



Norwegian
Meteorological
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Modelling Wave-Current Interaction in the Lofoten Maelstrom

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Overview

- The lofoten Maelstrom, locally named **Moskstraumen**
- Intense tidal ocean current in Northern Norway
- Classified as dangerous sailing area in the *Pilot Guide for Norway*
- All physical information so far are based on eyewitness accounts - no existing instrumental observations available
- Ships have been observed stationary at 10 knots (5 m/s)
- Complicated sailing conditions due to surface currents often with opposing the local wave direction

Here, we will present:

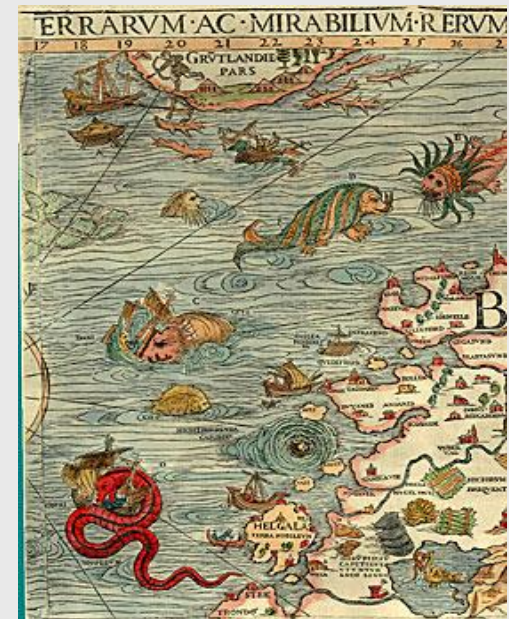
- High-resolution ocean modelling (800m)
- Observations from satellites (Optical and SAR) and photographs from land, collocated with numerical model results
- Current and wave modelling - wave-current interaction
- Plans for deploying wave-current observing instruments

Moskstraumen - The Lofoten Maelstrom



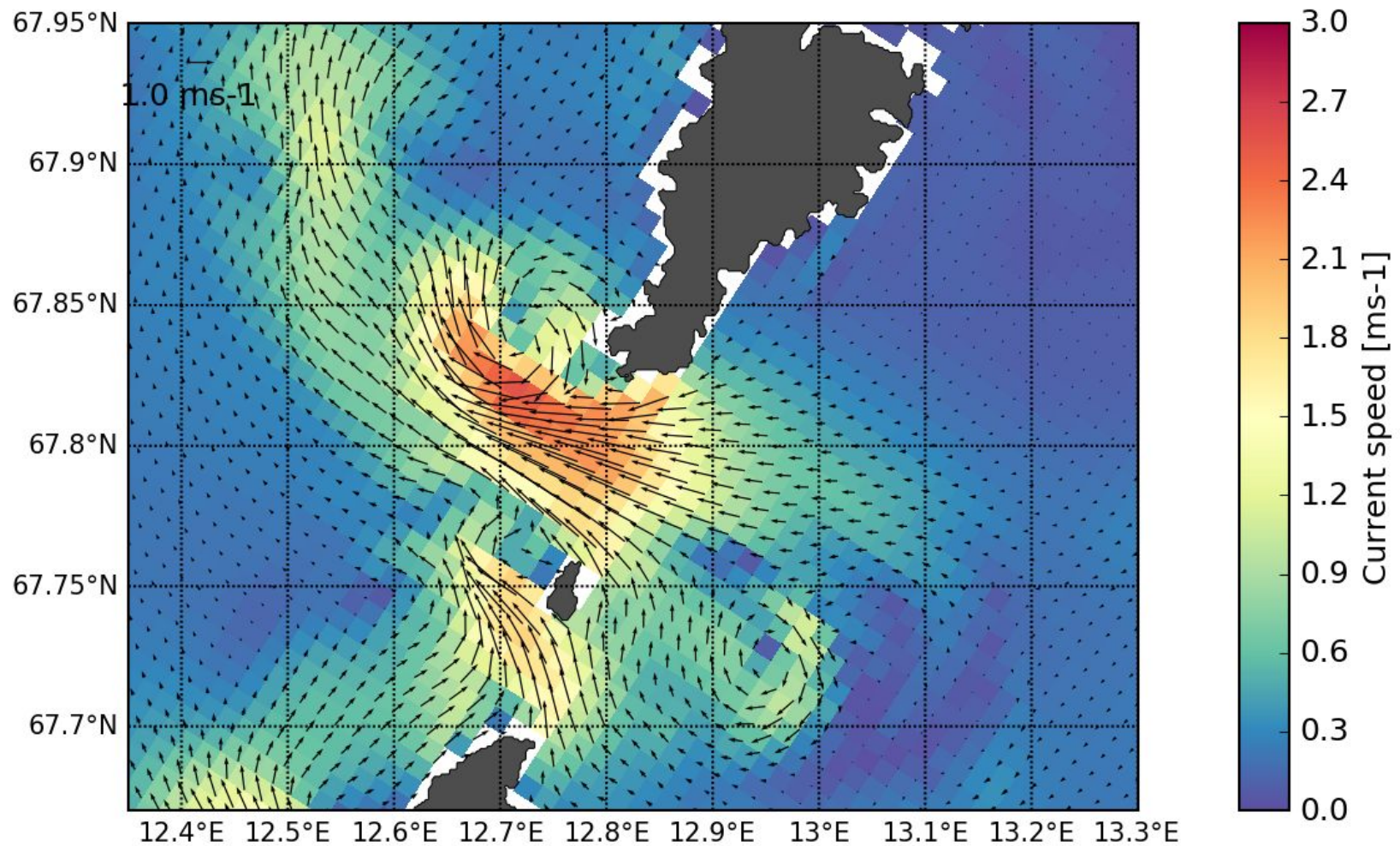
Moskstraumen - history and myths

Carta Marina by Olaus Magnus, Venice 1539

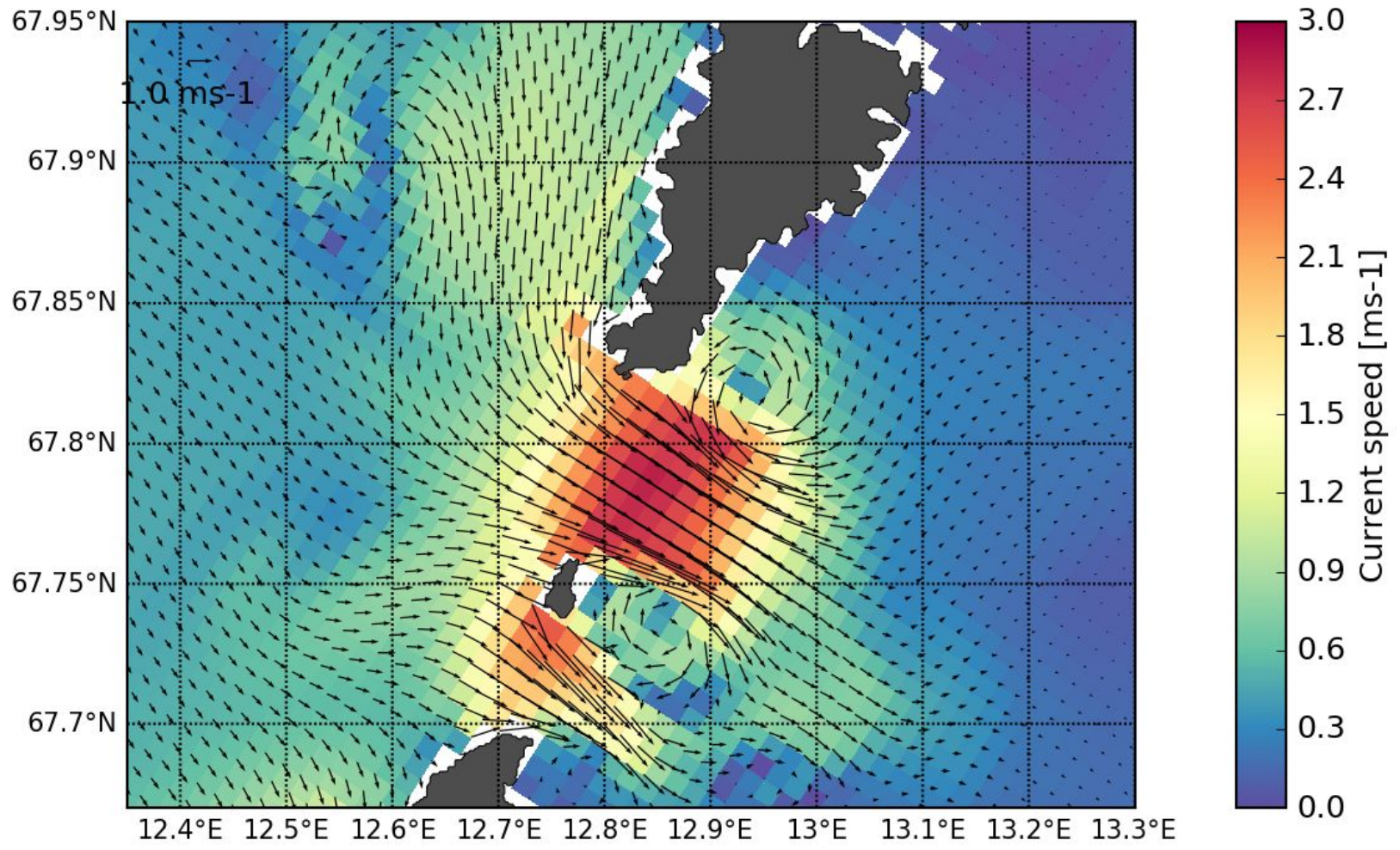


- One of the worlds strongest tidal currents in open ocean areas ($> 3\text{m/s}$)
- Described in Nordic tales as a magical millstone grinding salt on the bottom of the ocean
- Showed as a gigantic eddy in Olaus Magnus' map *Carta Marina* from 1539
- In international literature by Jules Verne *Twenty Thousand Leagues Under the Sea*, Edgar Allan Poe *A descent into the Malström* and Peter Dass, *The trumpet of Nordland*

Current at 0 m depth - 01-04-2018 01:00 UTC

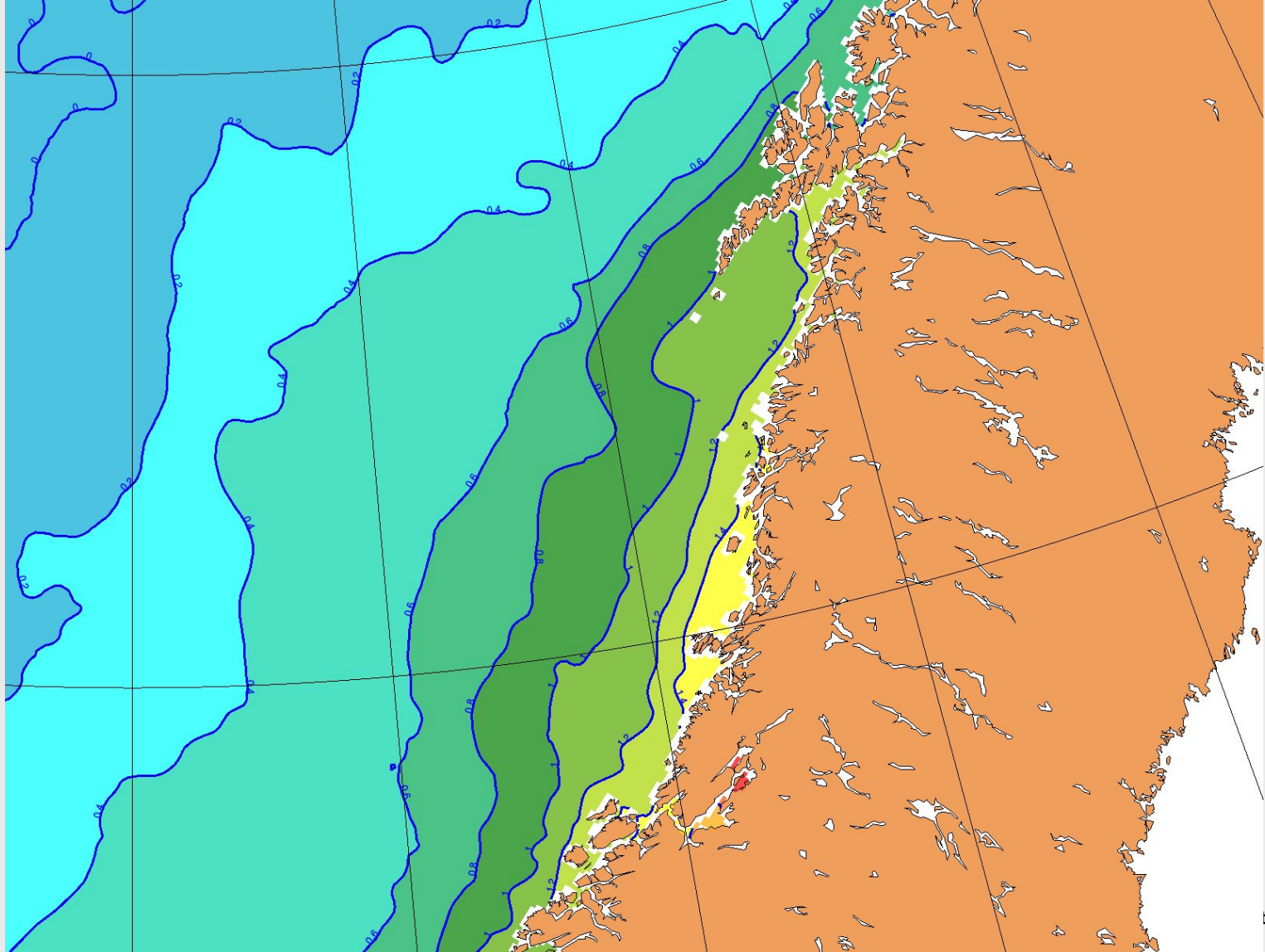


Current at 0 m depth - 01-04-2018 09:00 UTC



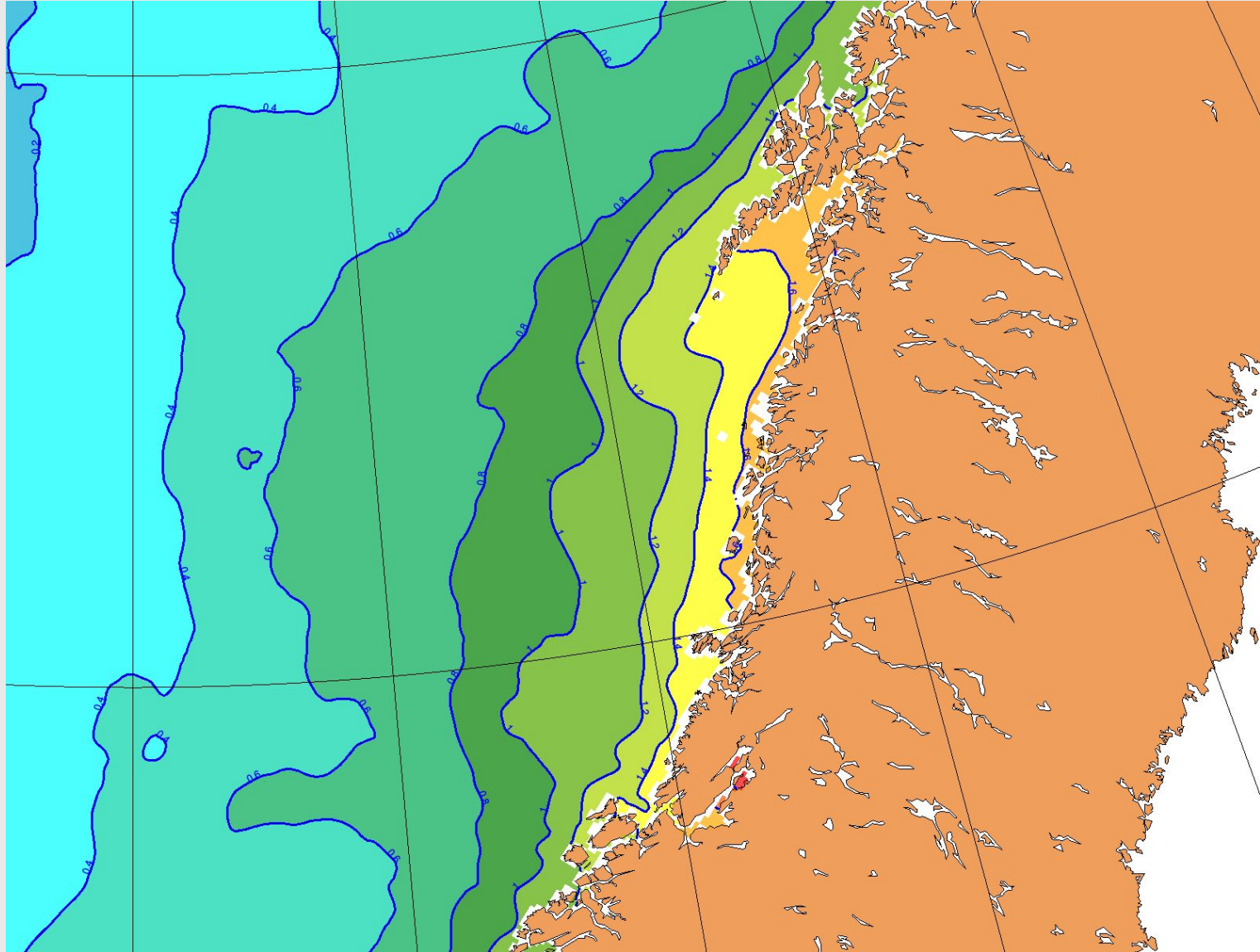
Tides - Coastal Kelvin Waves

26 September 2018 - 10 UTC



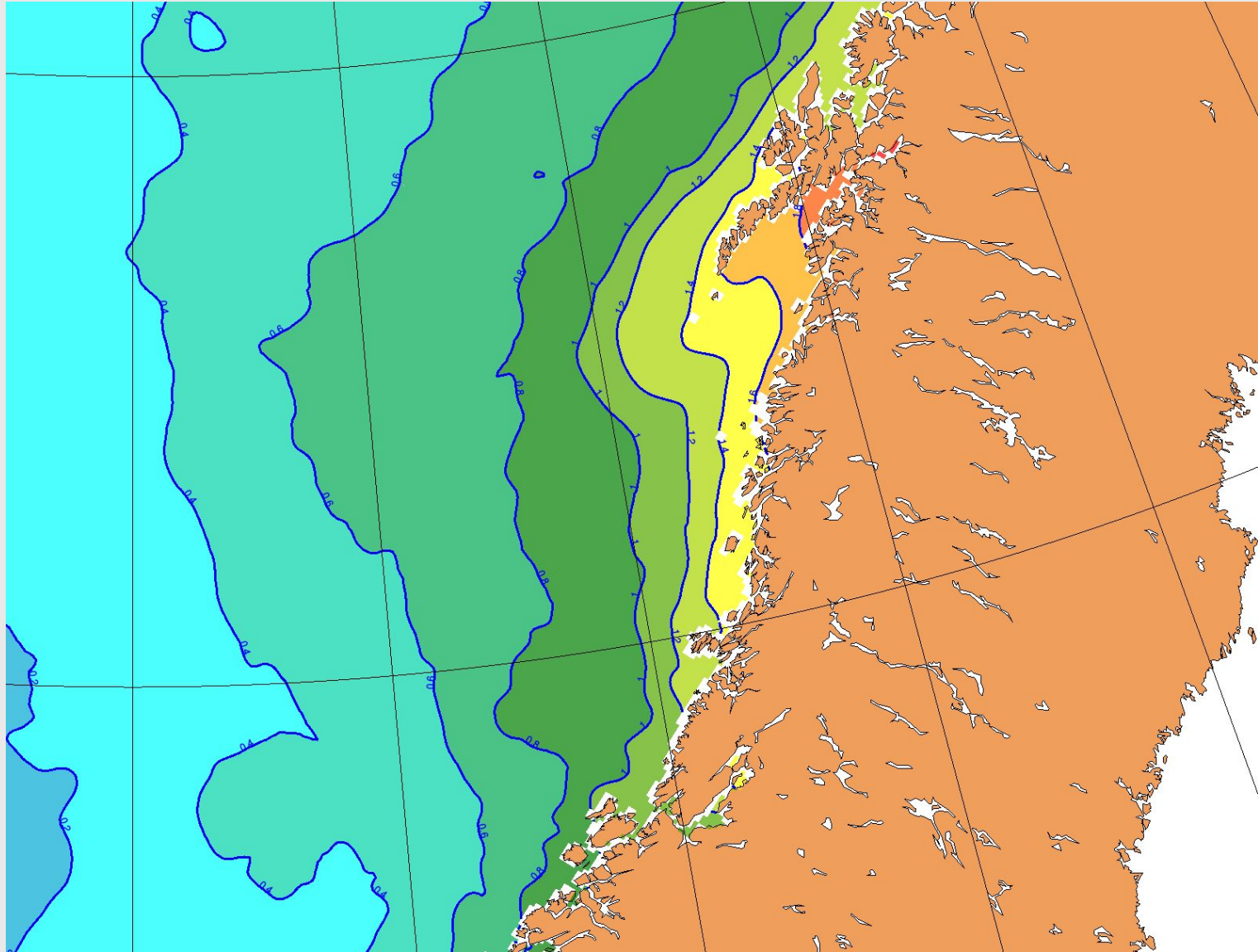
Tides - Coastal Kelvin Waves

26 September 2018 - 11 UTC

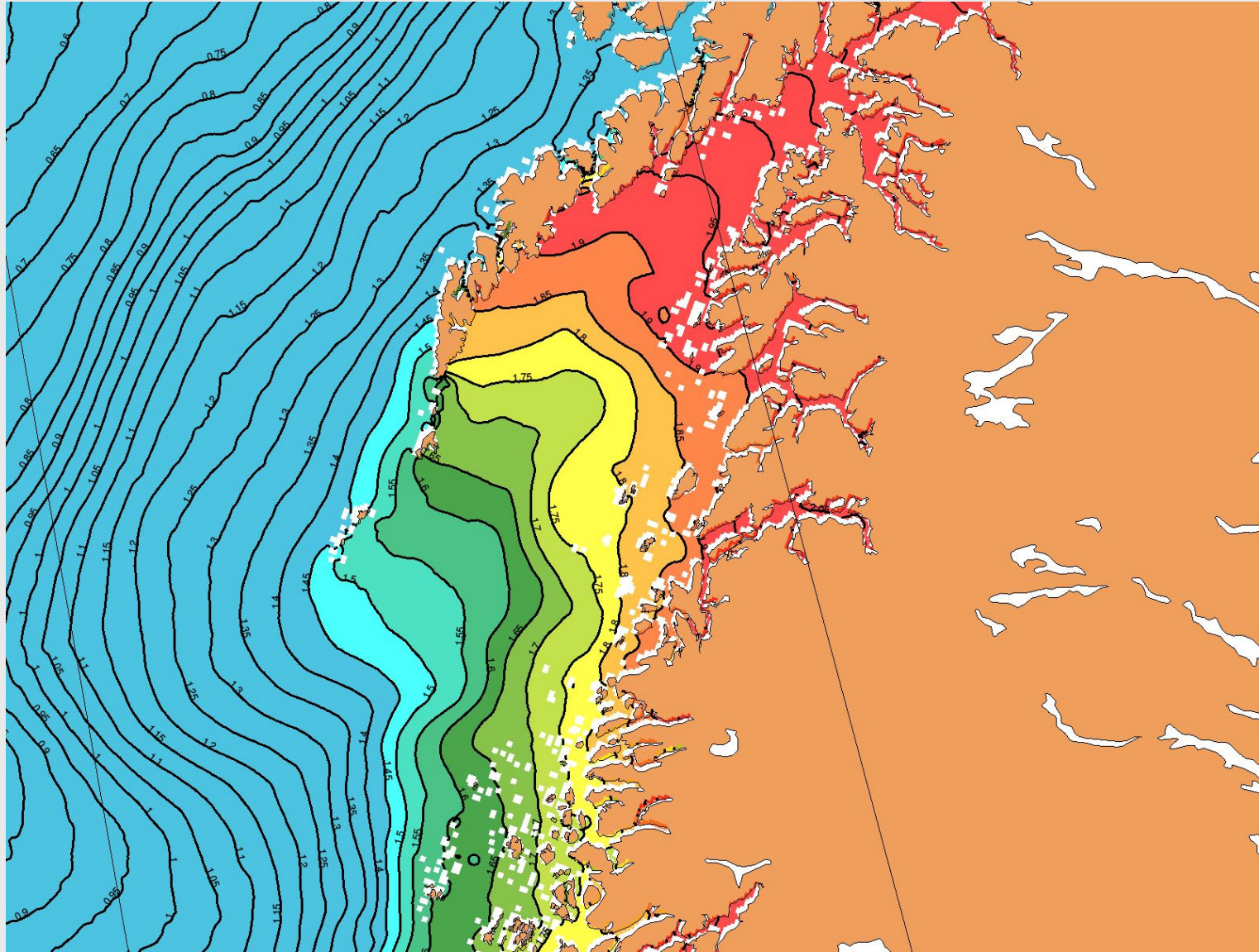


Tides - Coastal Kelvin Waves

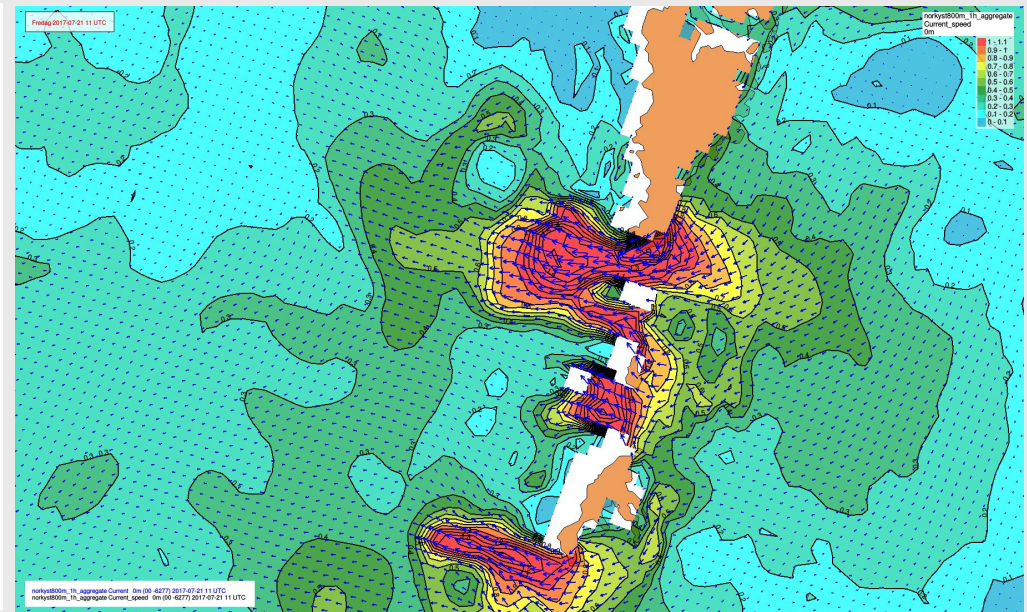
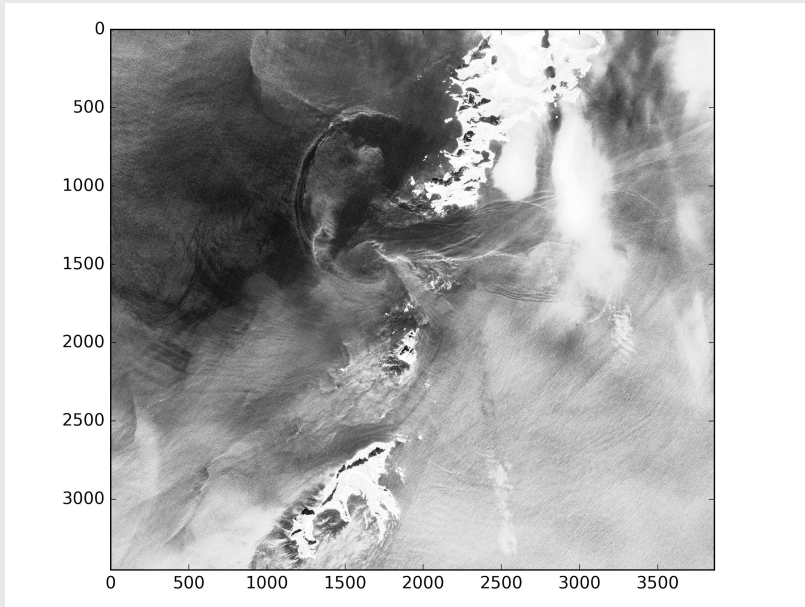
26 September 2018 - 12 UTC



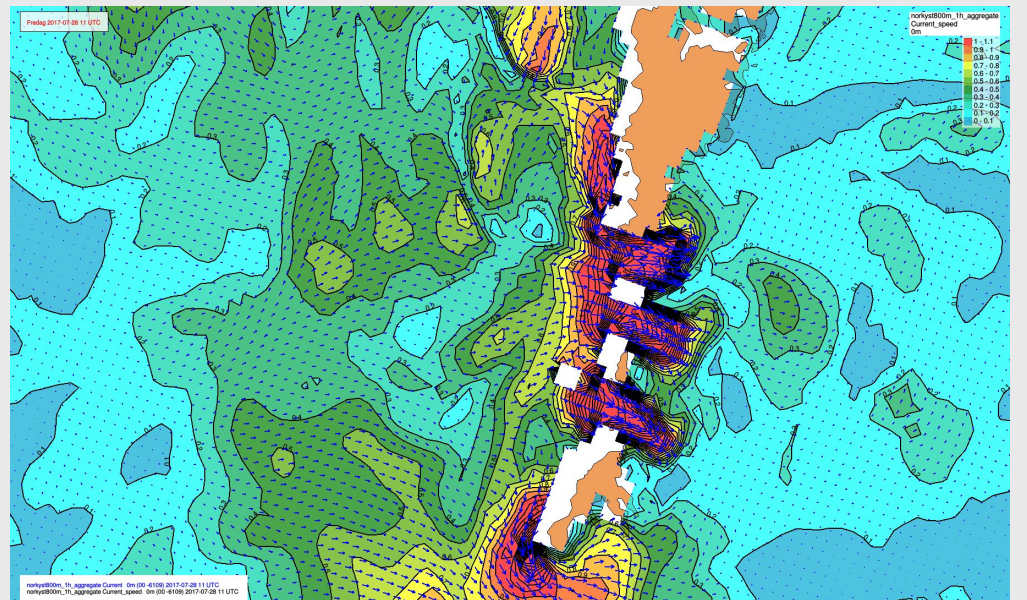
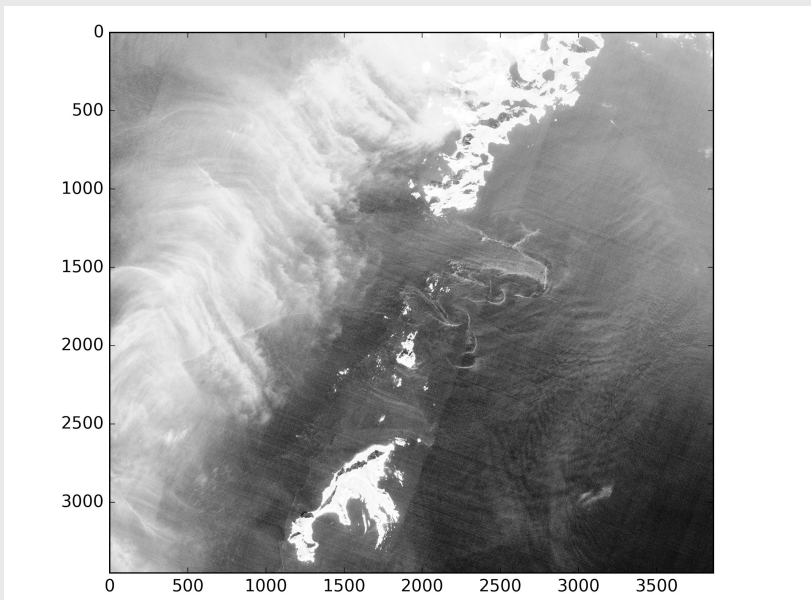
Flood tide in Vestfjorden



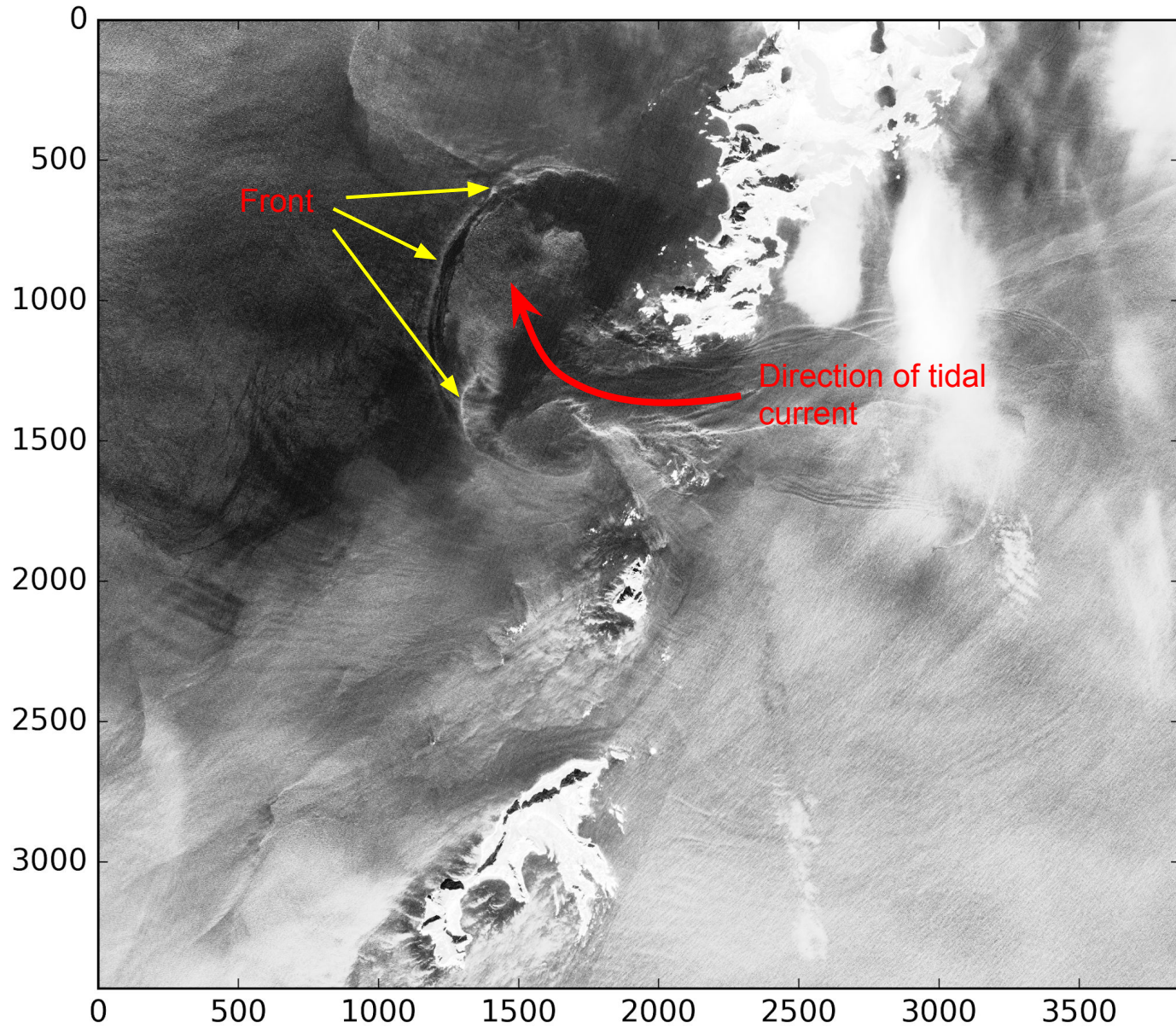
Ebb tide: 2017.07.21 1100 UTC



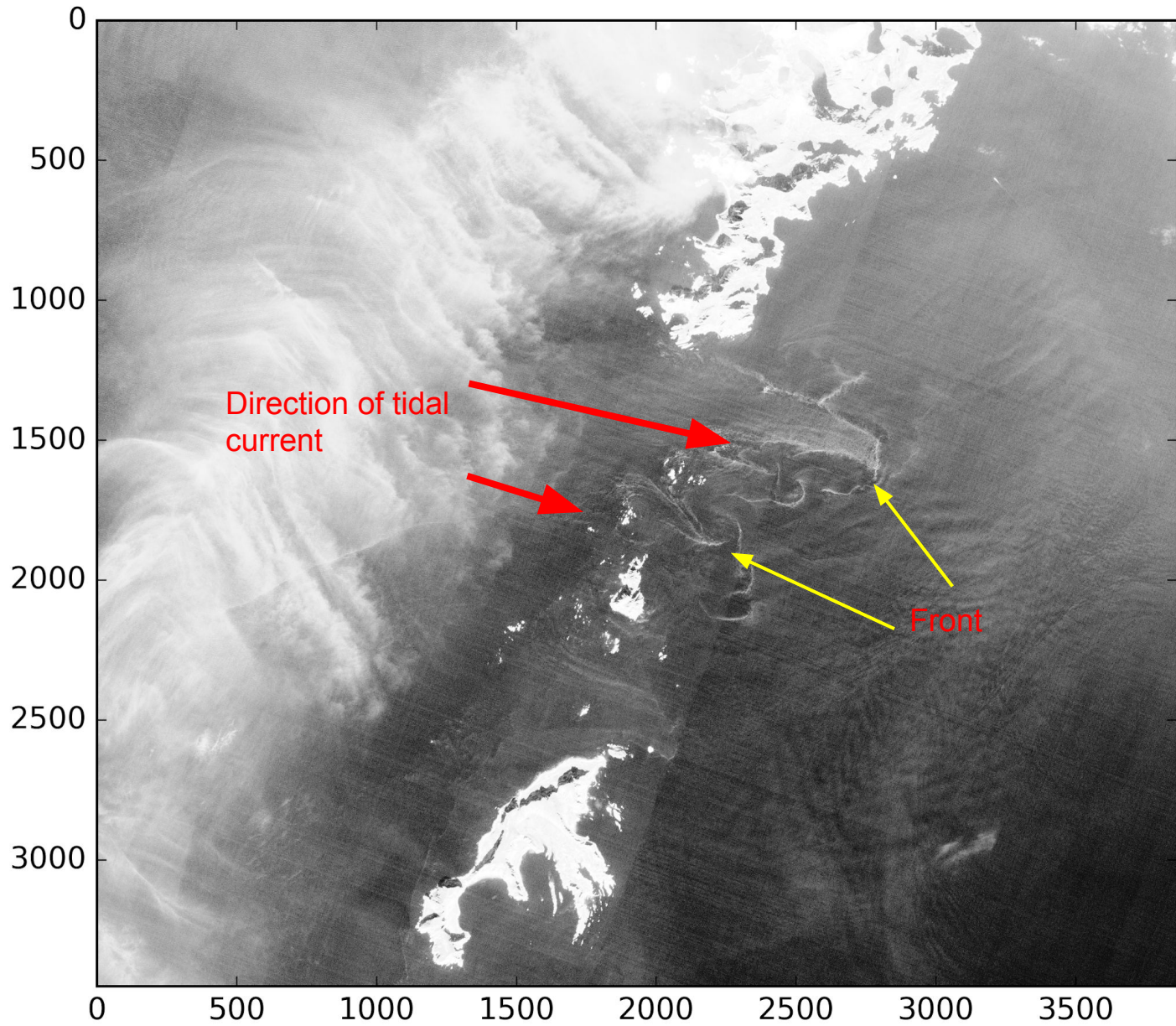
Flood tide: 2017.07.28 1100 UTC



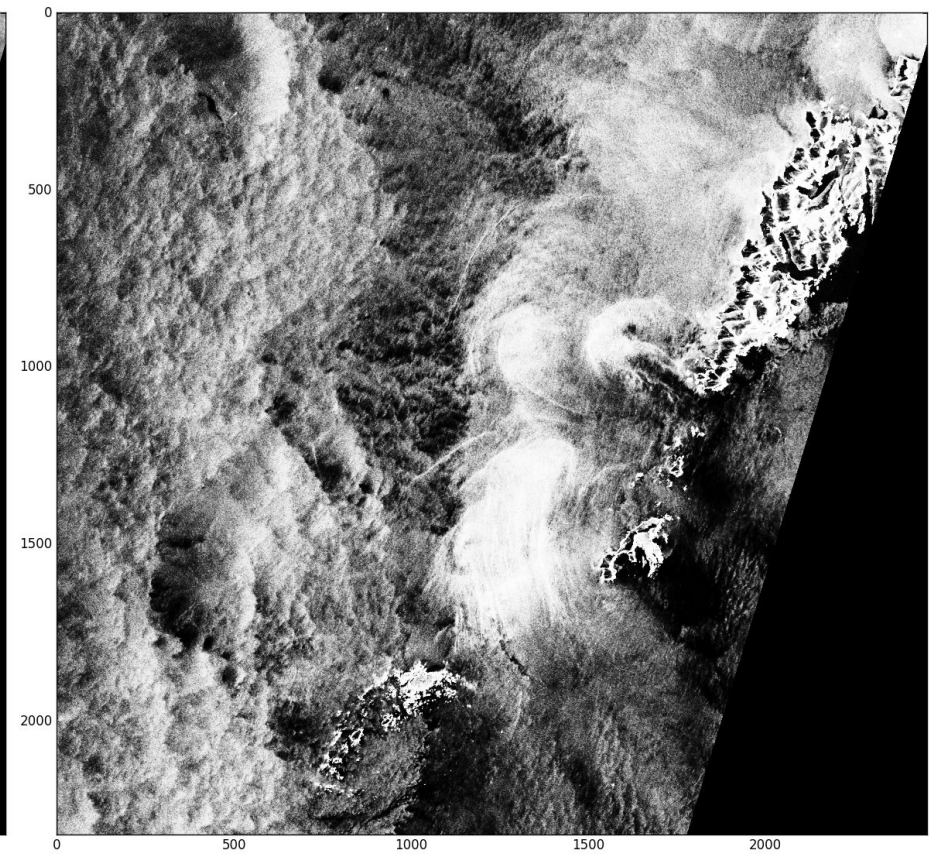
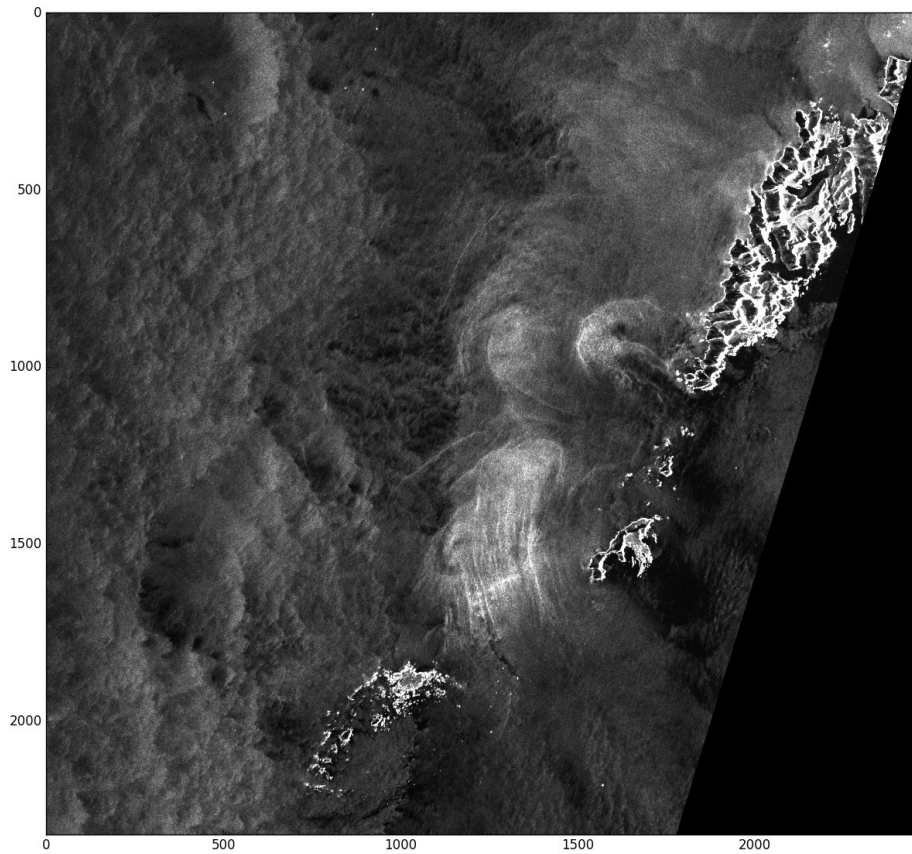
Ebb tide



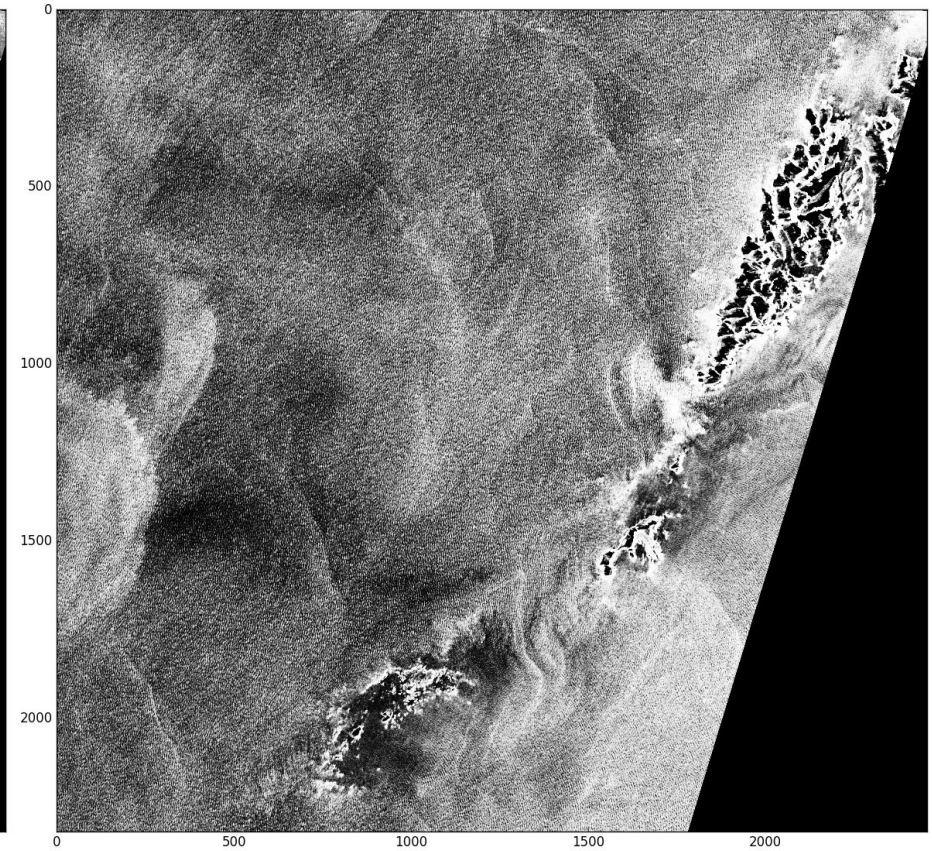
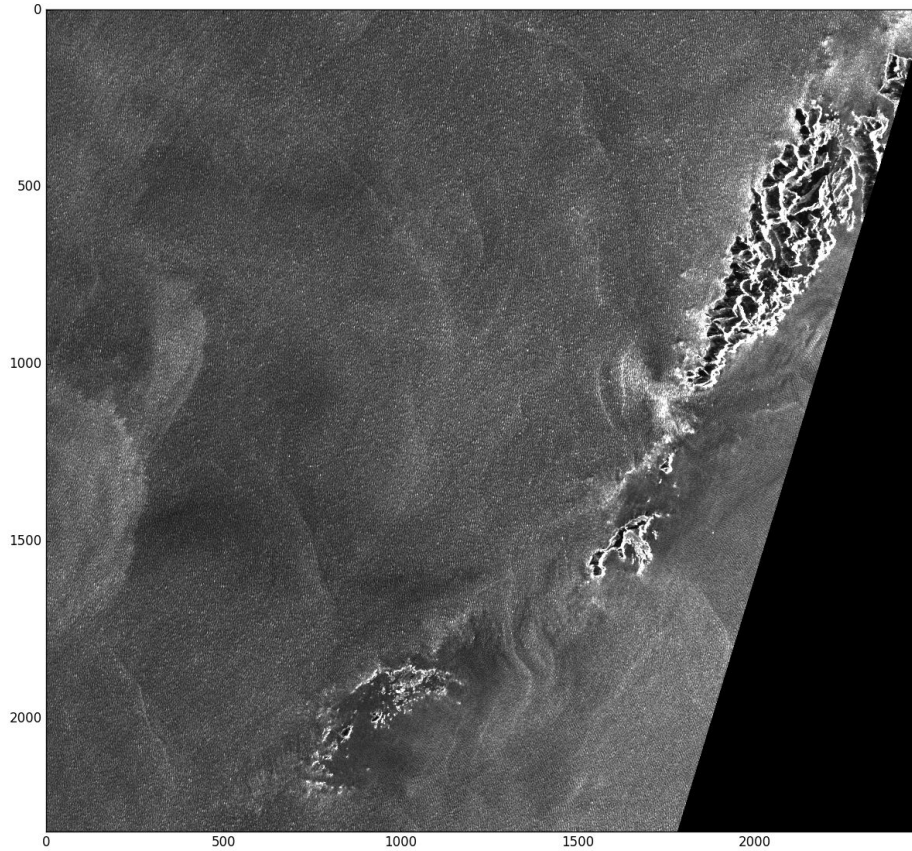
Flood tide



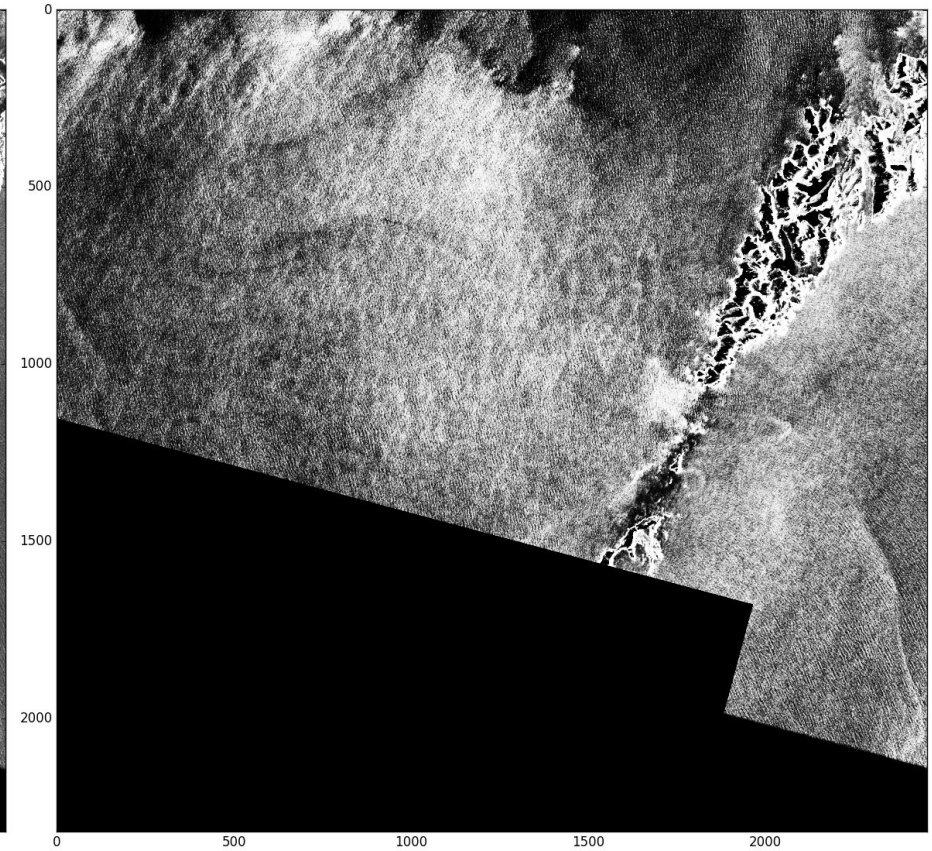
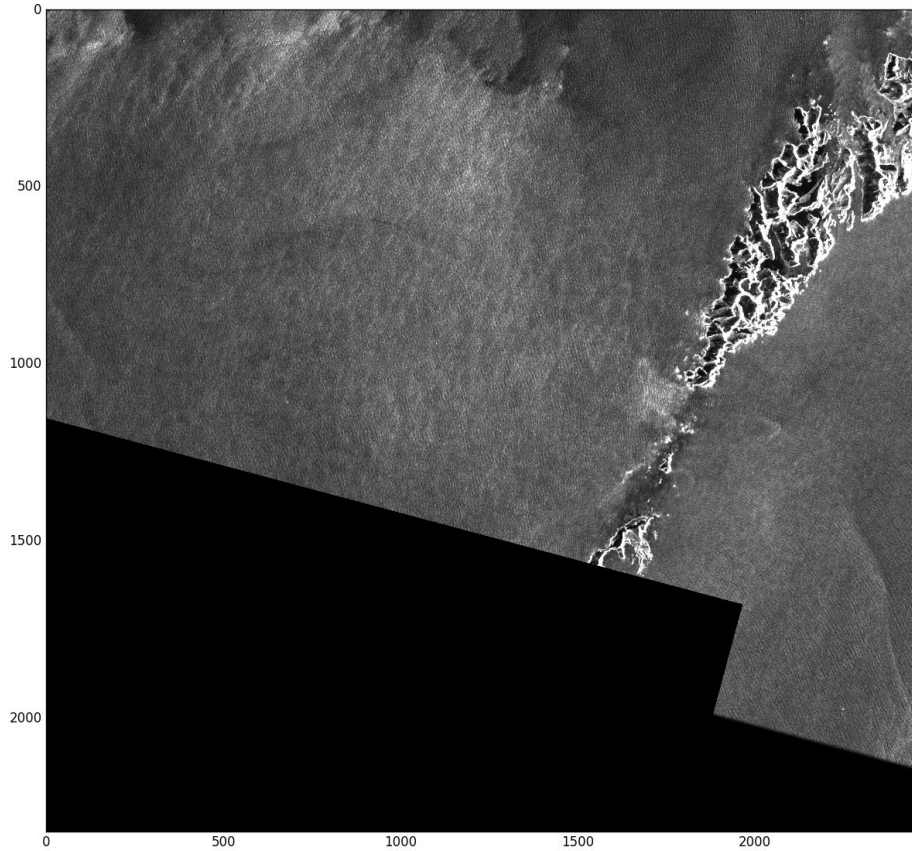
Sentinel-1 SAR: 20 March 2018 0101 UTC



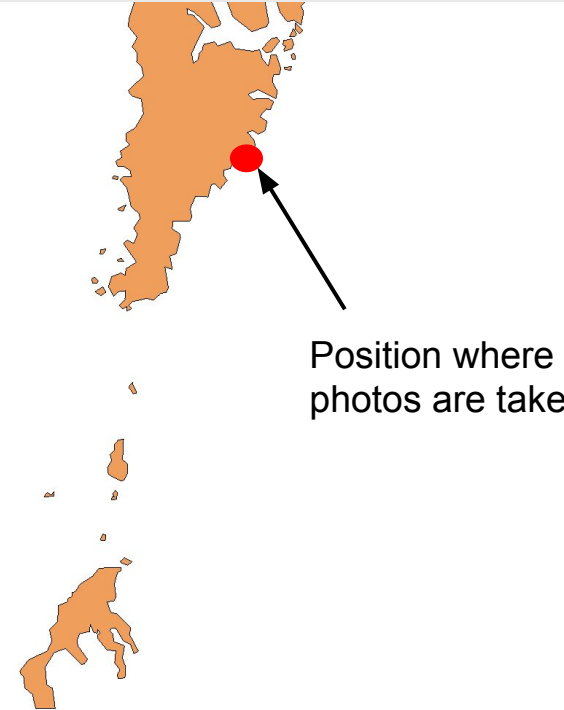
Sentinel-1 SAR: 5 October 2016 1020 UTC



Sentinel-1 SAR: 20 July 2018 0110 UTC



Photographs from ground 01 UTC



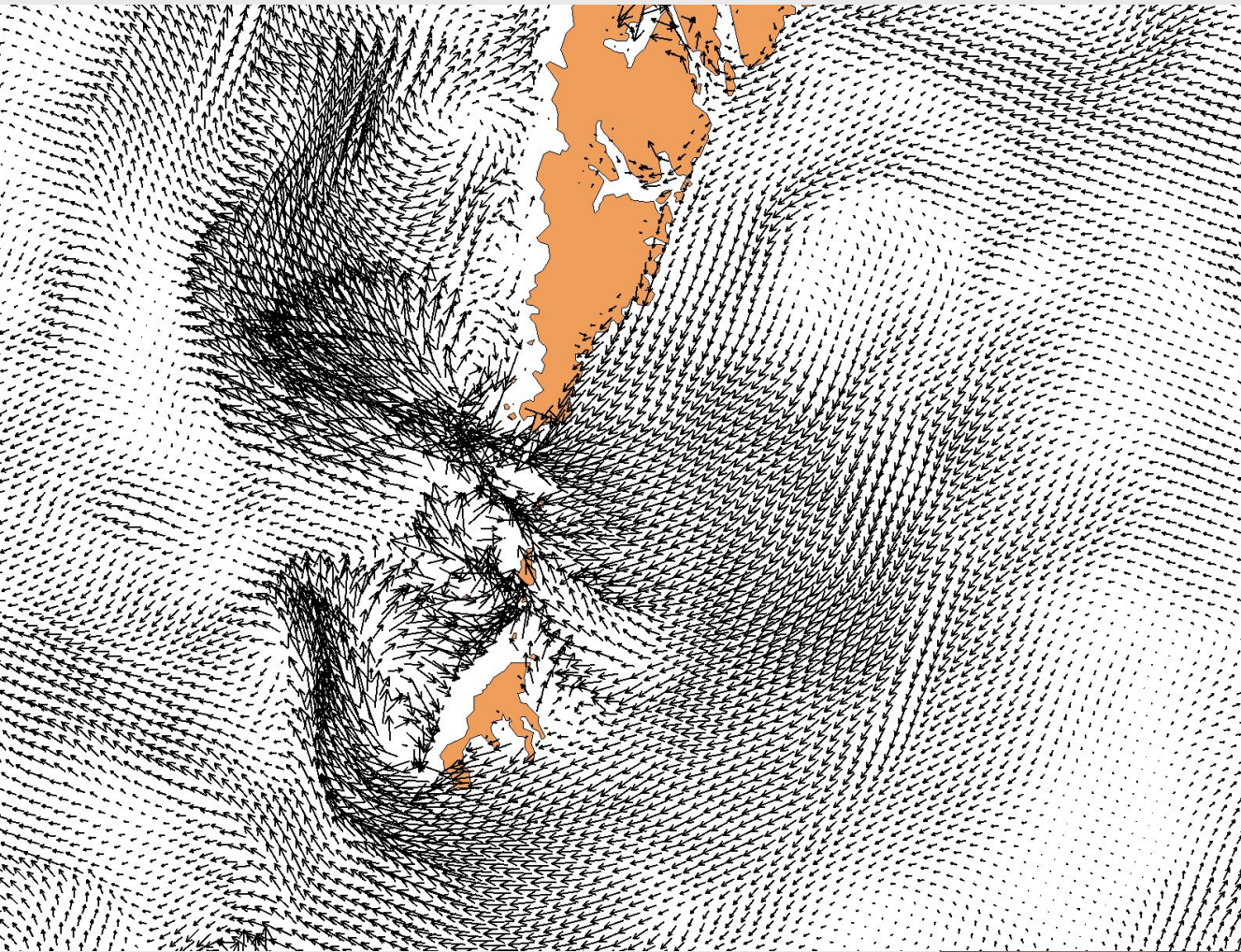
Position where
photos are taken

23 July 2017 01 UTC

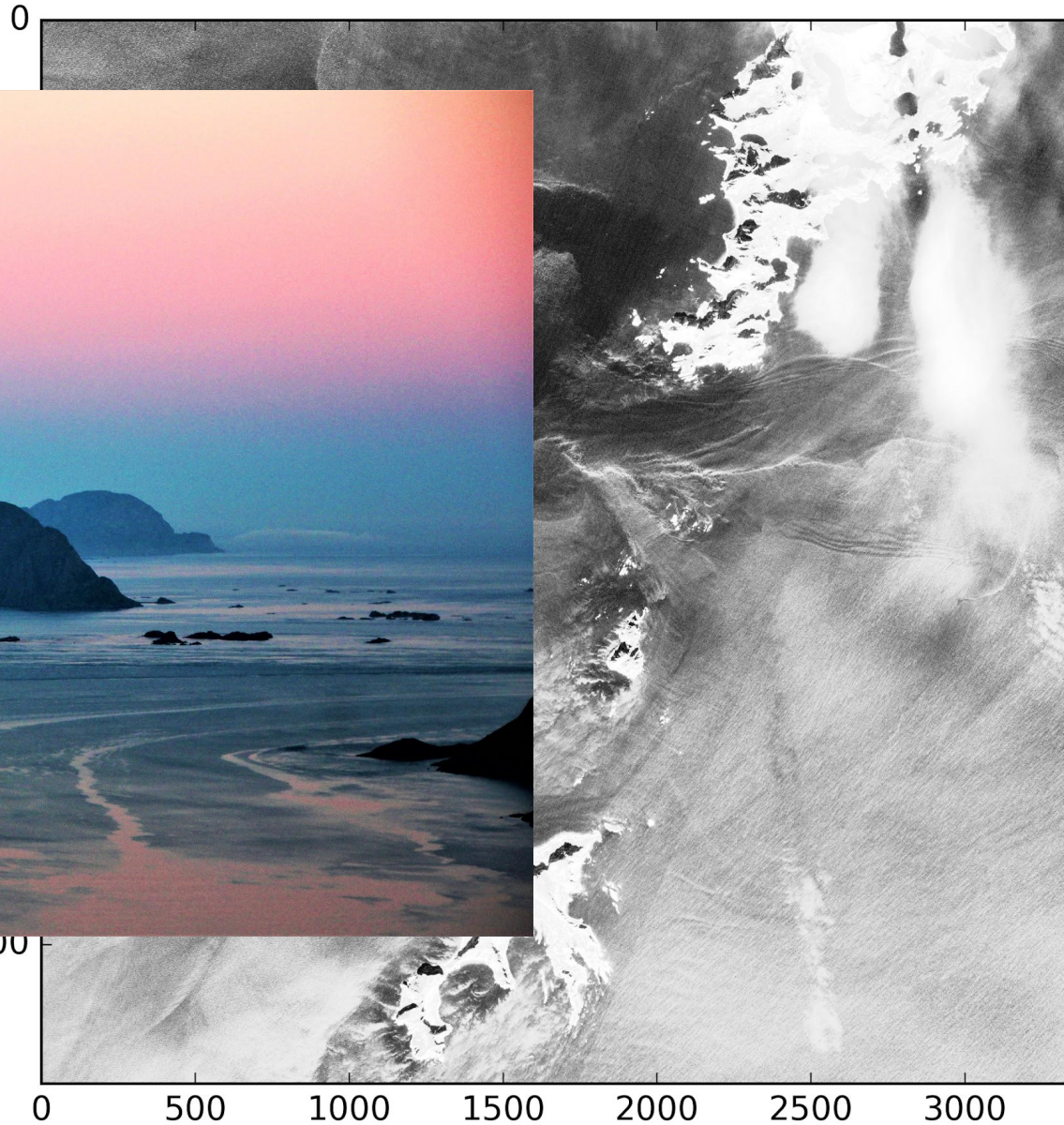


23 July 2017 01 UTC

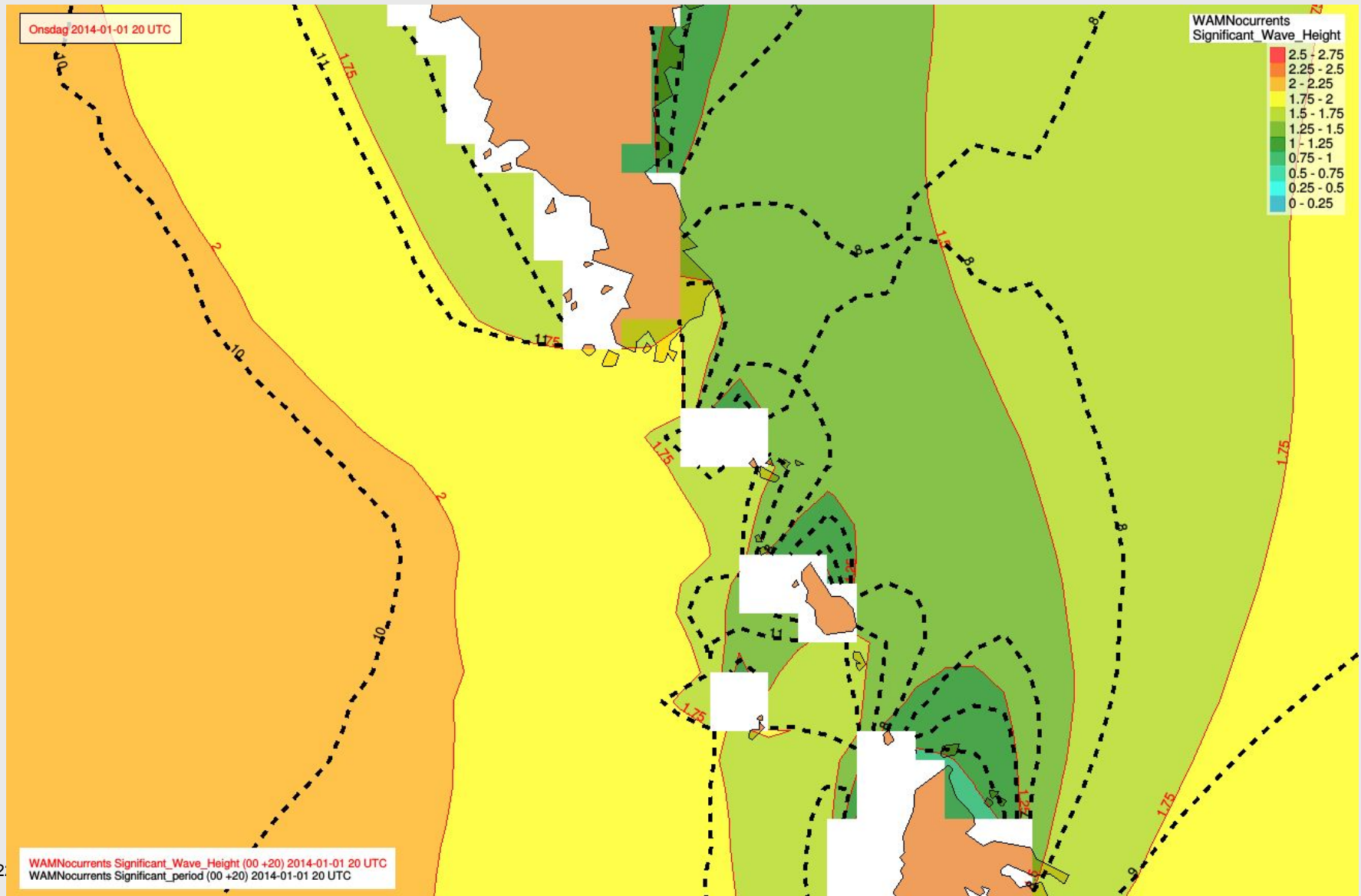




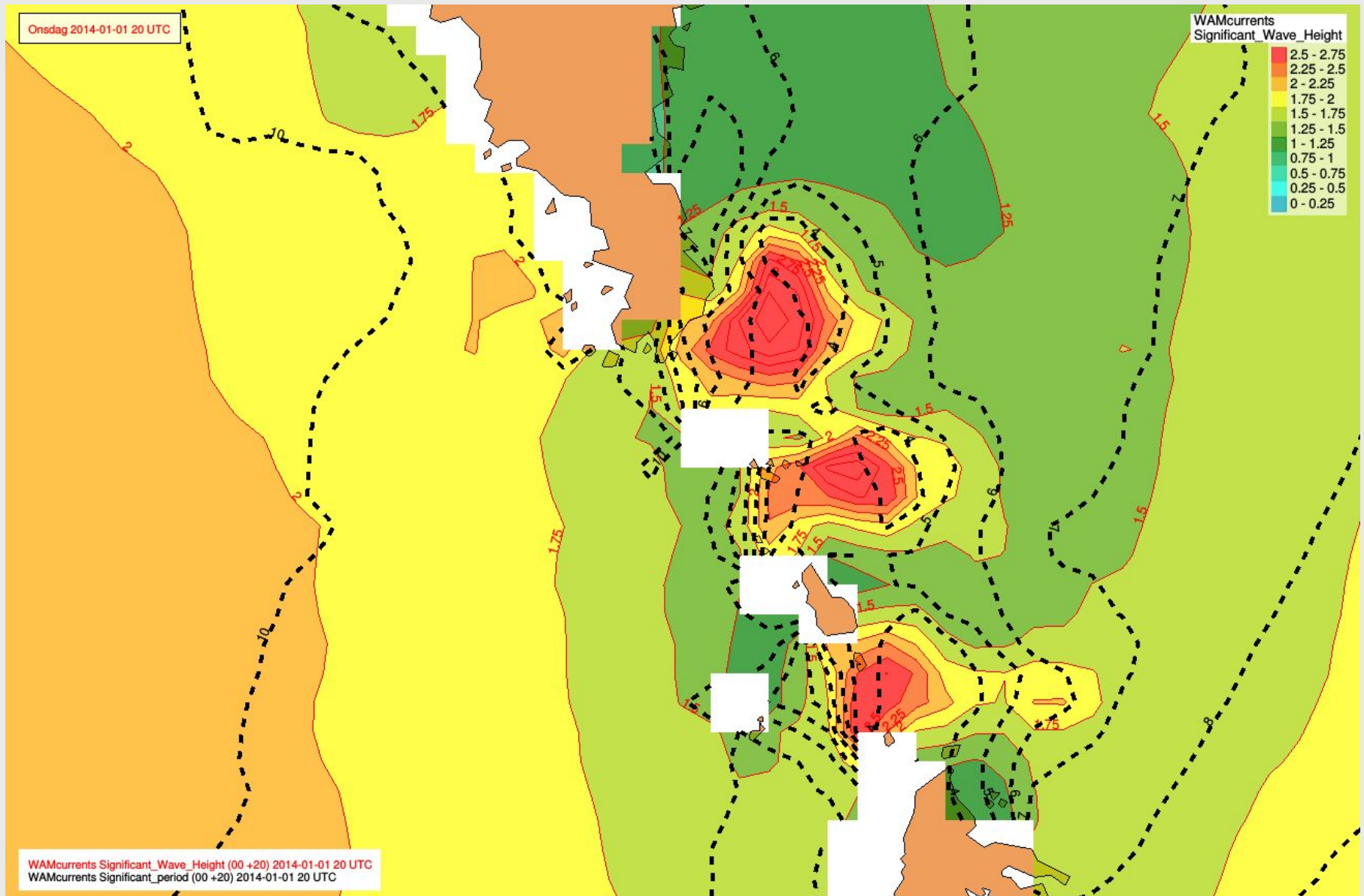
Ebb tide



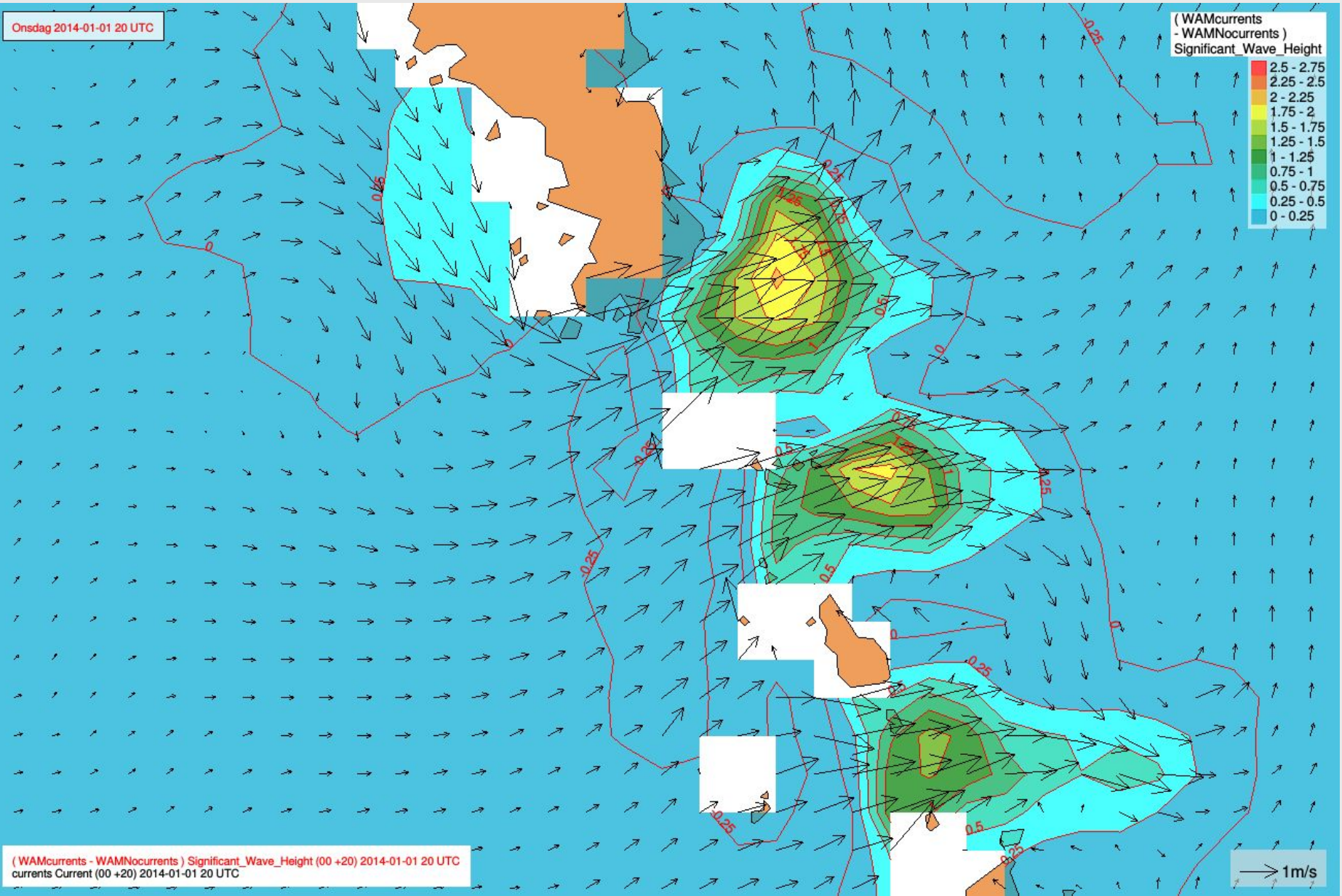
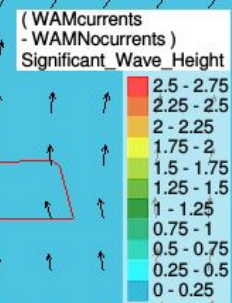
Wave height with no currents



Wave height with currents included



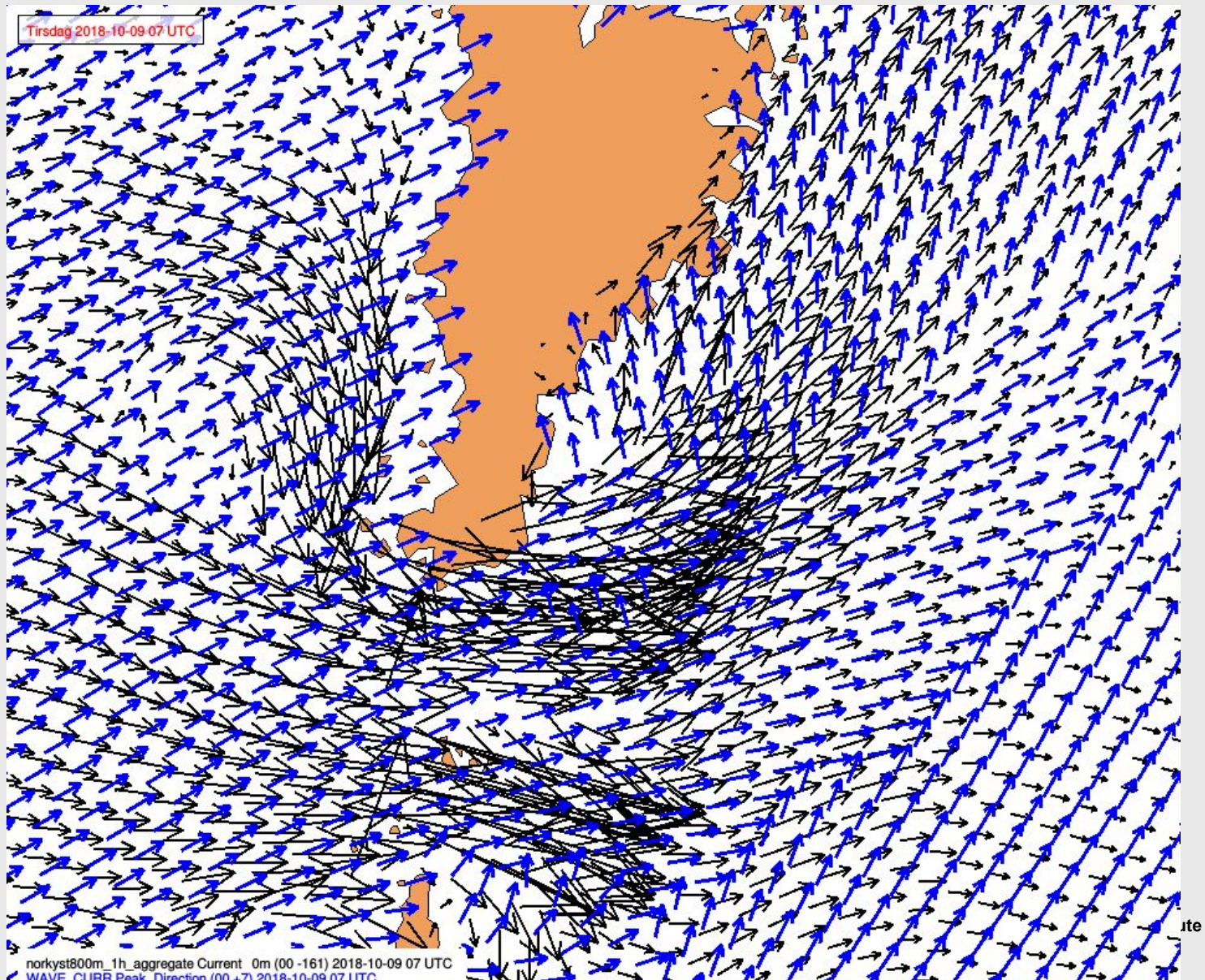
Onsdag 2014-01-01 20 UTC

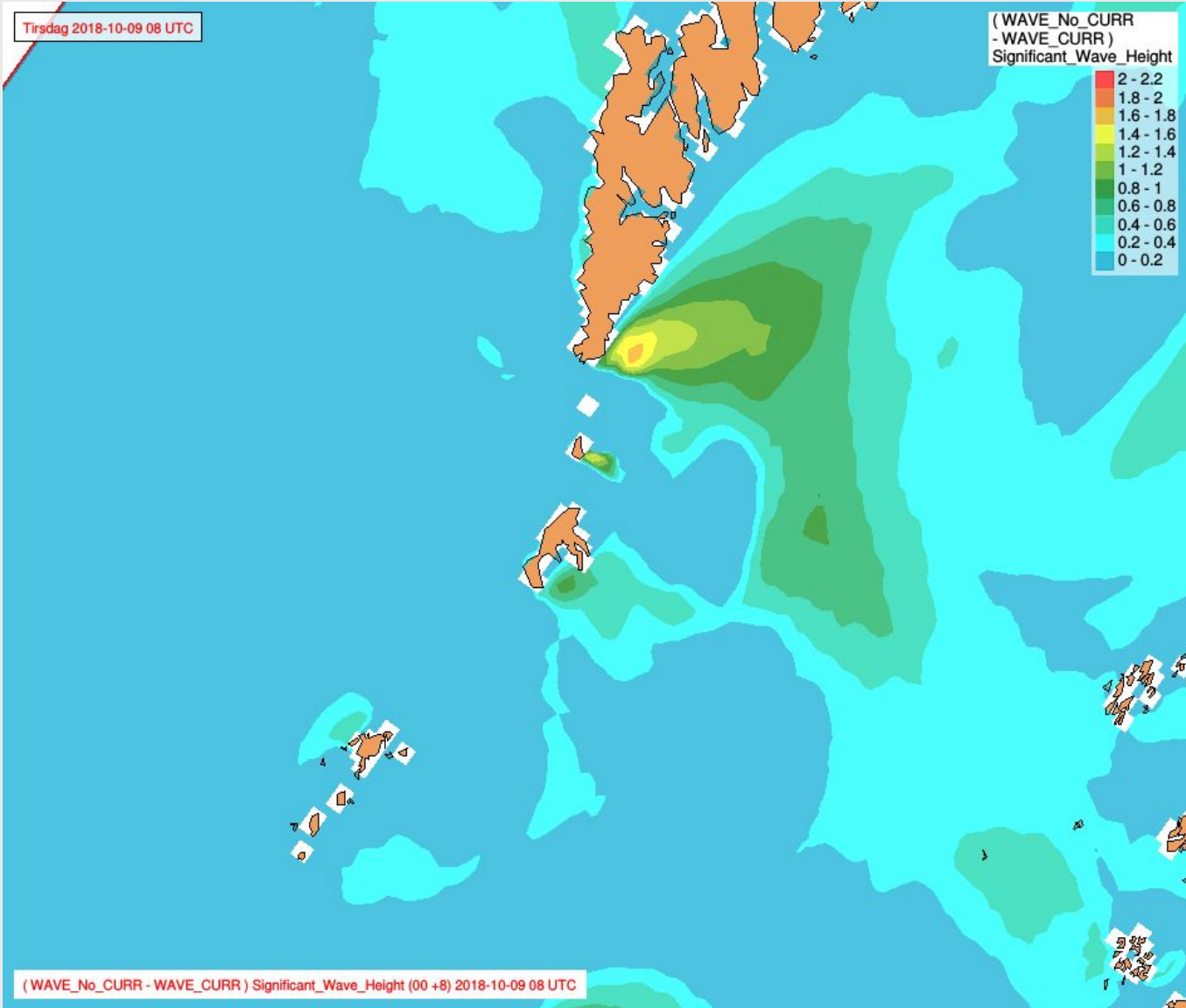


(WAMcurrents - WAMNocurrents) Significant_Wave_Height (00 +20) 2014-01-01 20 UTC
currents Current (00 +20) 2014-01-01 20 UTC

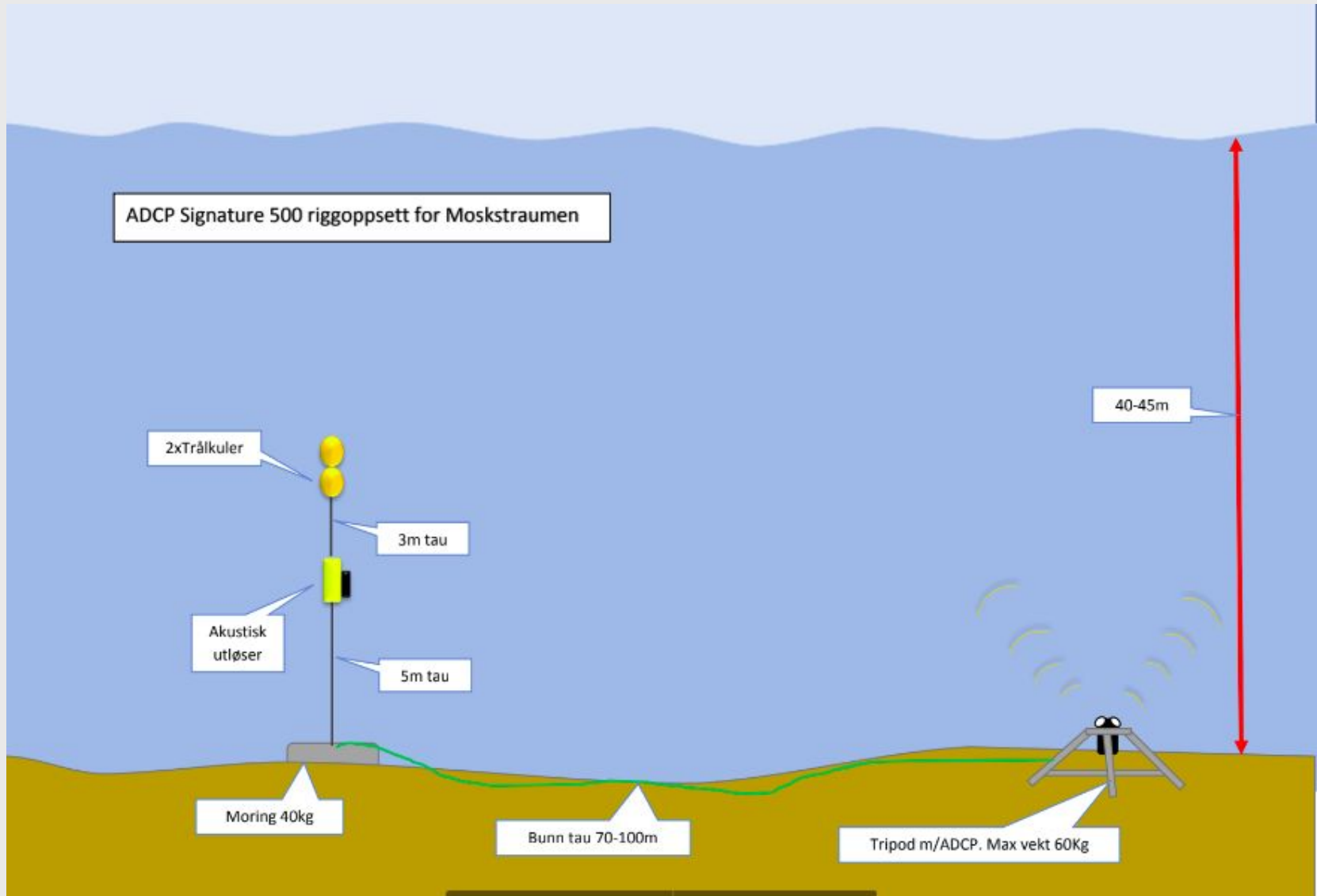
→ 1m/s

Current and wave direction





Plans for ADCP observation this winter



Plans for ADCP observation this winter

