Project Manta

East Australian Current (EAC) Region: Oceanographic conditions report

June 2013

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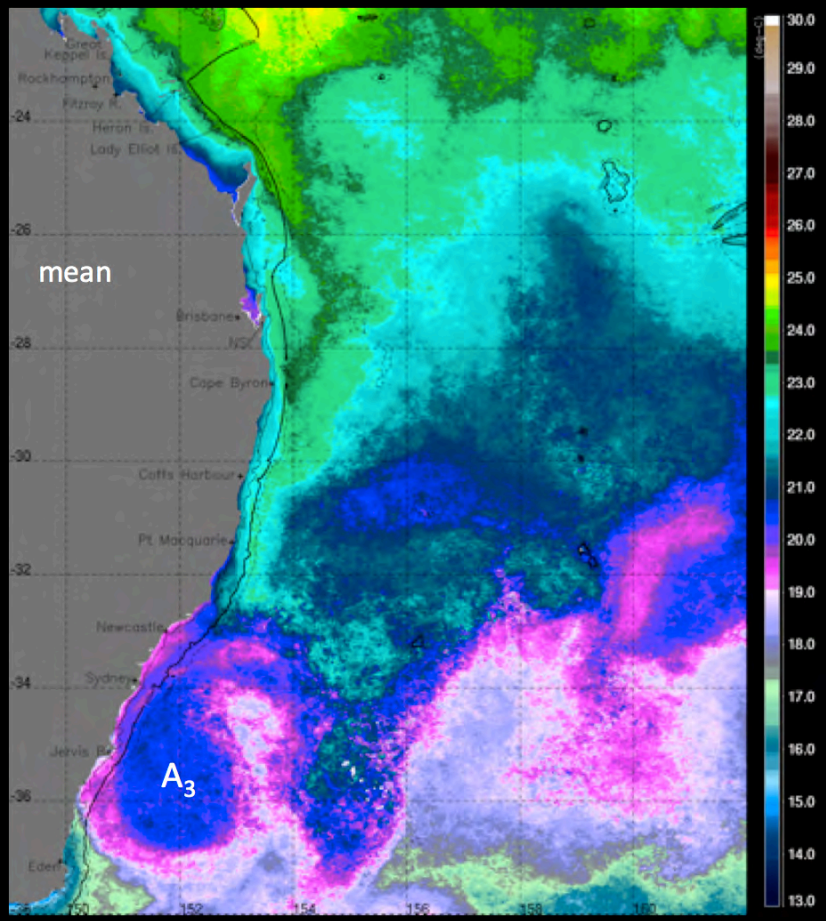
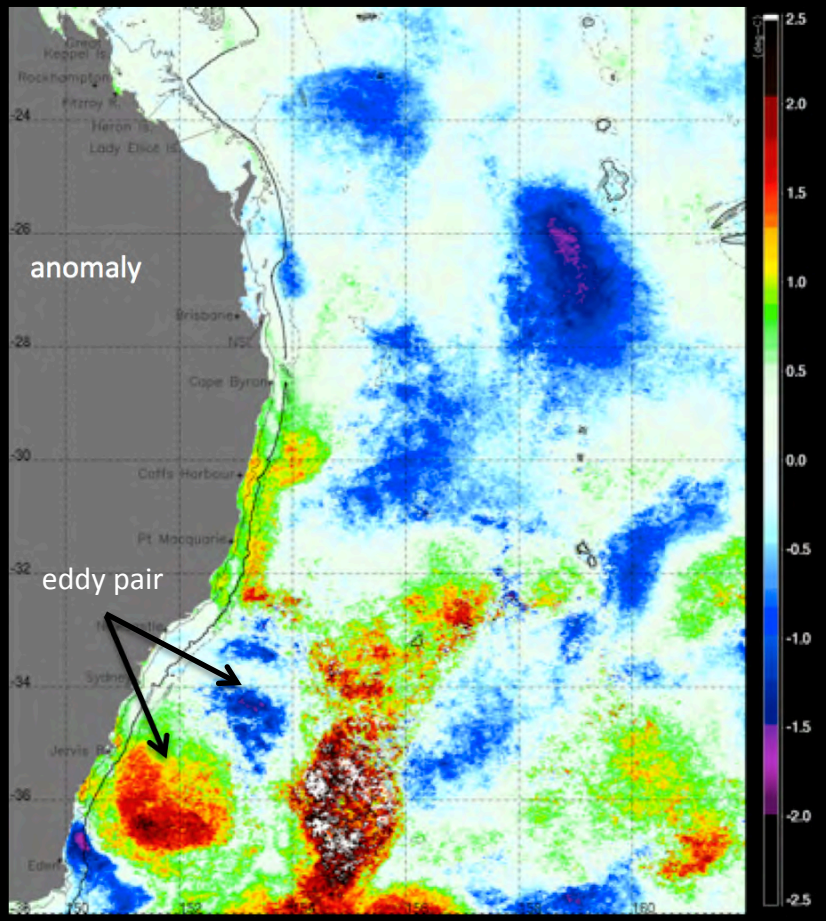
Overview: June 2013

- Monthly and weekly MODIS sea surface temperature (SST) means & anomalies showing dynamic East Australia Current (EAC) and eddy distribution
- Monthly MODIS chlorophyll means and anomalies for the region with distribution pattern highly correlated to the dynamics and strong eddy activity
- Weekly maps of sea level anomalies show the ocean topography related to the EAC and eddy activity in the region
- Weekly MODIS chlorophyll and SST means for southern GBR region highlighting the oceanographic conditions around Lady Elliot Island (LEI)
- Summary of Manta sightings at LEI for June 2013

EAC monthly MODIS SST (D+N): June 2013



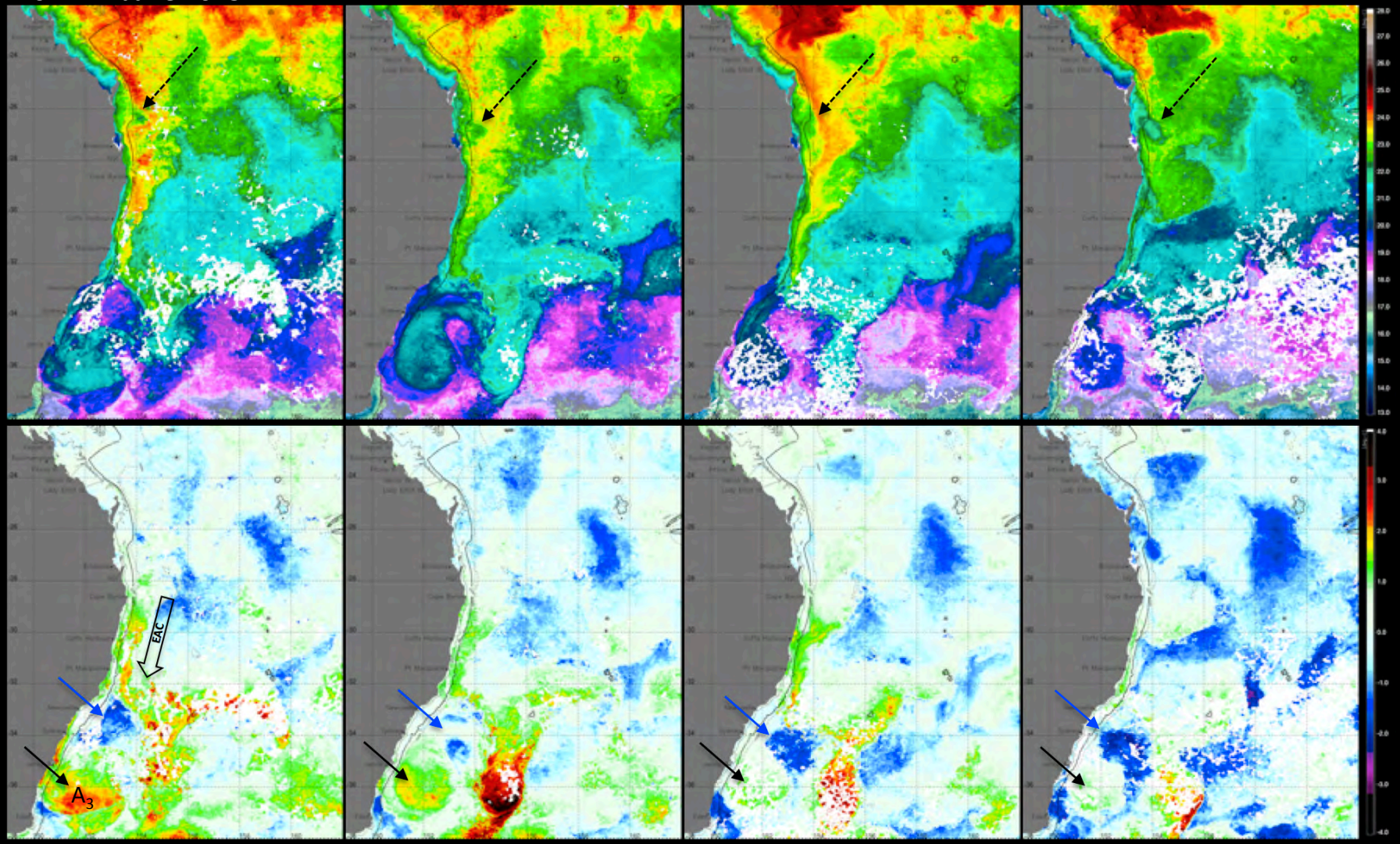


- Intense positive SST anomalies associated with:
  - EAC encroachment onto the shelf from Cape Byron to 32.5°S
  - Southern limit of the EAC meandering into the Tasman Sea
  - Anticyclonic eddy south of Sydney - has persisted for few months, now indicating surface core waters +1.5°C warmer than surrounding waters
  - 2nd offshore anticyclonic eddy: being shed from the primary EAC flow

- Intense negative SST anomalies associated with:
  - cyclonic eddies with core temperatures indicating at least -1.5°C colder than surrounding waters

Weekly MODIS SST means (top panel) and anomalies (bottom panel)

From 1-7 June 2013



- Note evolution of cyclonic eddy (stippled arrows): eddy originated on the broad shelf south of Fraser Island during May, now moving offshore and evolving as it becomes embedded in the EAC
- Dynamics and eddy shedding of eddy pair at the southern limit of the EAC: anticyclonic eddy (A_3 in the May 2013 report) persists in June with intense positive anomalies that progressively ease towards week 4. The cyclonic eddy (blue arrow) is associated with intensifying negative SST anomalies (note anomaly scale: -4.0, 4.0)

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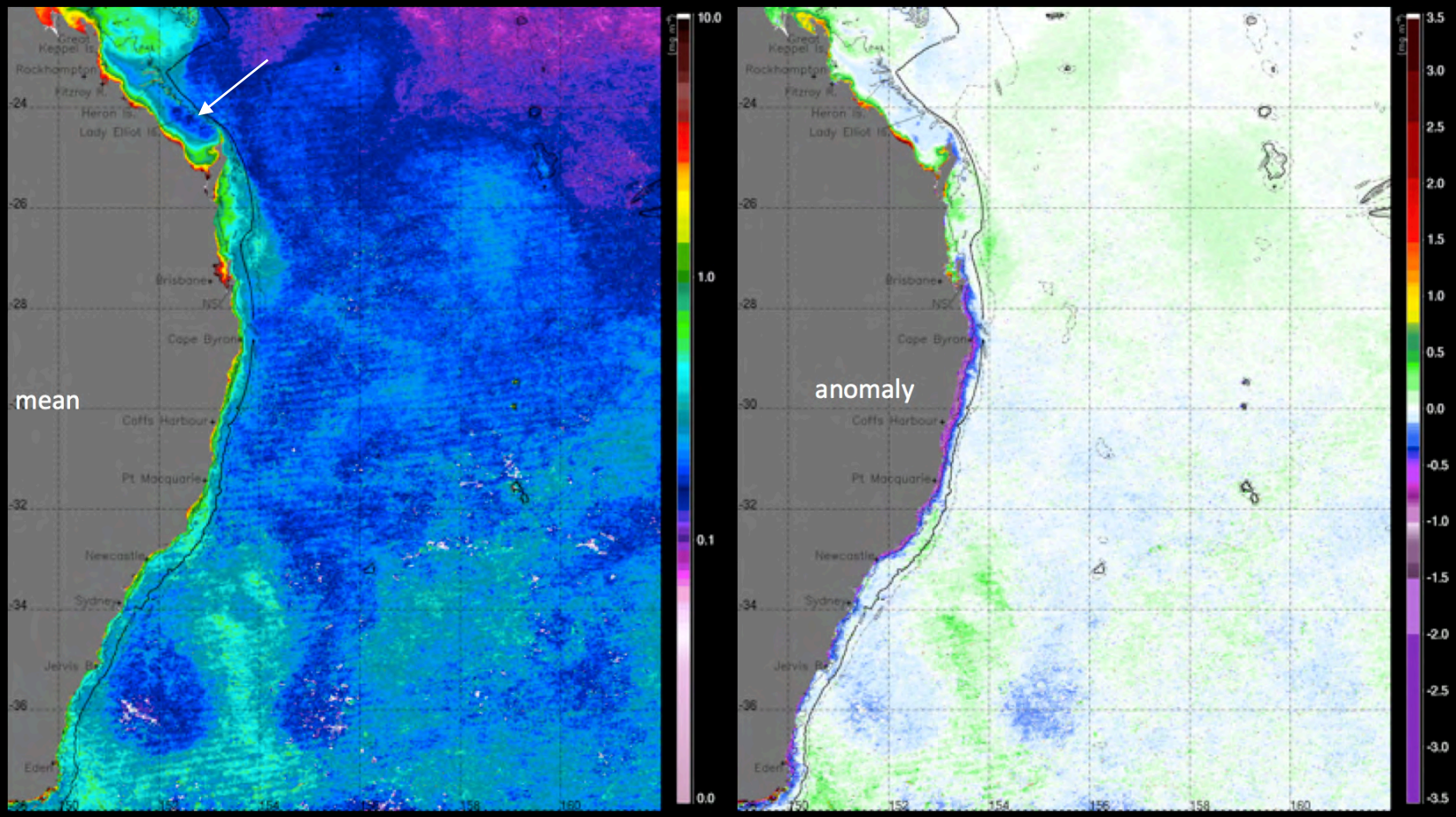
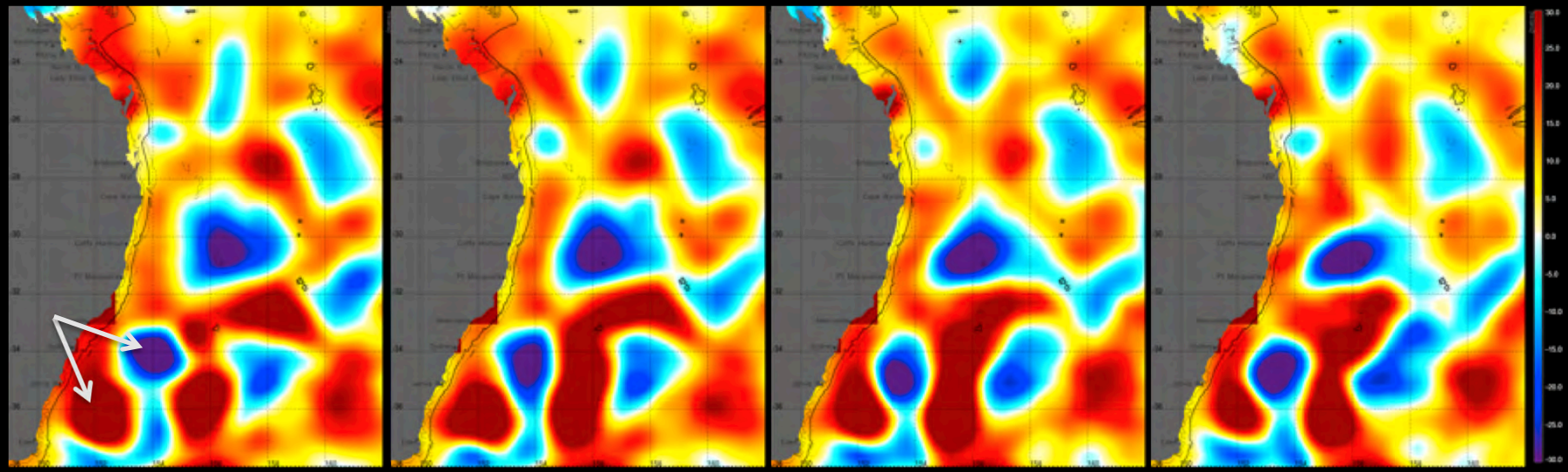
EAC Monthly MODIS Chlorophyll: June 2013



- Overall seasonal increase in chlorophyll concentration in the entire region except for Coral Sea waters (northeast)
- Clear intrusions of oceanic water onto the shelf around Lady Elliot Island (arrow)
- Pattern of chlorophyll distribution in the Tasman Sea (southern portion) highly correlated to the dynamics and eddy shedding of the EAC: enhanced chlorophyll concentration around the anticyclonic eddy south of Sydney & extending offshore to ~155°E with eddy centre characterised by low chlorophyll

Weekly AVISO Maps of Sea Level Anomalies

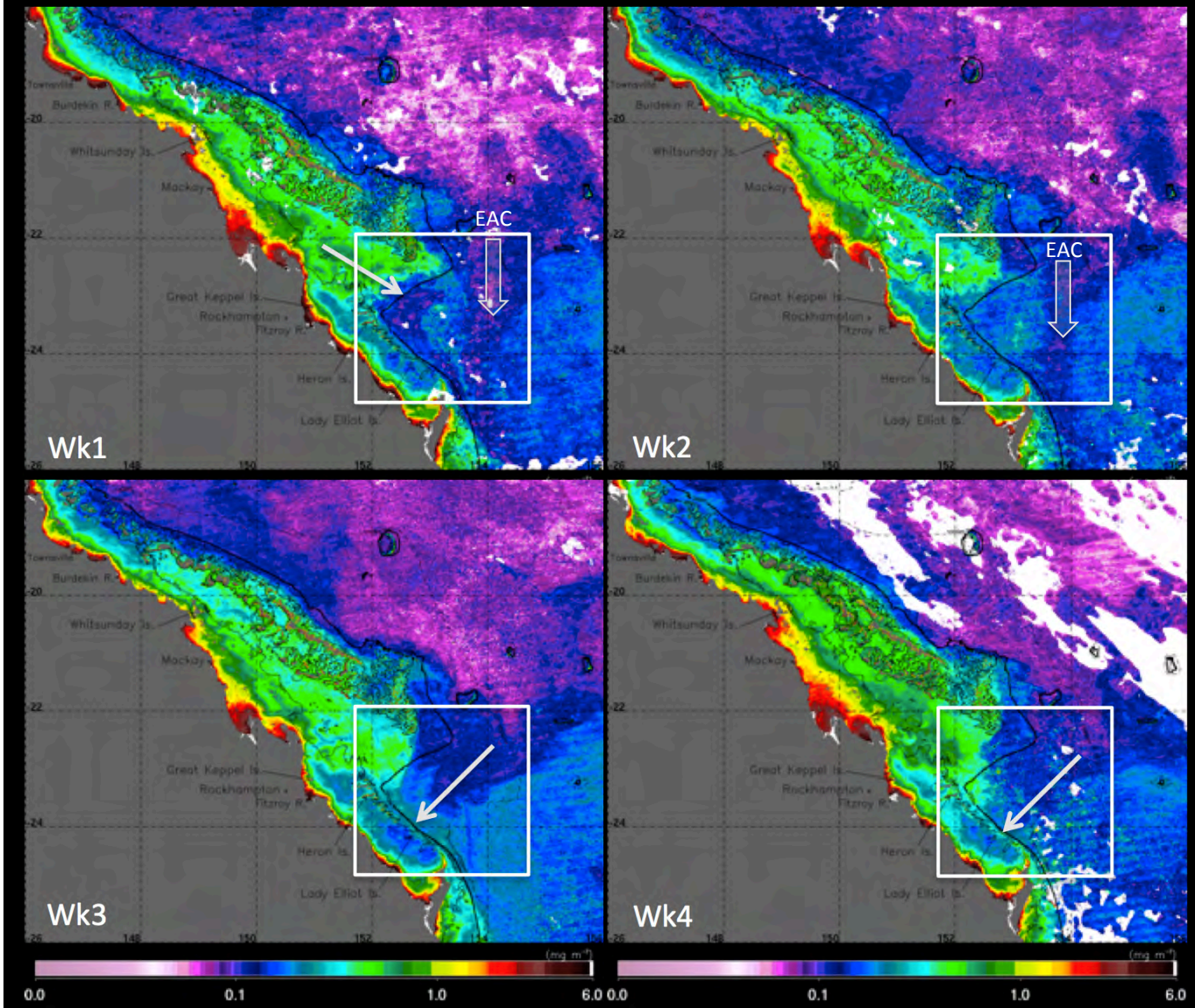
From 1-7 June 2013



- Weekly sea surface height anomalies showing the:
  - persistent eddy pair off Sydney and Jervis Bay moving slightly coastward
  - cyclonic eddy off 27.5°S – as highlighted in the MODIS images

Note: yellow to red = positive sea level anomalies

Weekly June 2013 MODIS Chlorophyll means in southern GBR



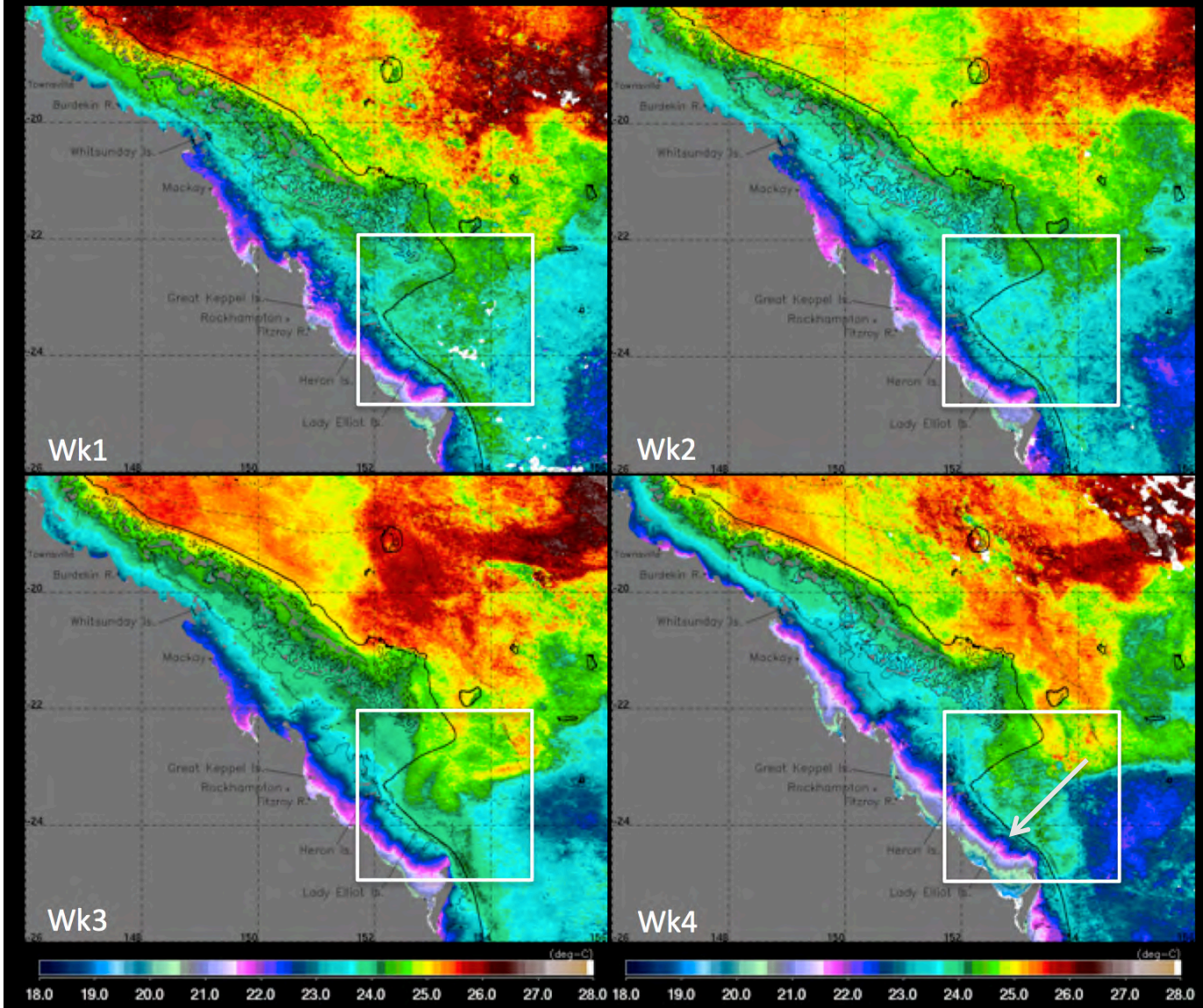
Weekly means showing changes in chlorophyll concentration associated with the dynamics of a mesoscale eddy. Details below focus on the region enclosed by rectangle.

- Wk1: Active Capricorn Eddy and clockwise advection of low chlorophyll EAC waters

- Wk2: Remnants of the eddy still visible. EAC apparent as the low chlorophyll band of water along the eastern end of the region

- Wk3-4: Further increase in chlorophyll concentration, particularly along the shelf edge, and clear intrusions on either side of Lady Elliot Island

Weekly June 2013 MODIS SST (D+N) means in southern GBR



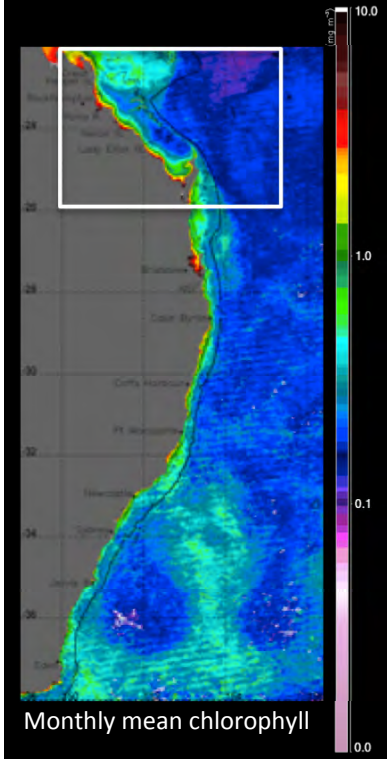
Weekly means showing coincident SST for the region enclosed in the rectangle

- Surface manifestation of the Capricorn Eddy not apparent in ocean 'skin' temperature

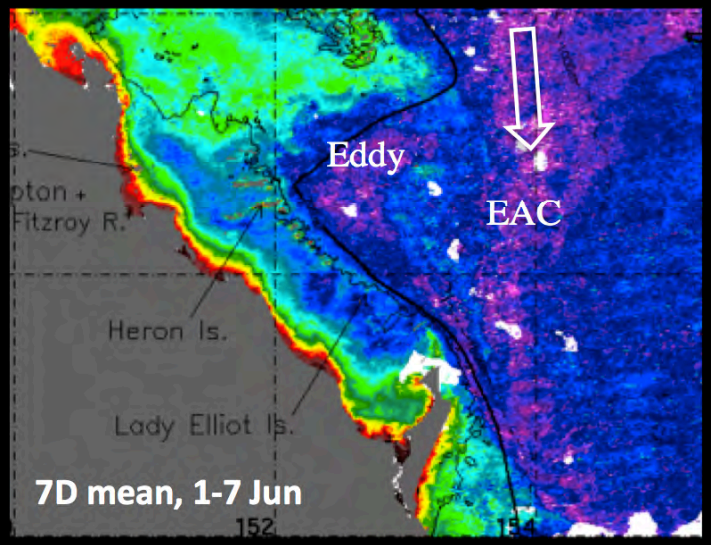
- Intrusions of warmer oceanic waters into the Curtis Channel creating a sharp frontal boundary between shelf and oceanic waters:

- Meeting of these two water masses along the frontal boundaries creates a region of mixing and concentration of plankton

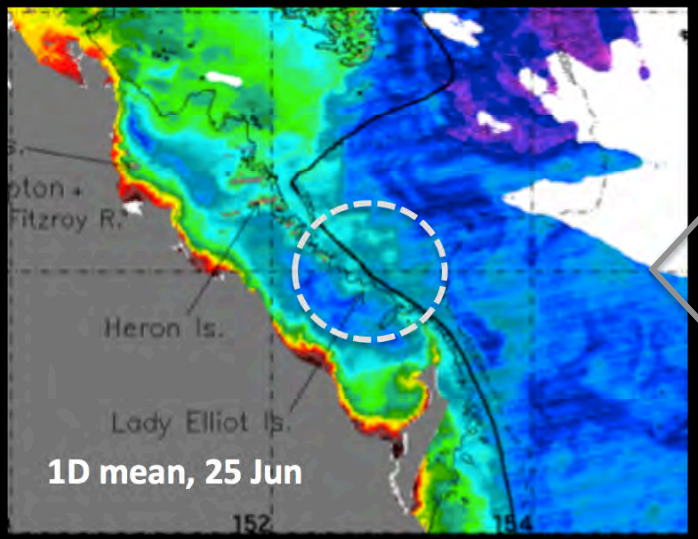
Manta sightings @ Lady Elliot Island in June 2013



Monthly mean chlorophyll



Active Capricorn Eddy – a few days before increased number of manta at LEI. Note that the eddy was active towards end of May 2013 and persisted into June.



Day	Number of Manta sighted	Animal Behaviour
1-10	31	Cleaning/Cruising
11	31	Cleaning/Cruising
12	12	Feeding @LHB, @Three Pyramids, @Spiders
13	4	Feeding @Second Reef, Feeding/Surfing @LH Quay/Way
14	18	Feeding @LHB, @LHB to Sunsets, 23°C, northerly current
15	19	Feeding @LHB to Mooring 1, @LH Quay/LHB, 23°C, northerly current
19	14	Feeding @LHB and @Second Reef, Cruising @Three Pyramids
21	20	
22	12	
23	17	
24	29	
25	49	
26	27	
27	84	Feeding Frenzy!!!
28	56	

Note increased chlorophyll concentrations along the entire length of the shelf - coincided with the subsequent increase in manta sightings and another feeding frenzy at LEI 2 days later.

An active Capricorn Eddy early in June resulted in strong intrusions of oceanic waters into the Curtis Channel (& either side of LEI). Shelf break fronts form here due to hydrographic differences between coastal and open ocean water masses mixing along the shelf break. Fronts are regions where nutrients can concentrate and result in increased primary production == attractive feeding grounds to many marine animals, including manta rays