

Leeuwin Current Eddies

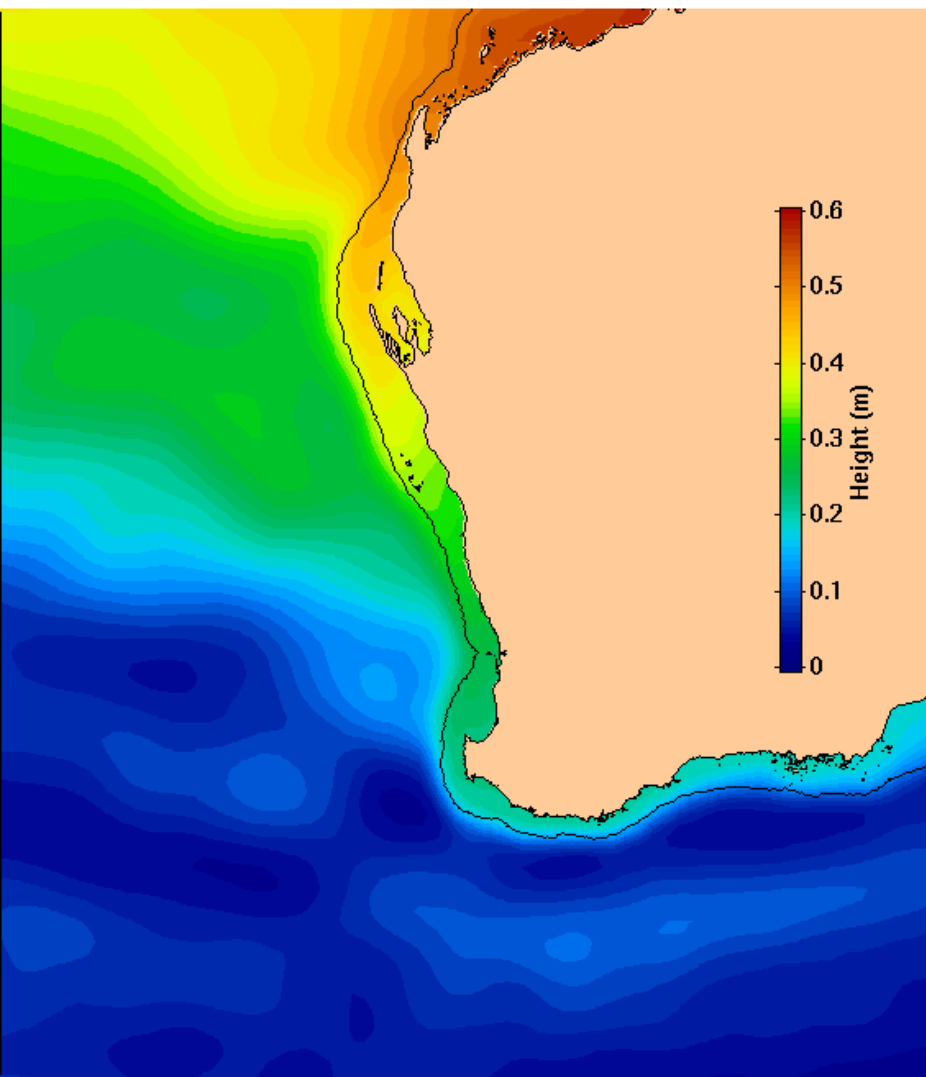
Altimetry, HF radar and SST imagery

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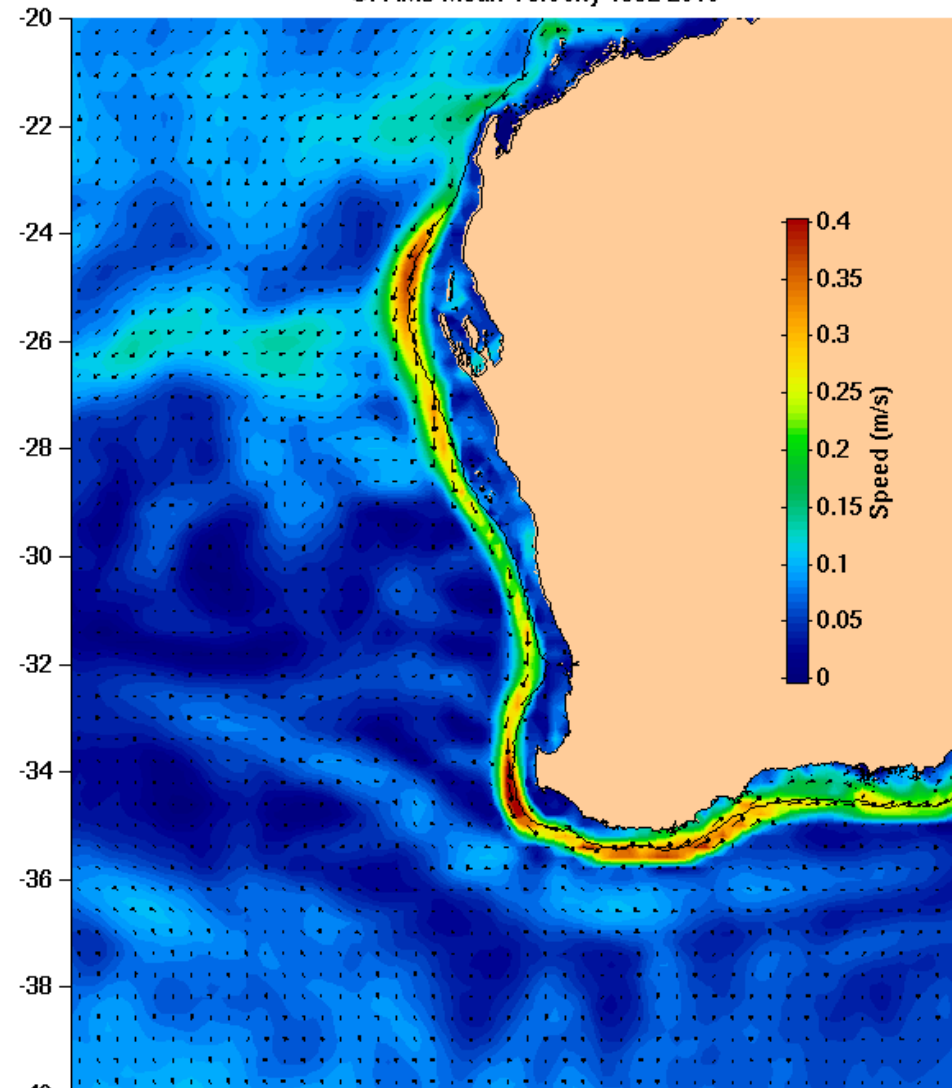
The Leeuwin Current has the coast on the wrong side.

- Flowing poleward on the west coast of Australia, the Leeuwin is unique in being a downwelling (elevated coastal sea level) boundary current
- Consequently, the geometry of its instabilities are unlike other boundary currents,
- The Australian Integrated Marine Observing System (IMOS) has a SeaSonde as well as a WERA HF radar to monitor the Leeuwin off Perth.
- Lets compare HF radar, altimetry, SST, MODIS chl-a and drifter views of the Leeuwin, particularly the small scale shelf-edge features

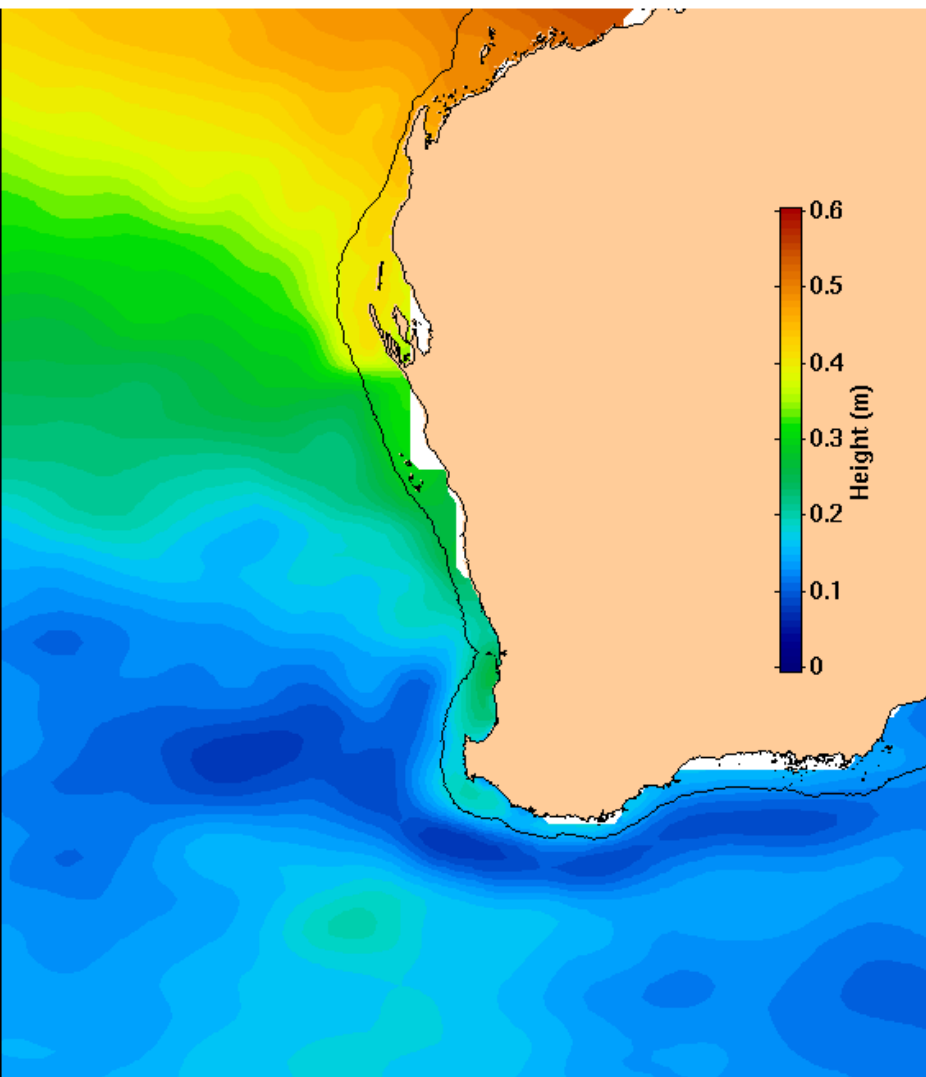
OFAM3 Mean Height 1993-2010



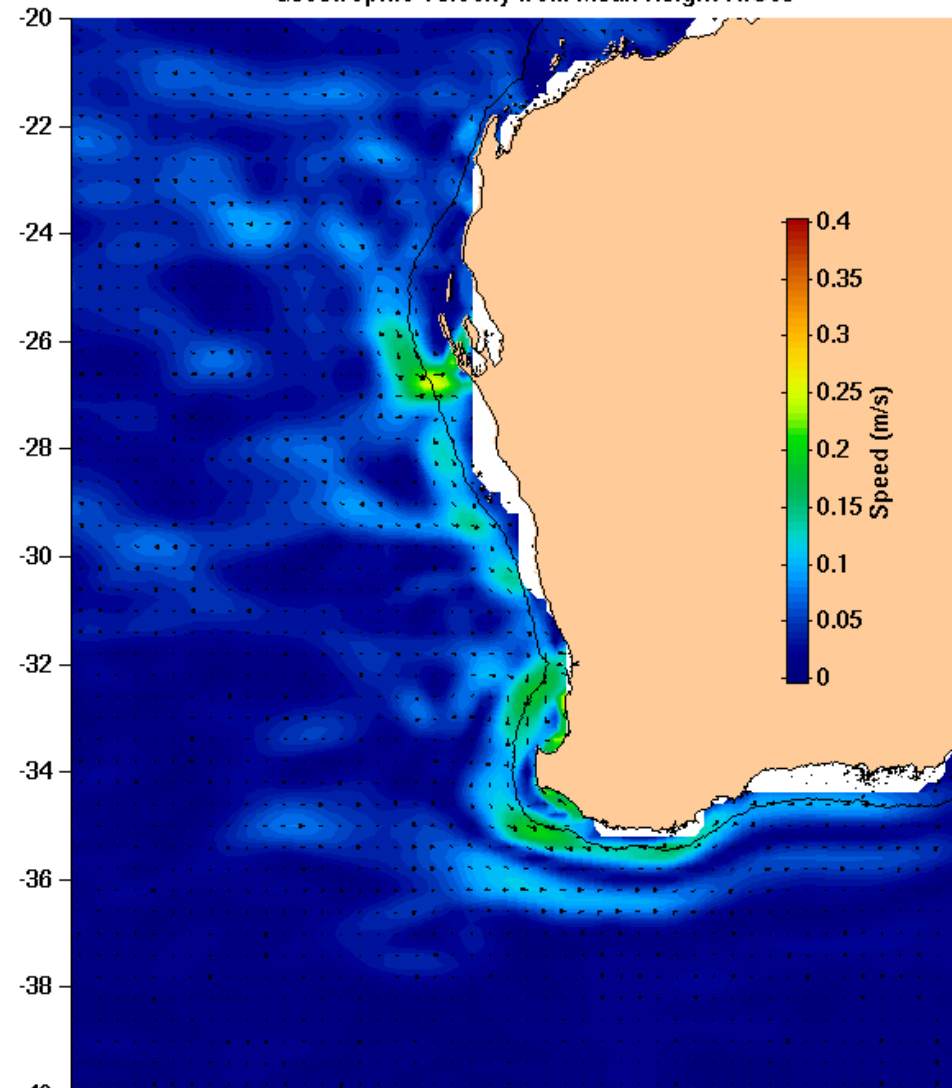
OFAM3 Mean Velocity 1992-2010

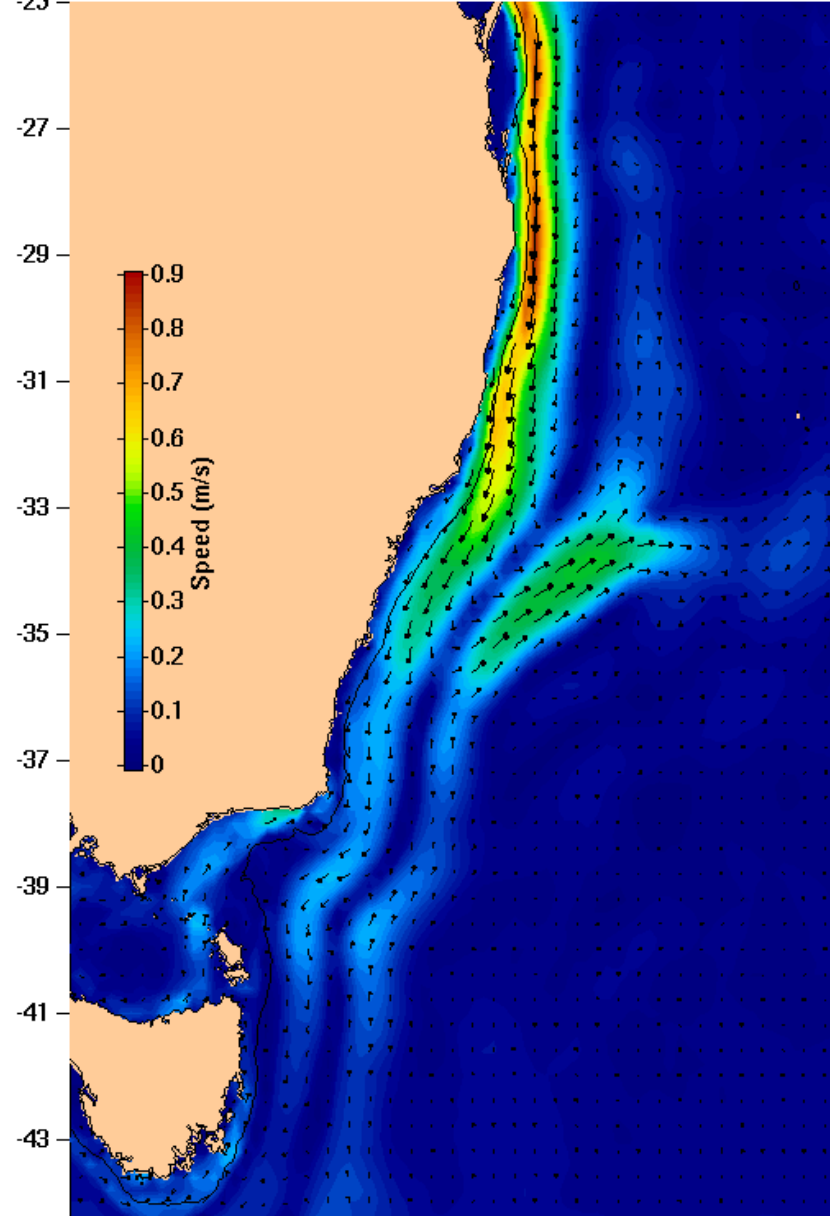
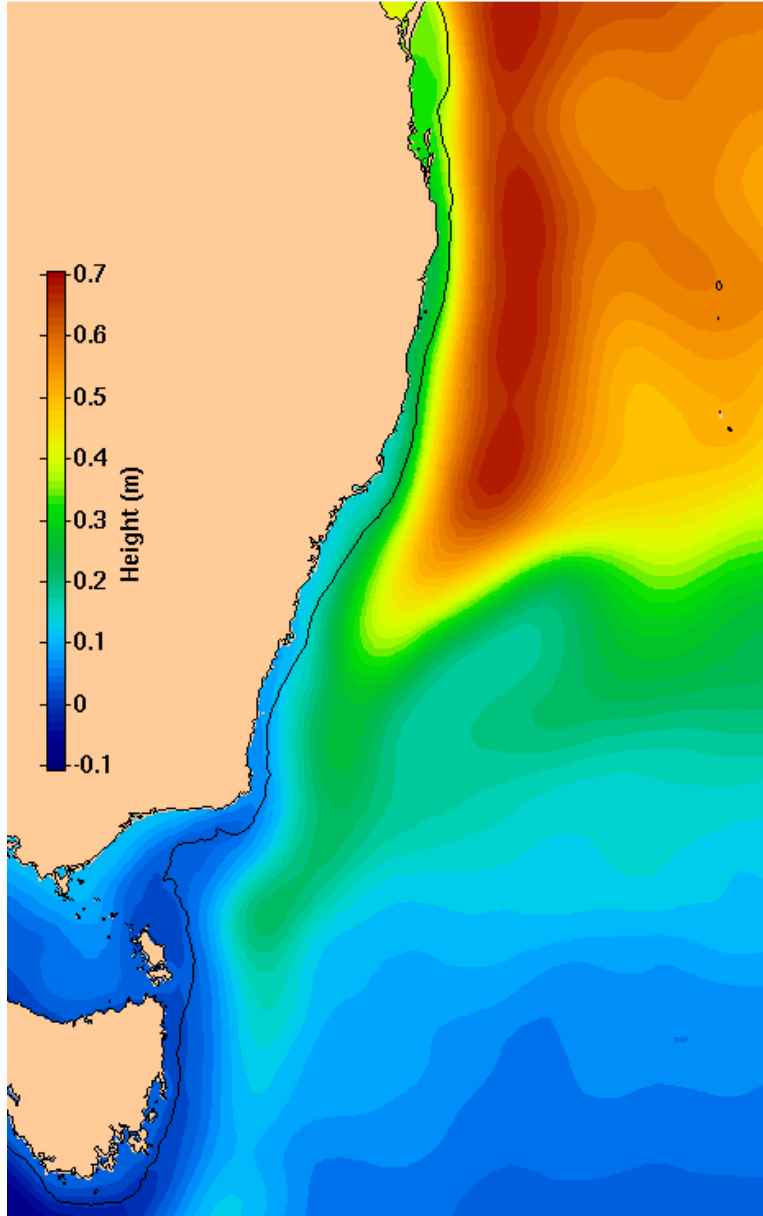


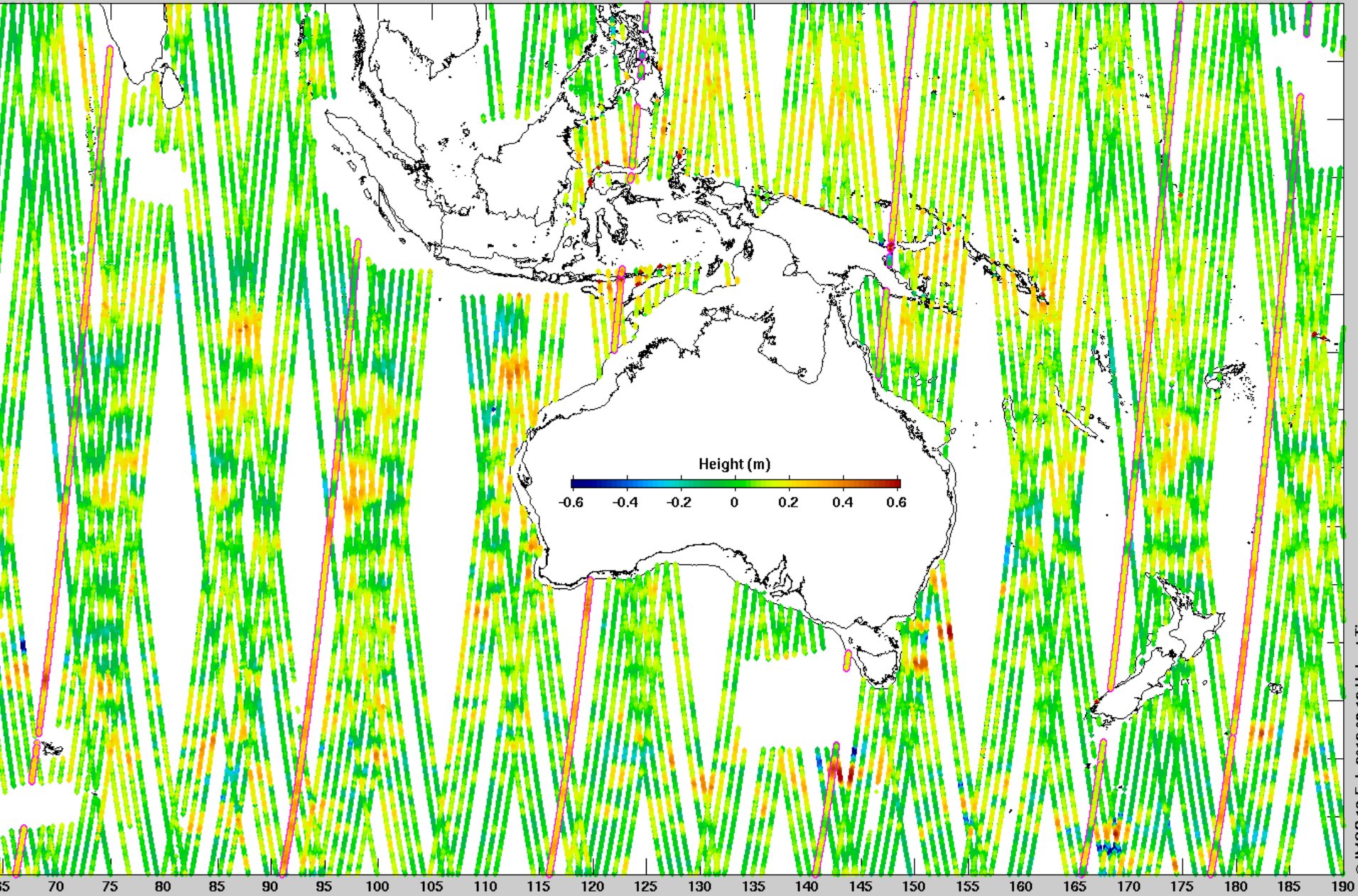
Mean Height RIO09



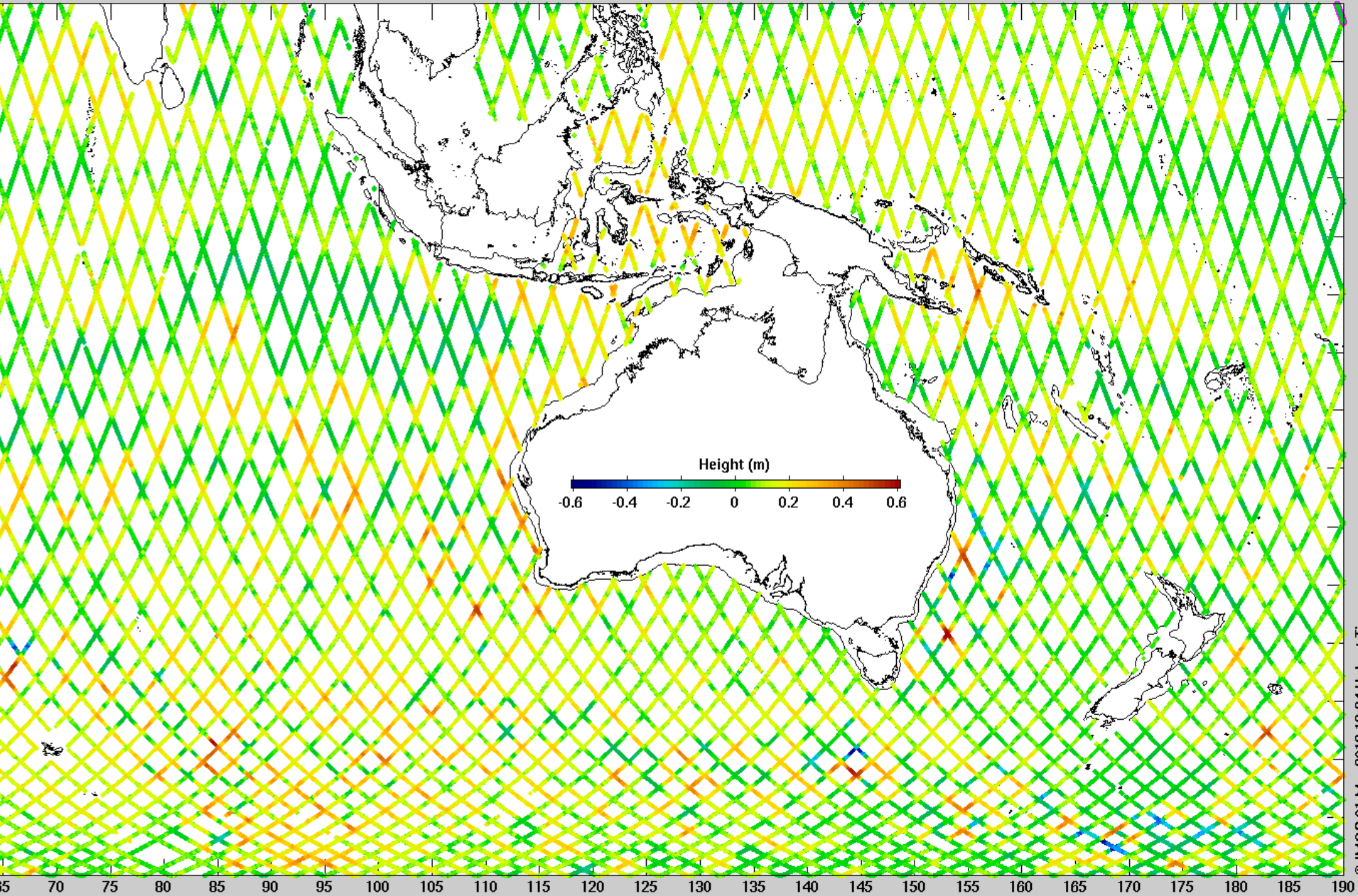
Geostrophic Velocity from Mean Height RIO09



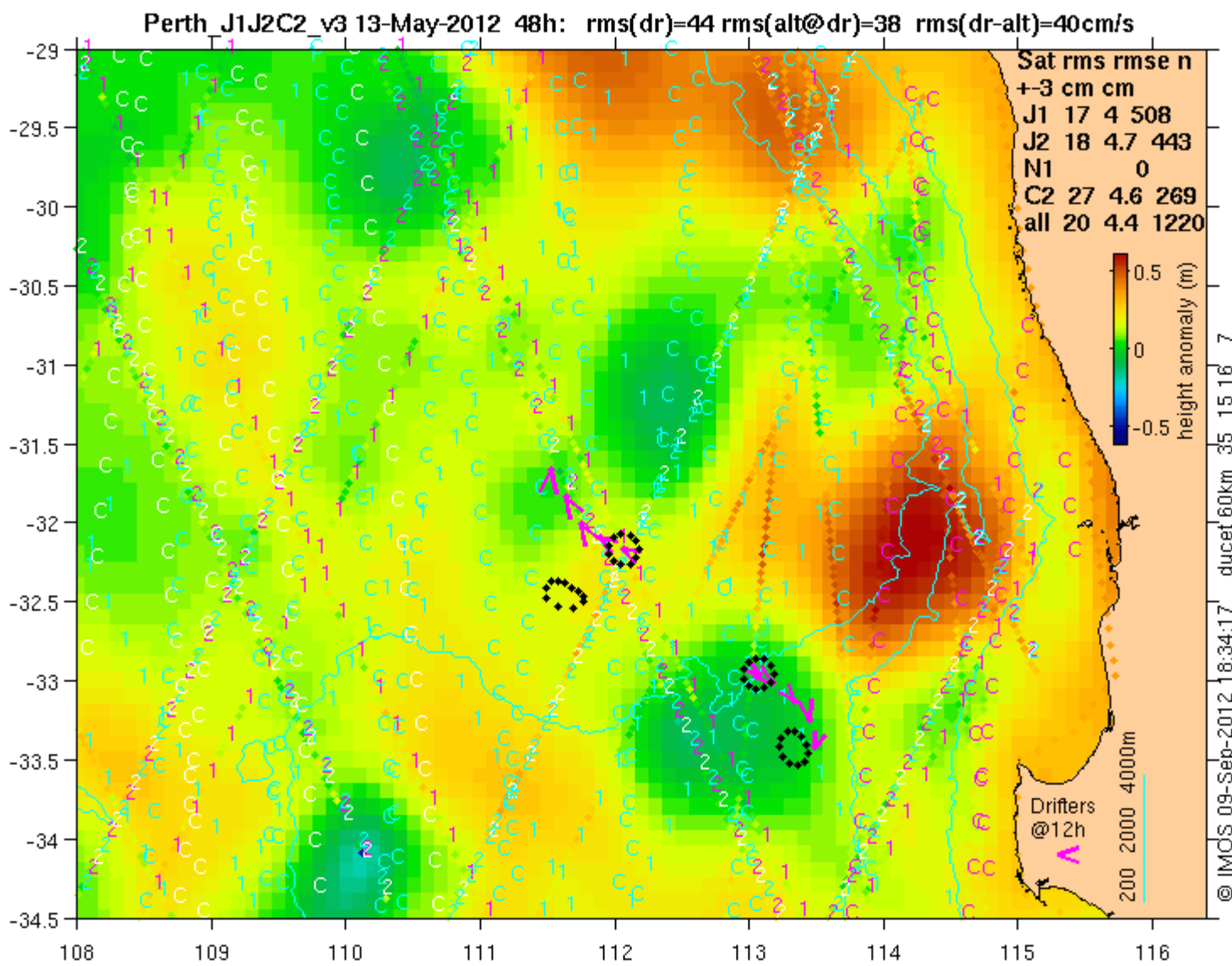


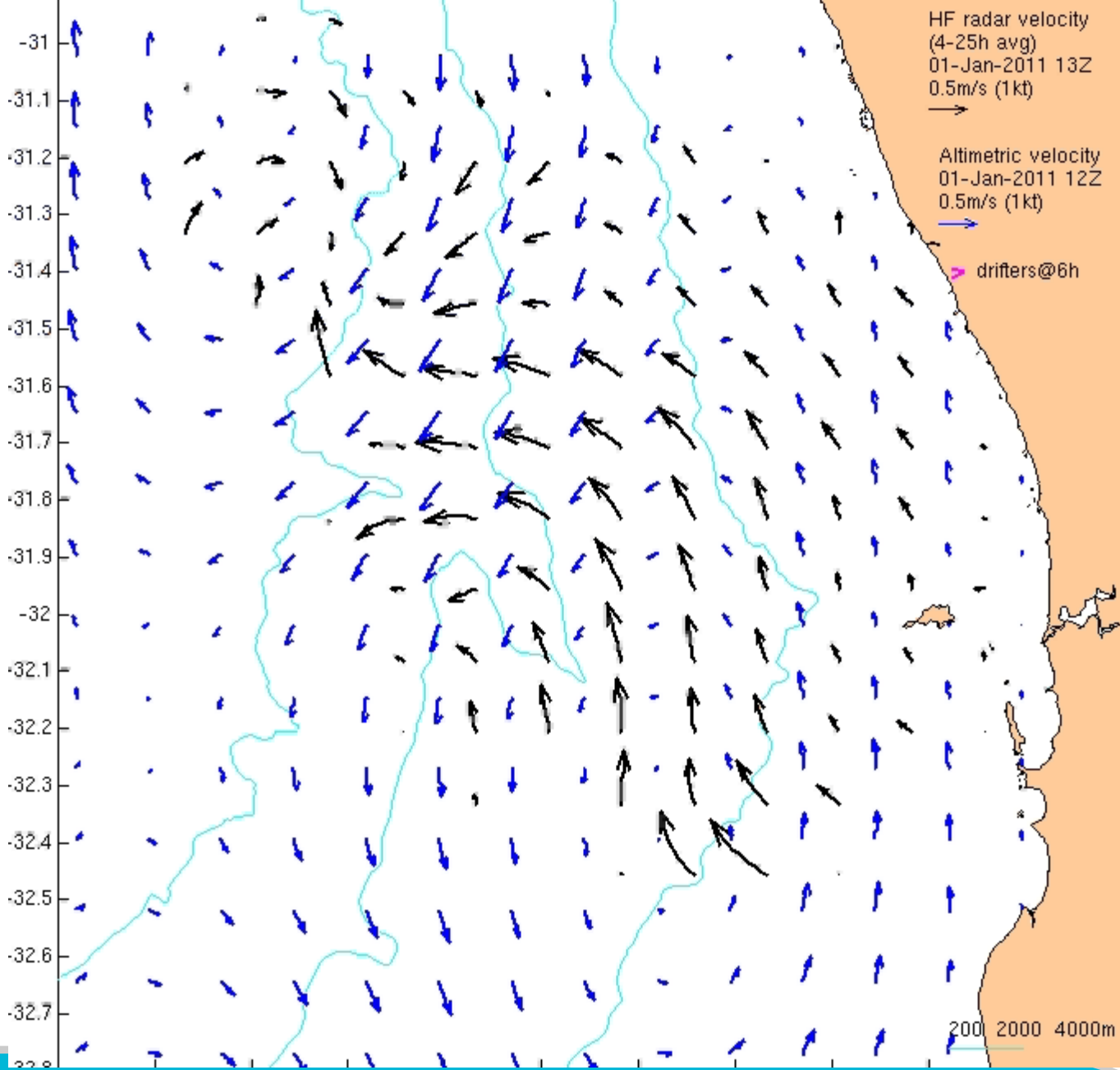


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HF radar velocity
(4-25h avg)
01-Jan-2011 13Z
0.5m/s (1kt)

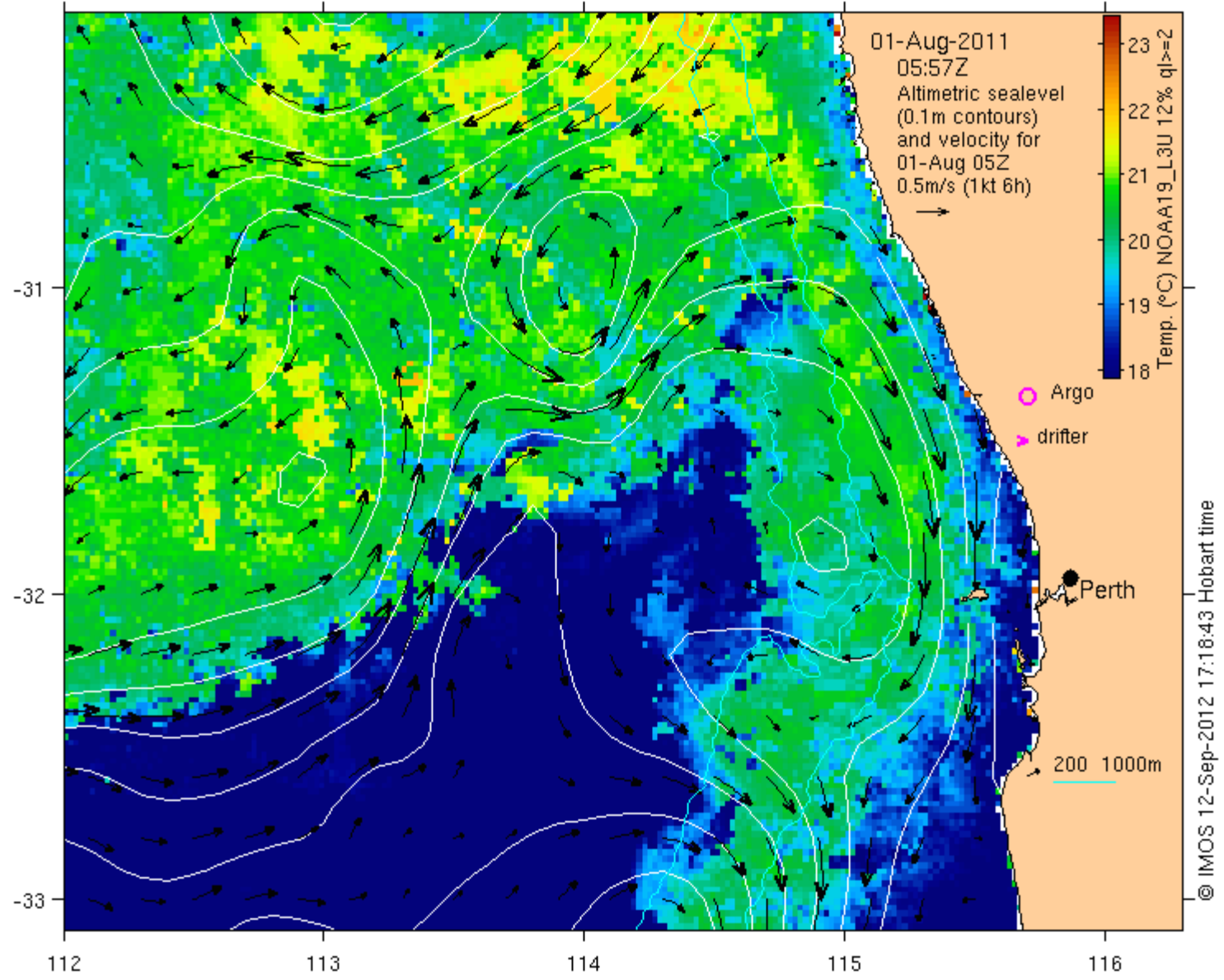
Altimetric velocity
01-Jan-2011 12Z
0.5m/s (1kt)

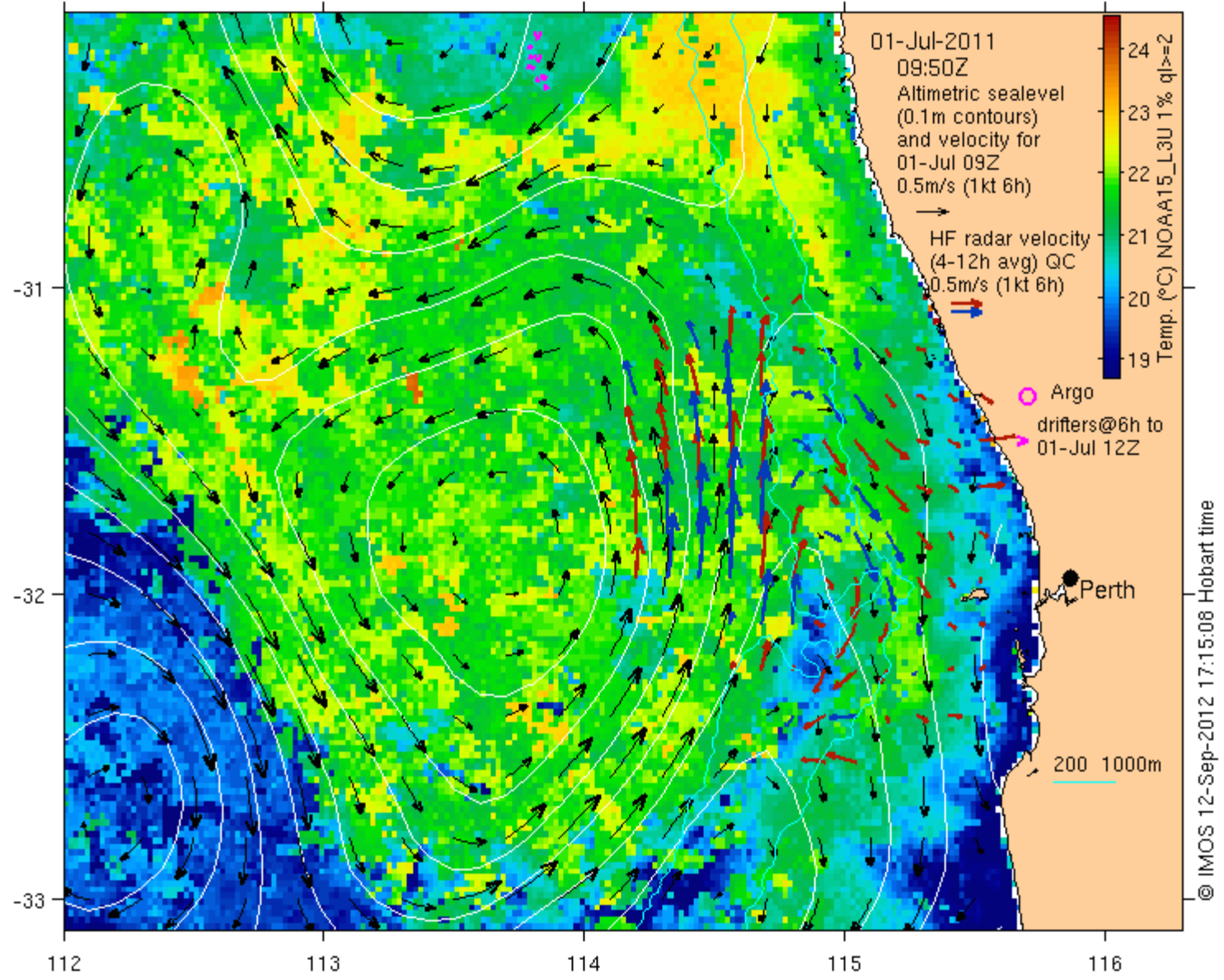
drifters@6h

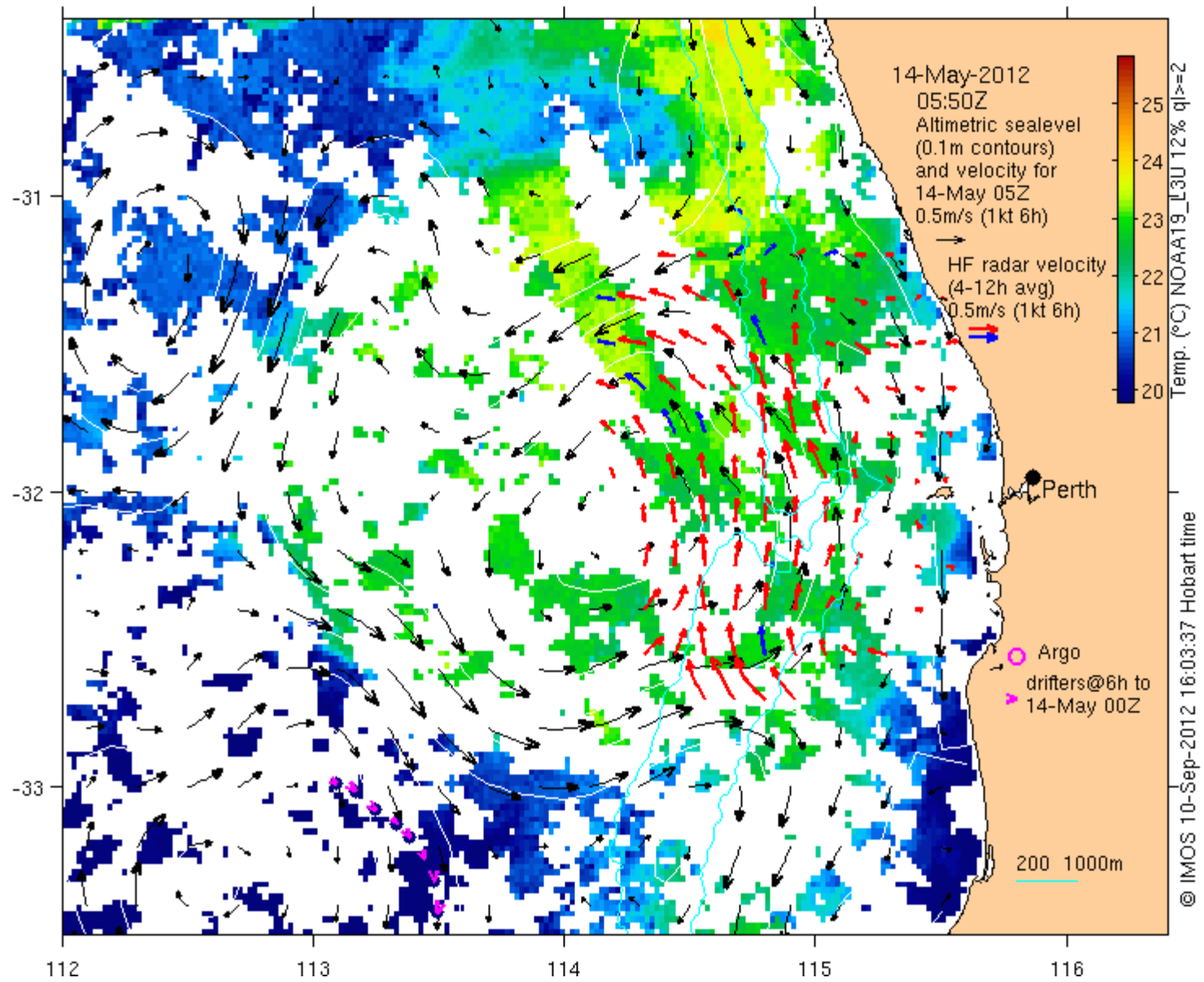
200 2000 4000m

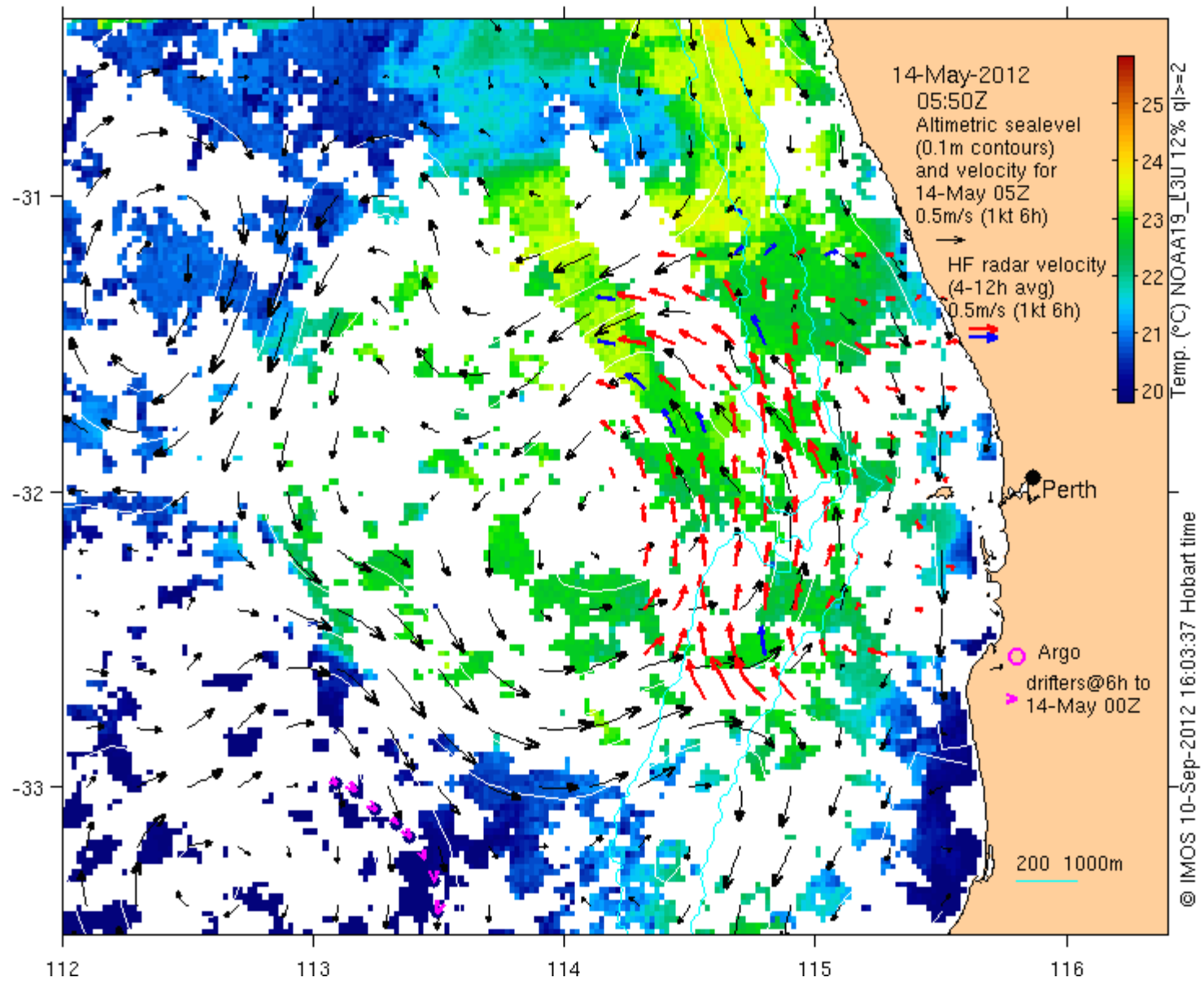
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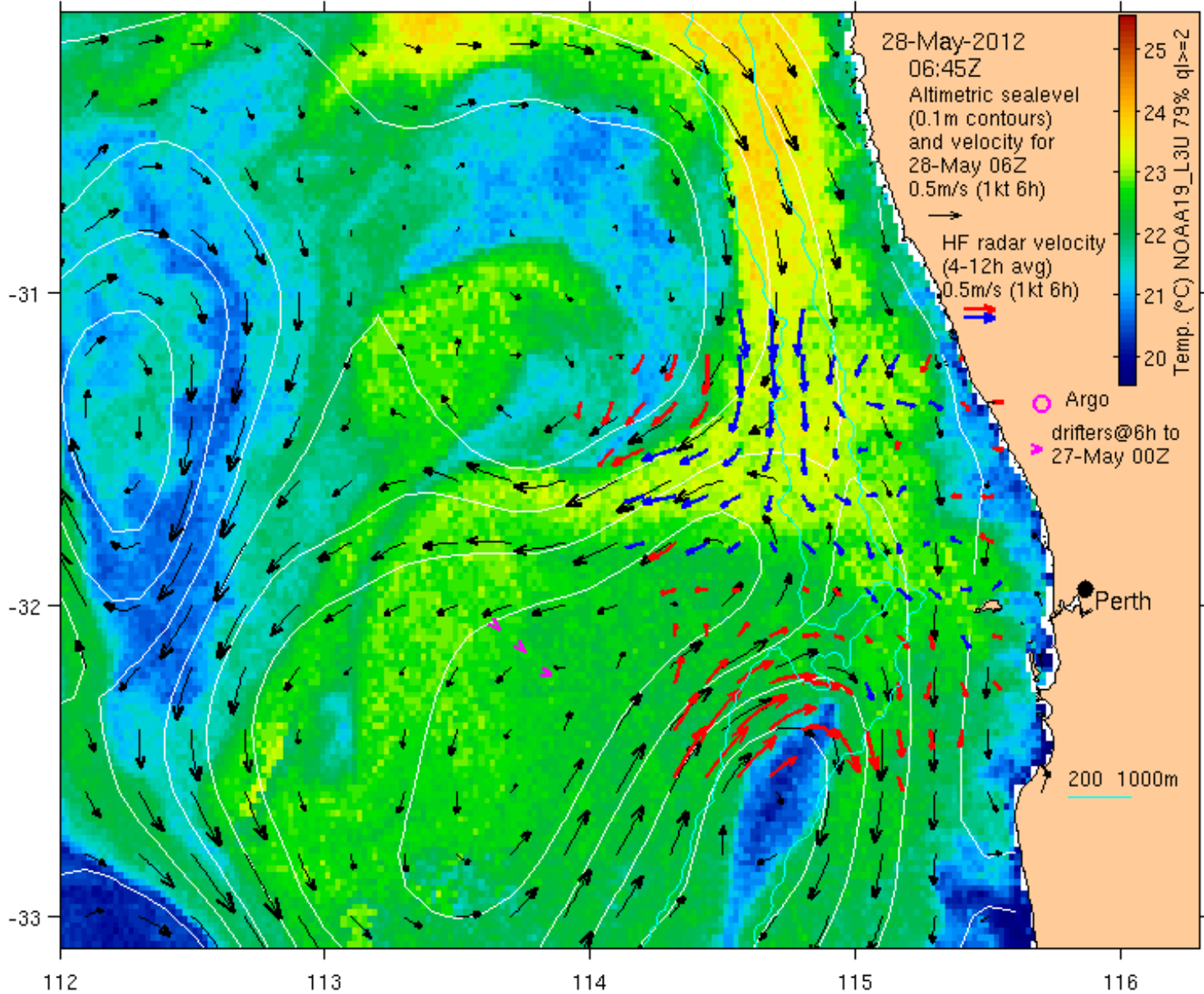




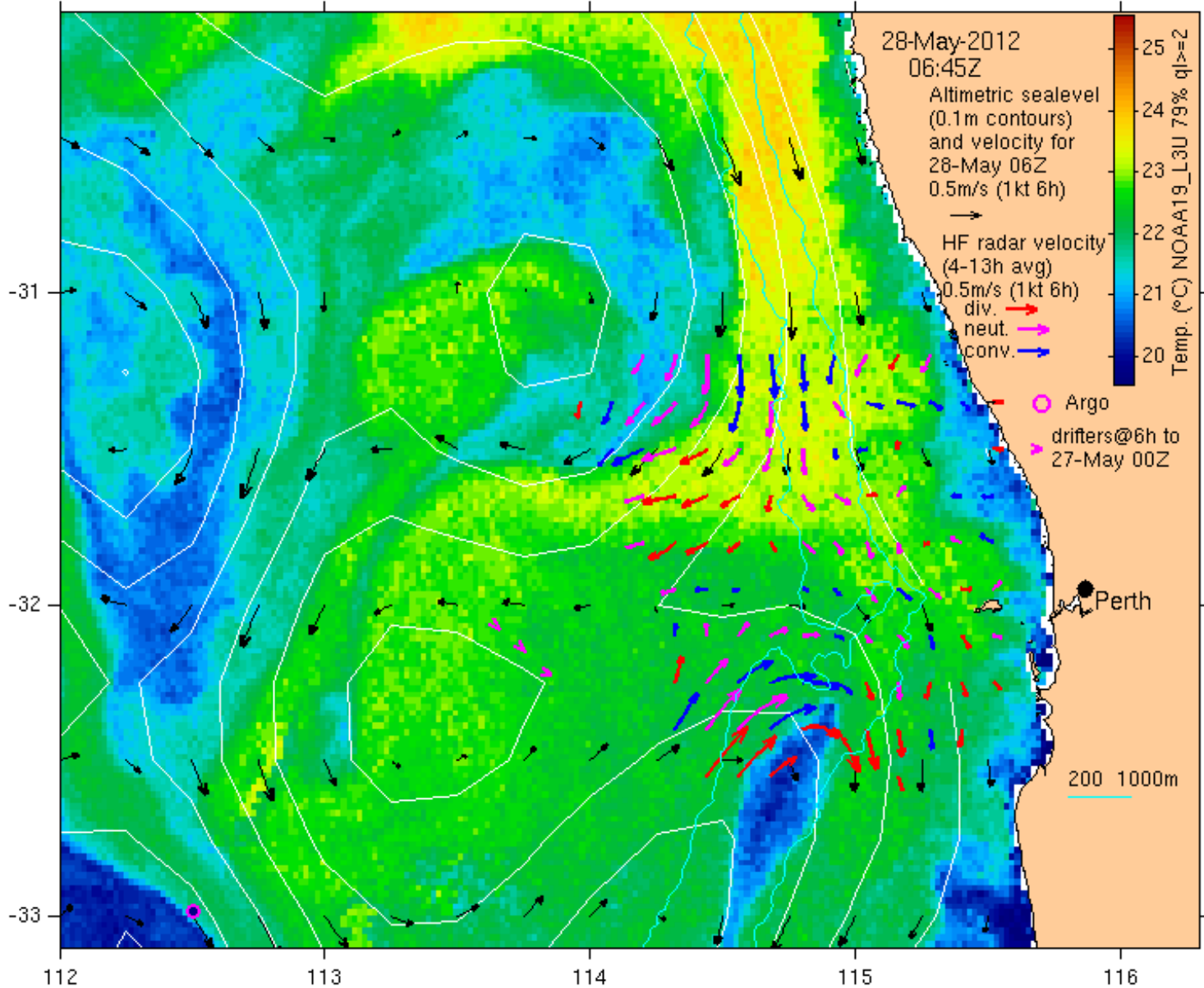




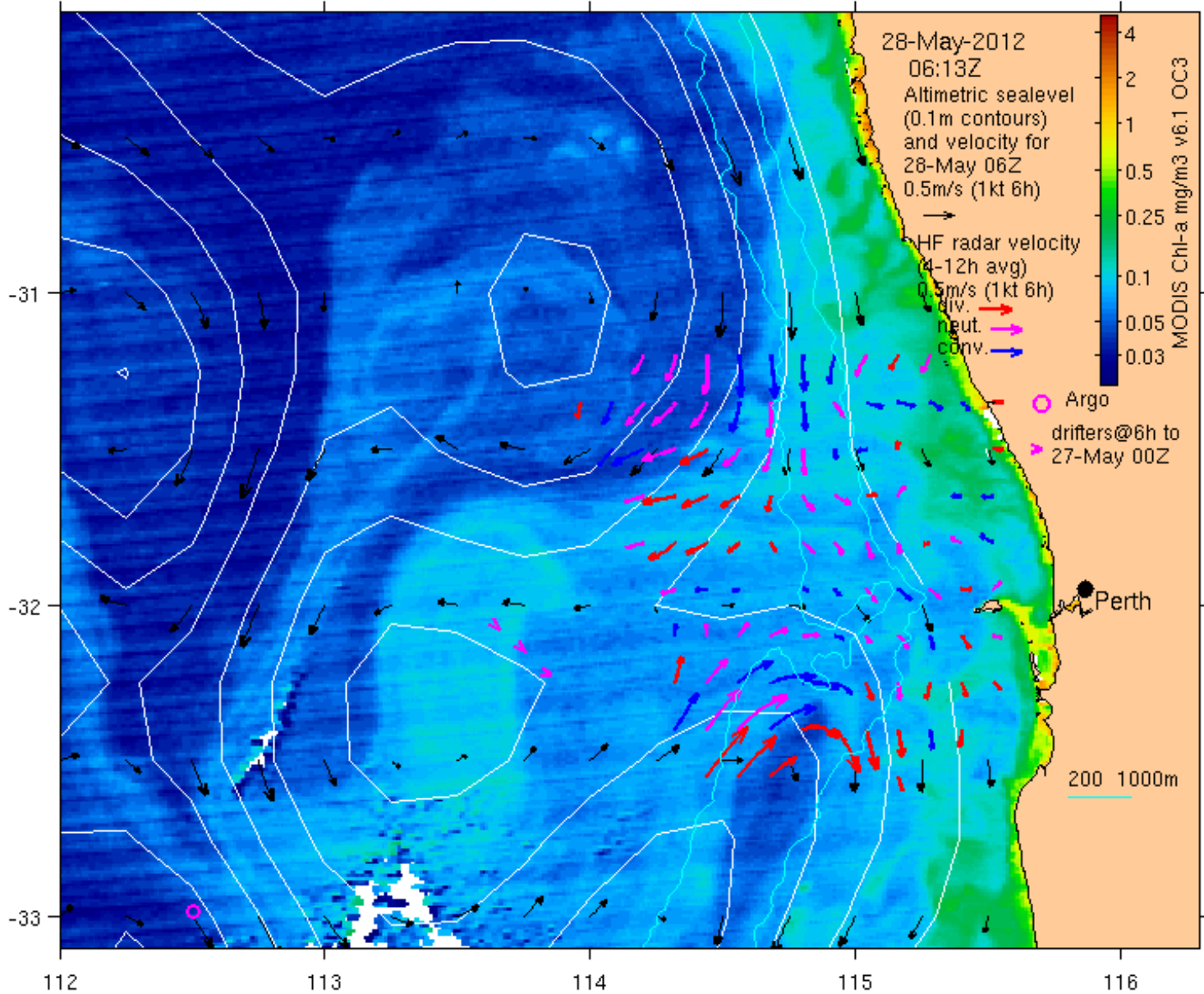




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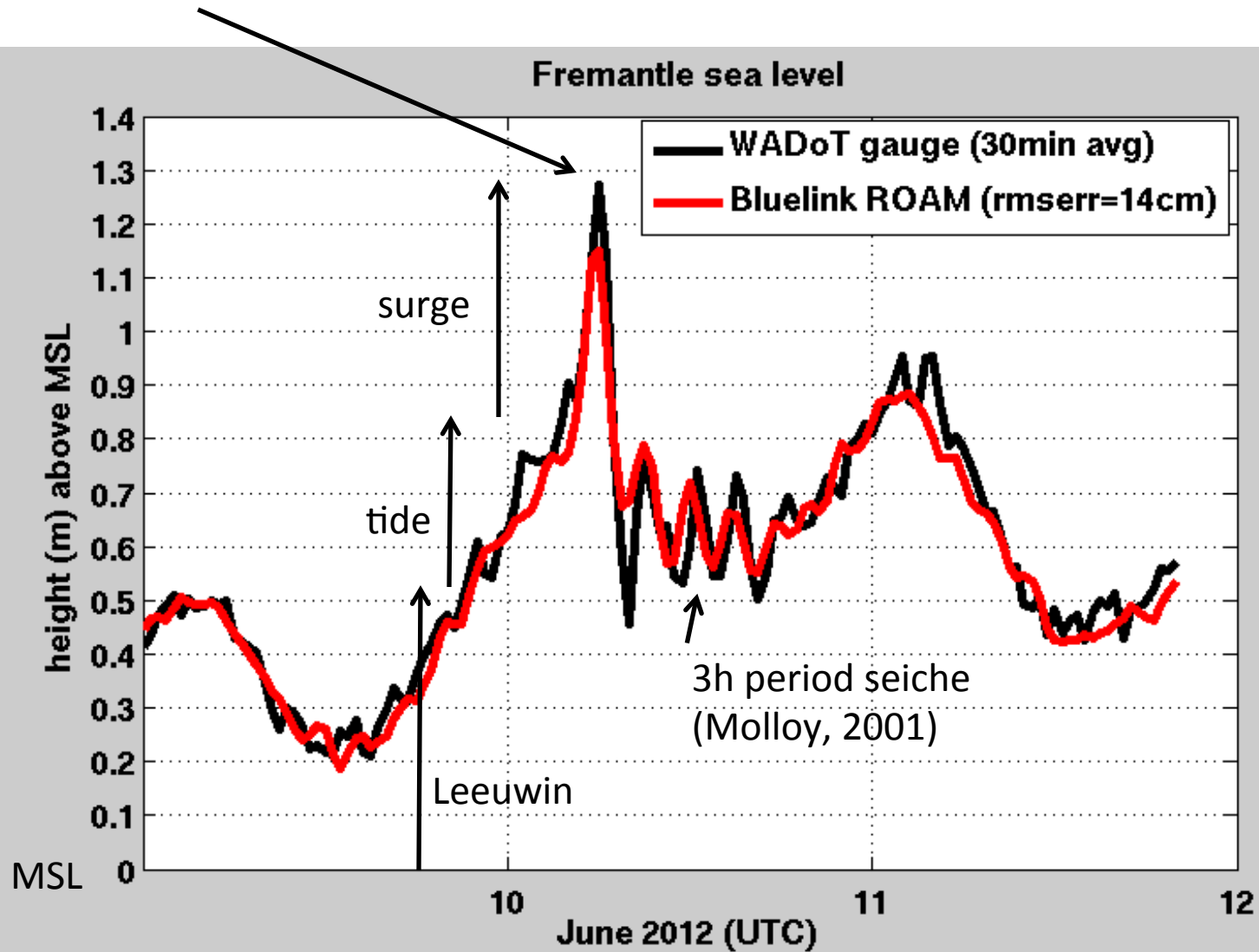
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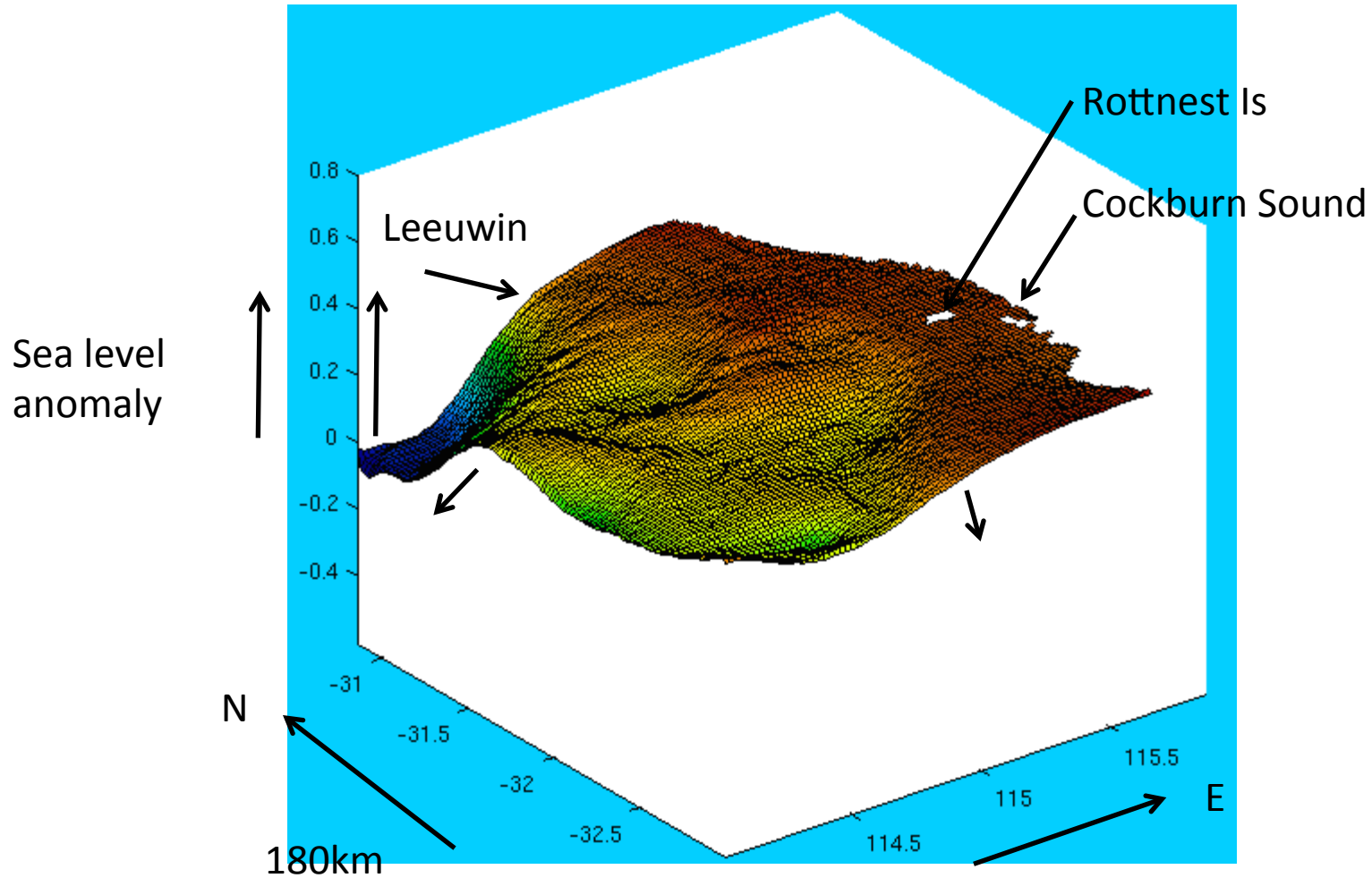
Conclusions (part 1)

- J2+J1+C2 yields SLA maps similar to what we are used to. The J1 geodetic orbit has not ruined the data for mesoscale applications. C2 orbit has some advantages to compensate the disadvantages.
- The HF radar resolves finer-scale processes but is very gappy and has large errors at coverage perimeter.
- The altimetry, HF radar, drifters and imagery mostly yield consistent pictures of the circulation features.
- A 20km-radius cyclonic eddy captured a drifter in the 'armpit' of Leeuwin. Radar estimates (1m/s) agreed with altimetry (geostrophy) even at this radius. Relative vorticity \approx planetary.
- Leeuwin has 0.1mg/m³ chl-a. Offshore cold water (incl. eddy) has even less. Coastal cold water had more, but is not the source for the Leeuwin's elevated concentration.

Highest-ever sea level at Fremantle



modelled sea level, 10-12 June 2012 (initialised with altimetry)



Final conclusion

- Don't neglect across-shelf wind forcing. That's what set this record.
- De-aliasing of coastal altimetry is harder than deep ocean altimetry.

Thank you

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