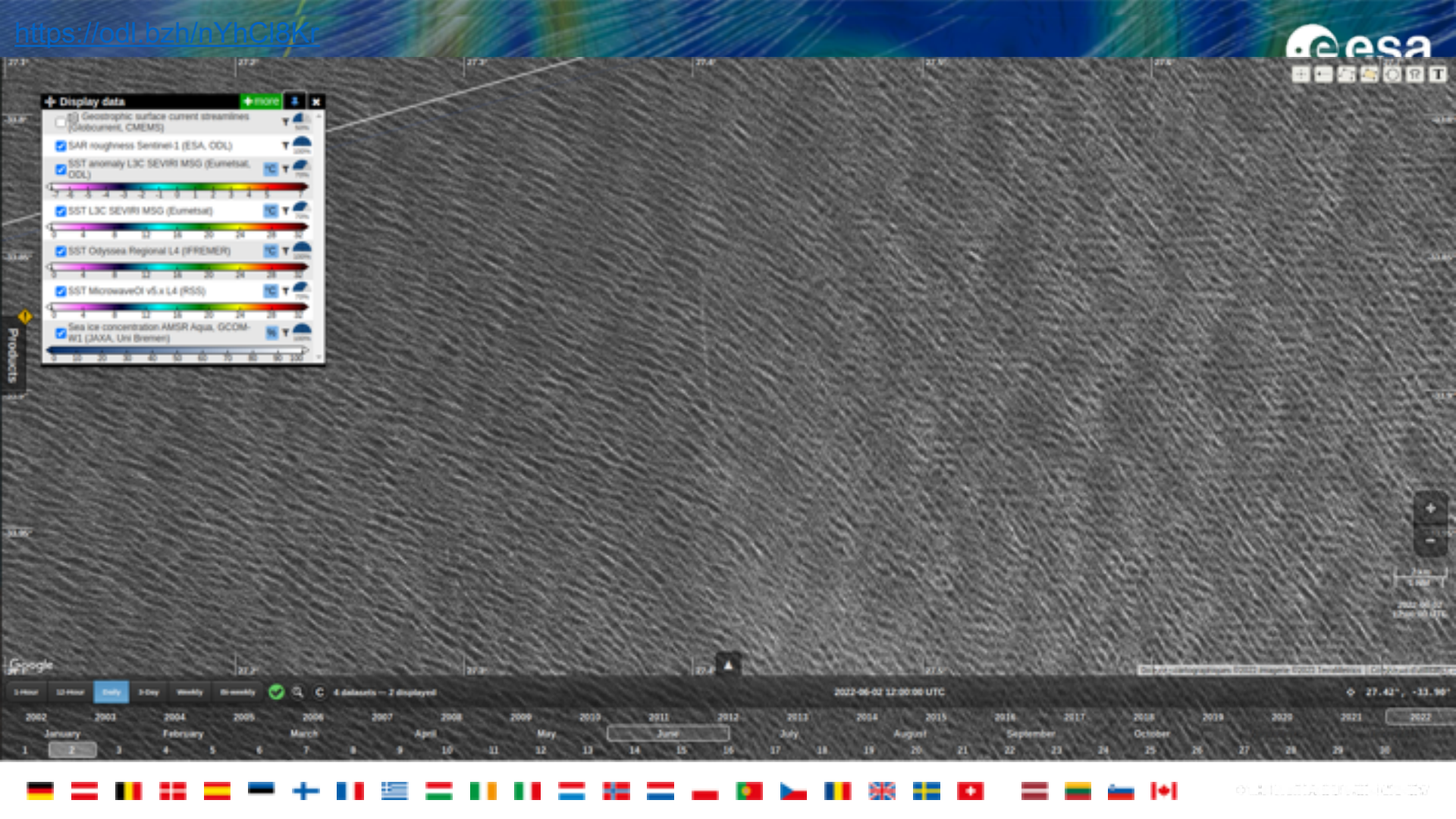
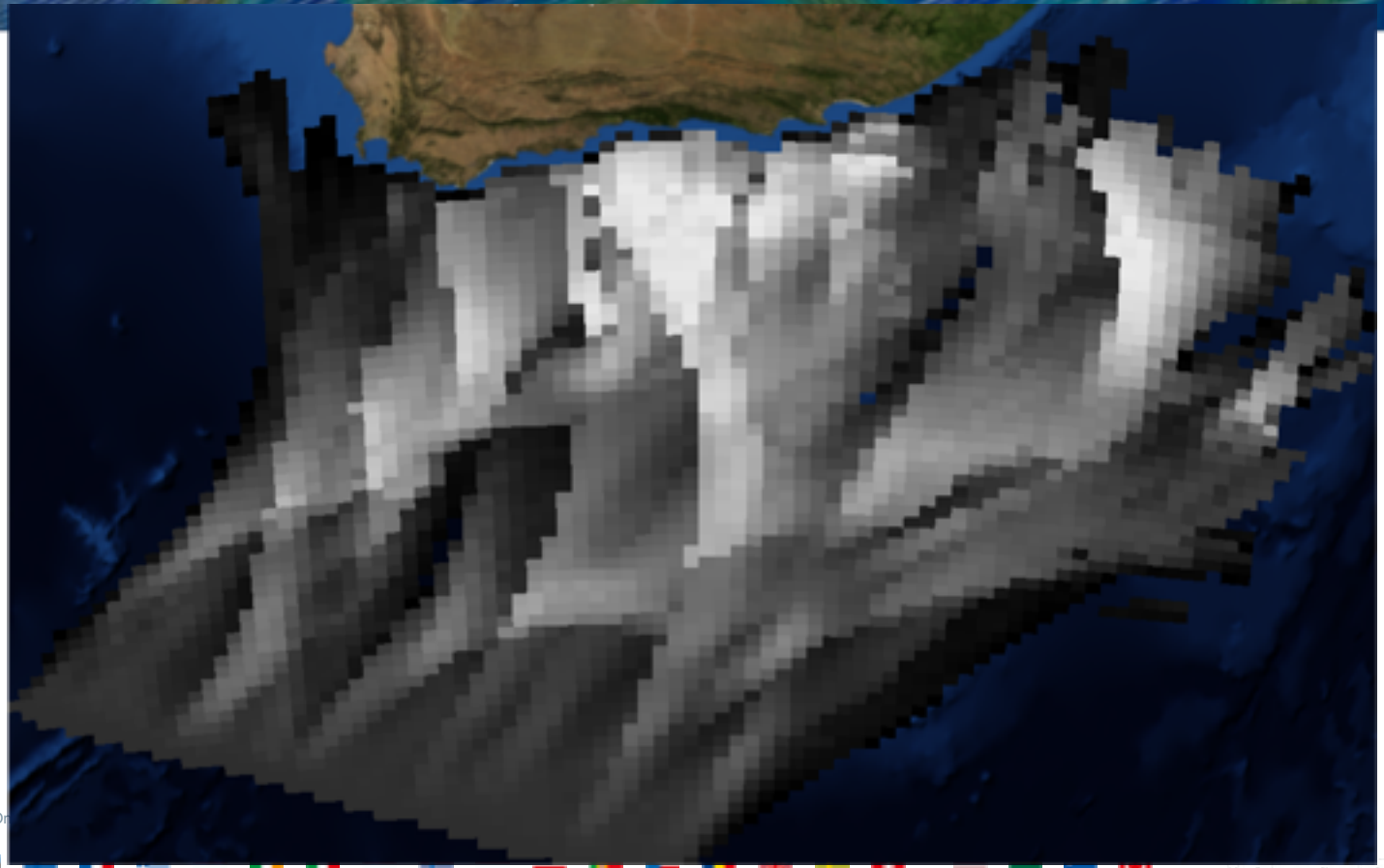


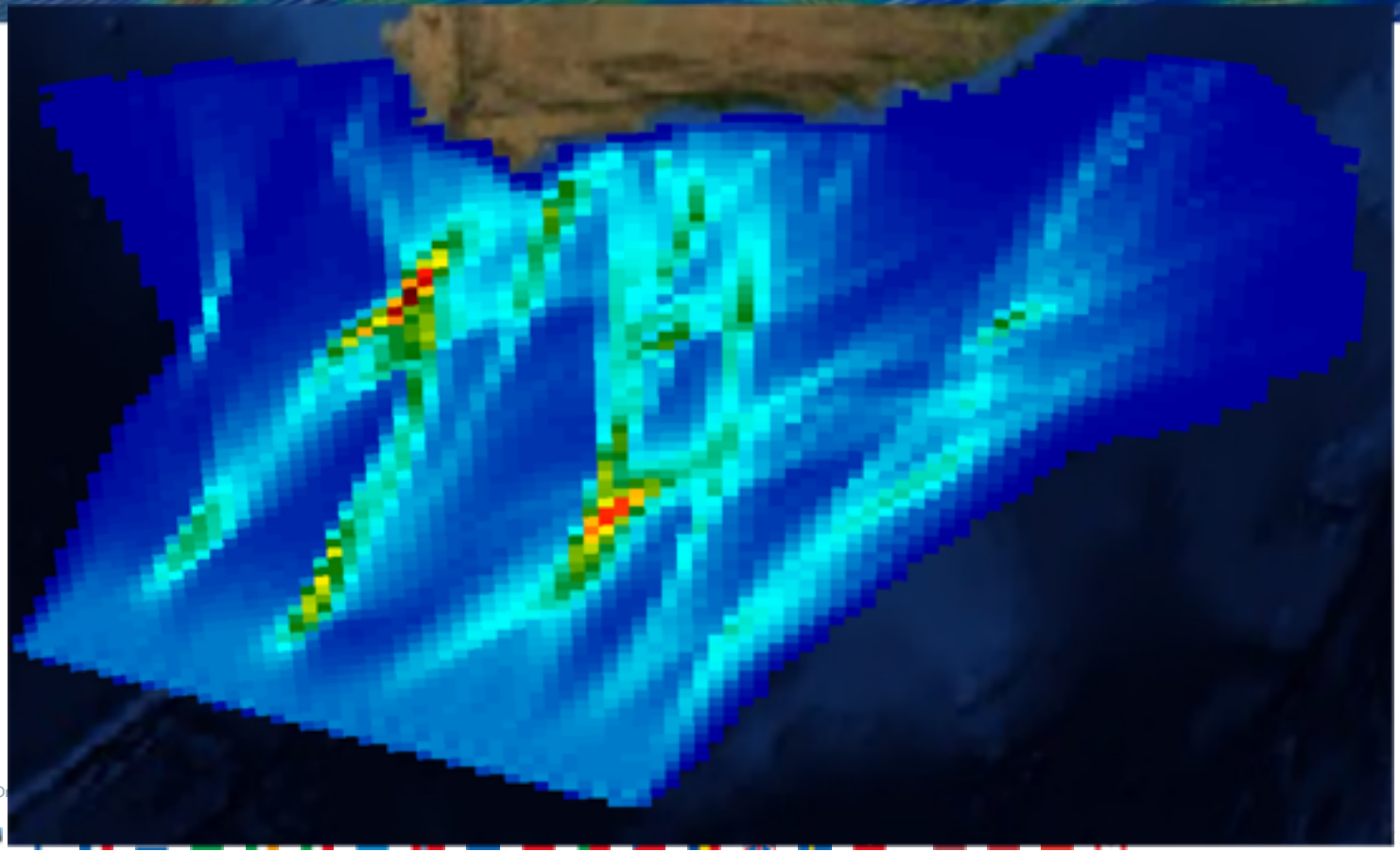
Crossing swell waves

wave spectra boundary conditions from **Arpege forced MFWAM swell** :
No surface current forcing !



Swell wave energy focussing

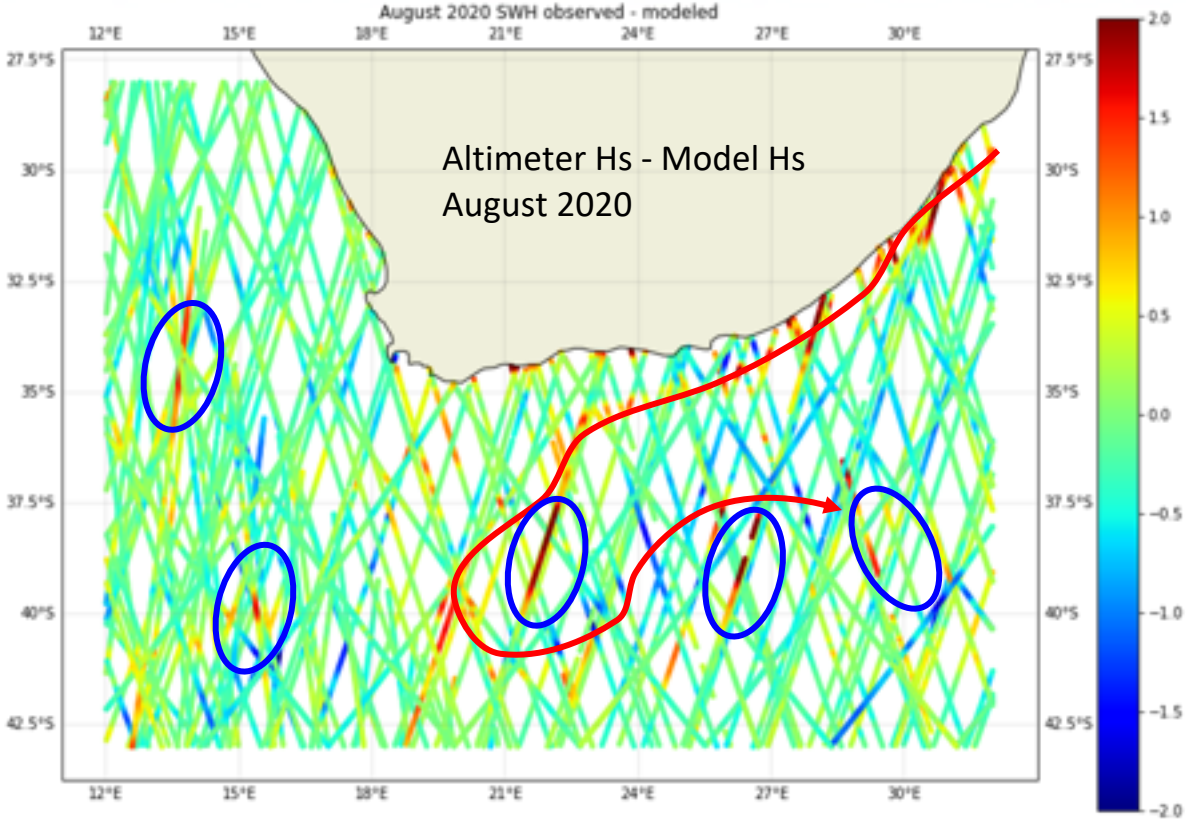
wave spectra boundary conditions from **Arpege forced MFWAM swell** :
No surface current forcing !



Significant wave height (Hs) model under-estimation

Altimeter Hs : CCI sea state denoised Hs

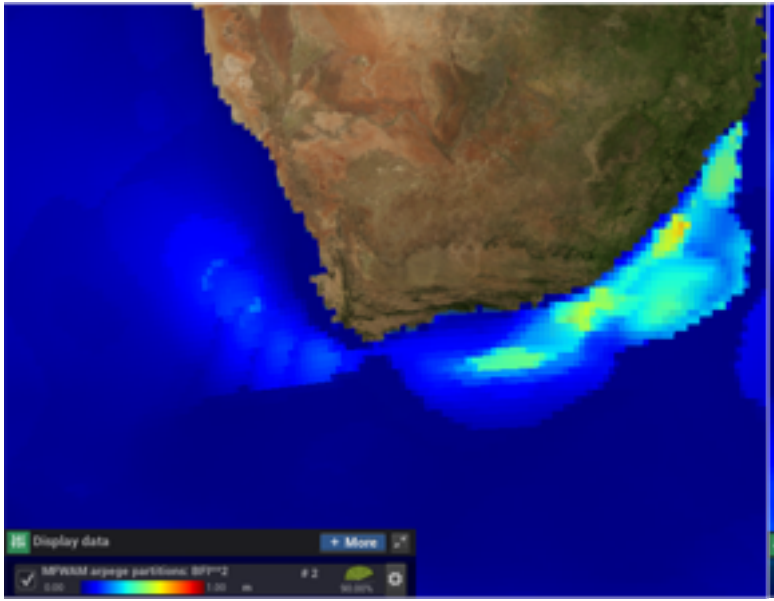
Model Hs: Arpege forced Météo France MFWAM (no surface current input)



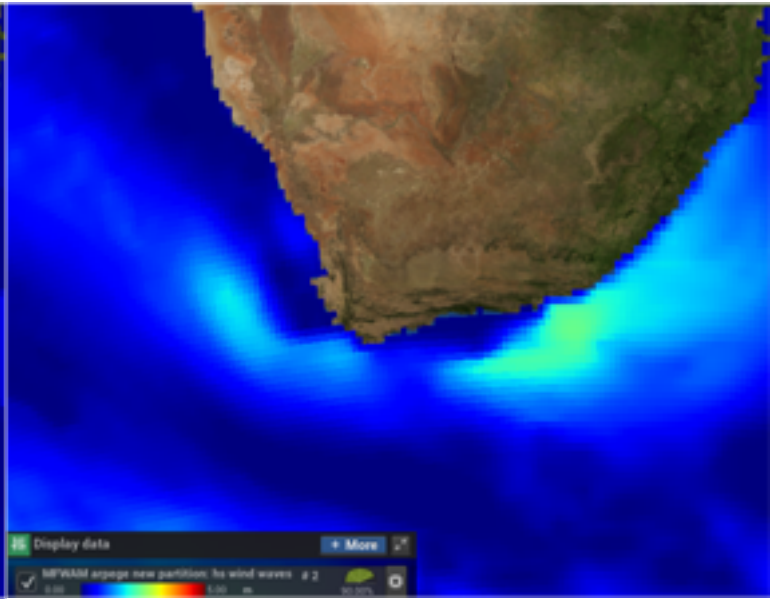
Benjamin&Feir Index (Frequency spread)

Arpege forced MFWAM sea state model estimation of BFI

BFI



Wind



Dangerous seas index determination

Location of dangerous seas for navigation

- Output : index of dangerous seas (green, yellow, red).
- multiplication of 3 indexes
  - cross seas index (directions difference > threshold and minimum swh > threshold)
  - wave height under-estimation by sea state model (altimeter based) if available
  - wavenumber/frequency spread (BFI).