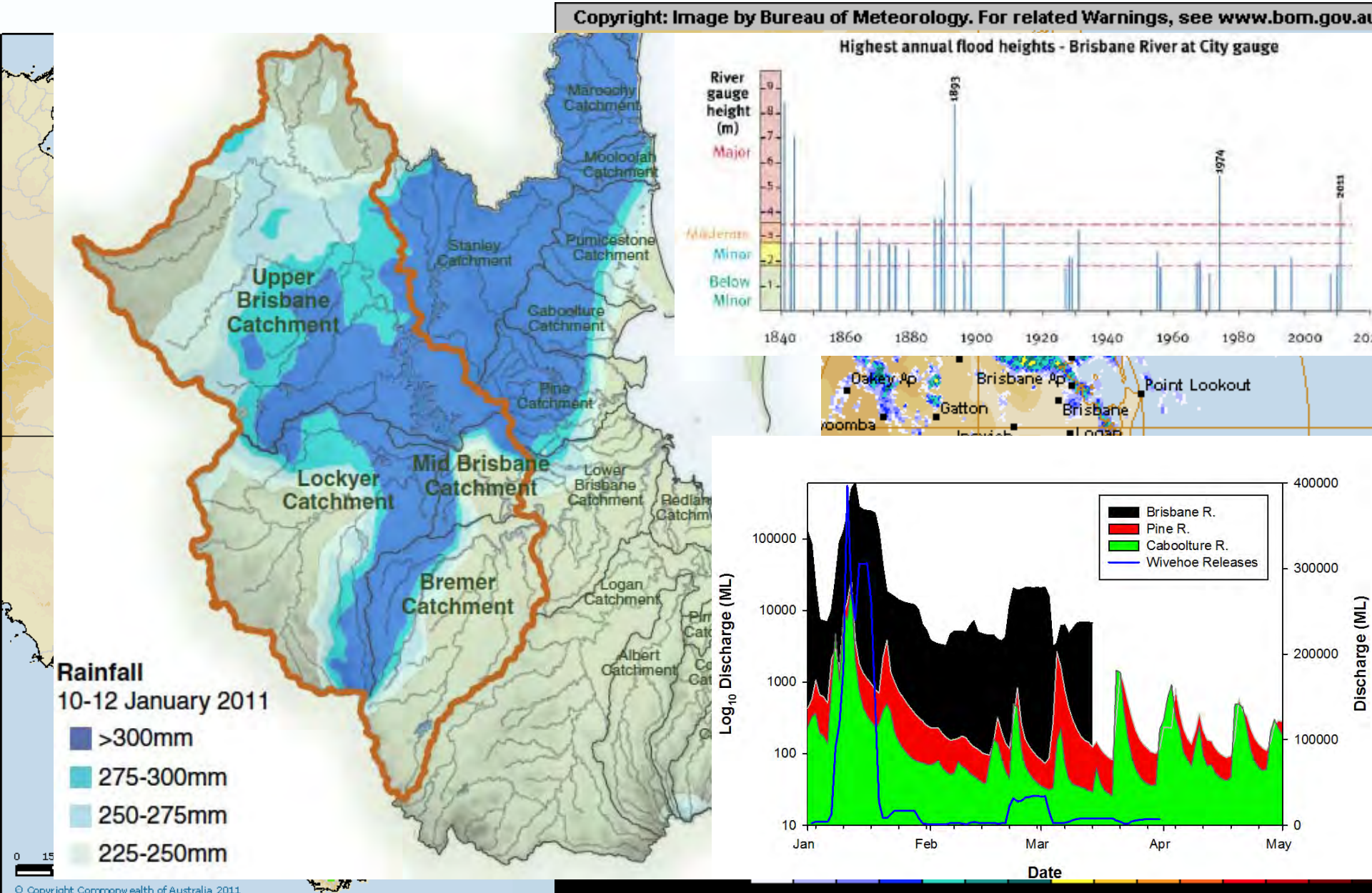
Biogeochemical and Bio-optical properties of the 2011 Floods in Moreton Bay

Andy Steven, Russ Babcock, Geoff Carlin, Nagur Cherukeru, Phillip Ford, Felipe Gusmao, Gary Fry and Kadija Oubelkheir

2010-11 : A Very Wet year!



Brisbane Floods, 12 -14 January 2011

Rocklea Markets

Photos: ABC news online

Go to http://www.abc.net.au/news/specials/qld-floods/

Bundamba

2011 SEQ Floods Damage

- 33 people died
- **Insurance claims**
  - 58 463 claims
- **State public infrastructure**
  - $5 - 6 billion
- **State enquiry**
  - Flood proofing
  - prosecutions

Changes to waterways

Moreton Bay and its Catchments

Max. length 125 km
Max. width 35 km
Surface area 1,523 km²
Average depth 6.8 m

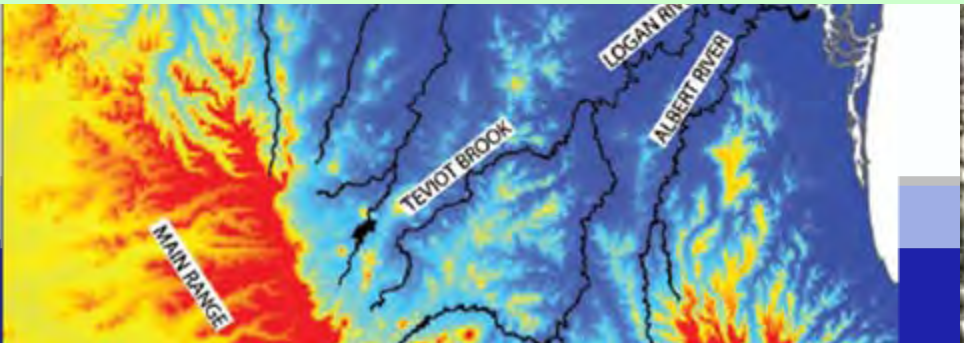
Seagrass: 25,000 ha, 6 species

Mangroves: 15300 ha, 8 species

Dugongs: 960

Green sea turtles: 10,000

ShoreBirds: 43 species, 30 migratory



Moreton Bay – Before and After Flood

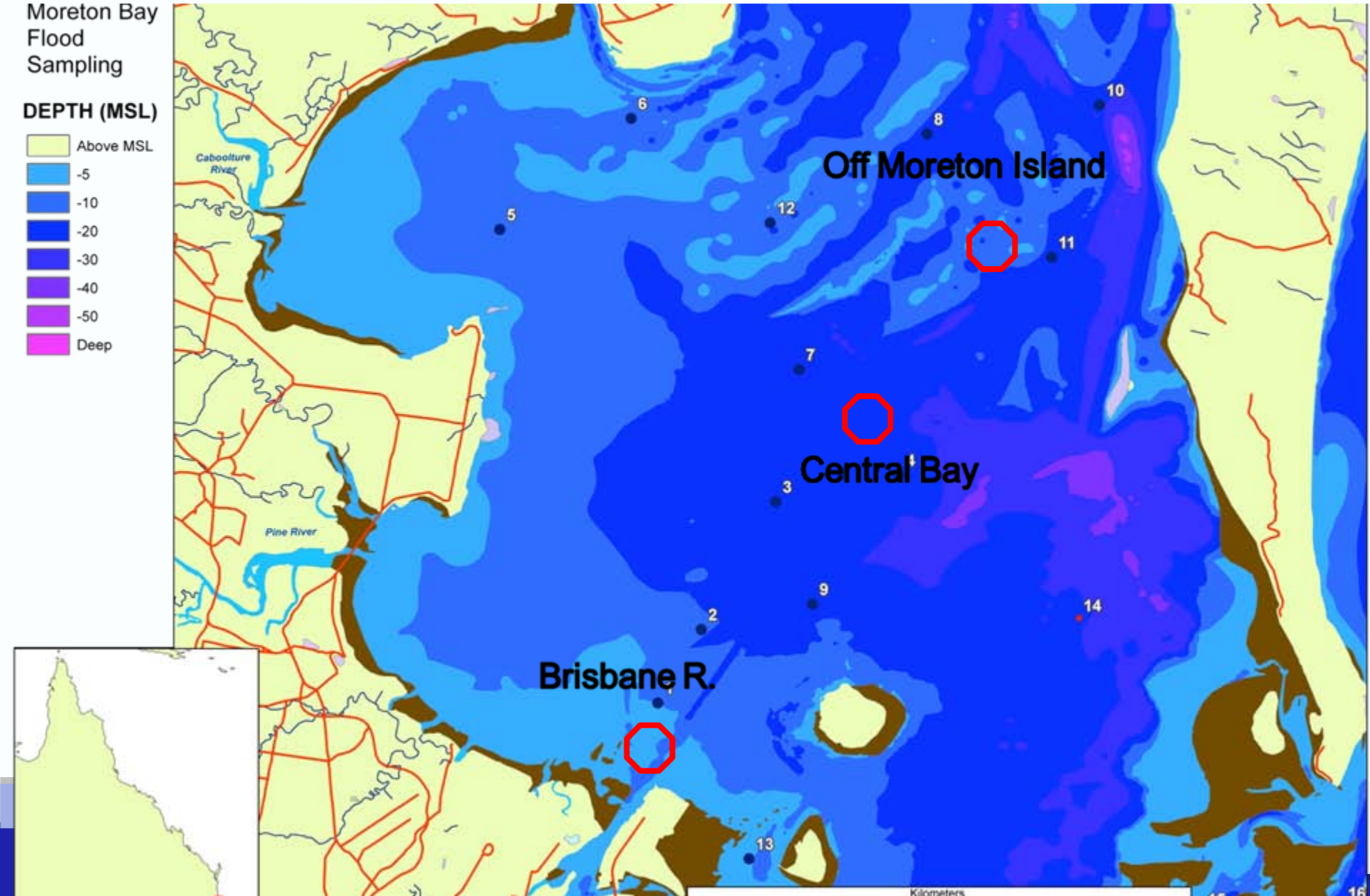
Key Questions

1. What was the extent of the plumes?
2. What was the 3D structure and biogeochemical composition of the flood plume ?
3. How does the structure and composition of the plumes change through time?
4. What were the bio-optical properties and how did they change ?
5. What are the ecological Impacts of the floods?

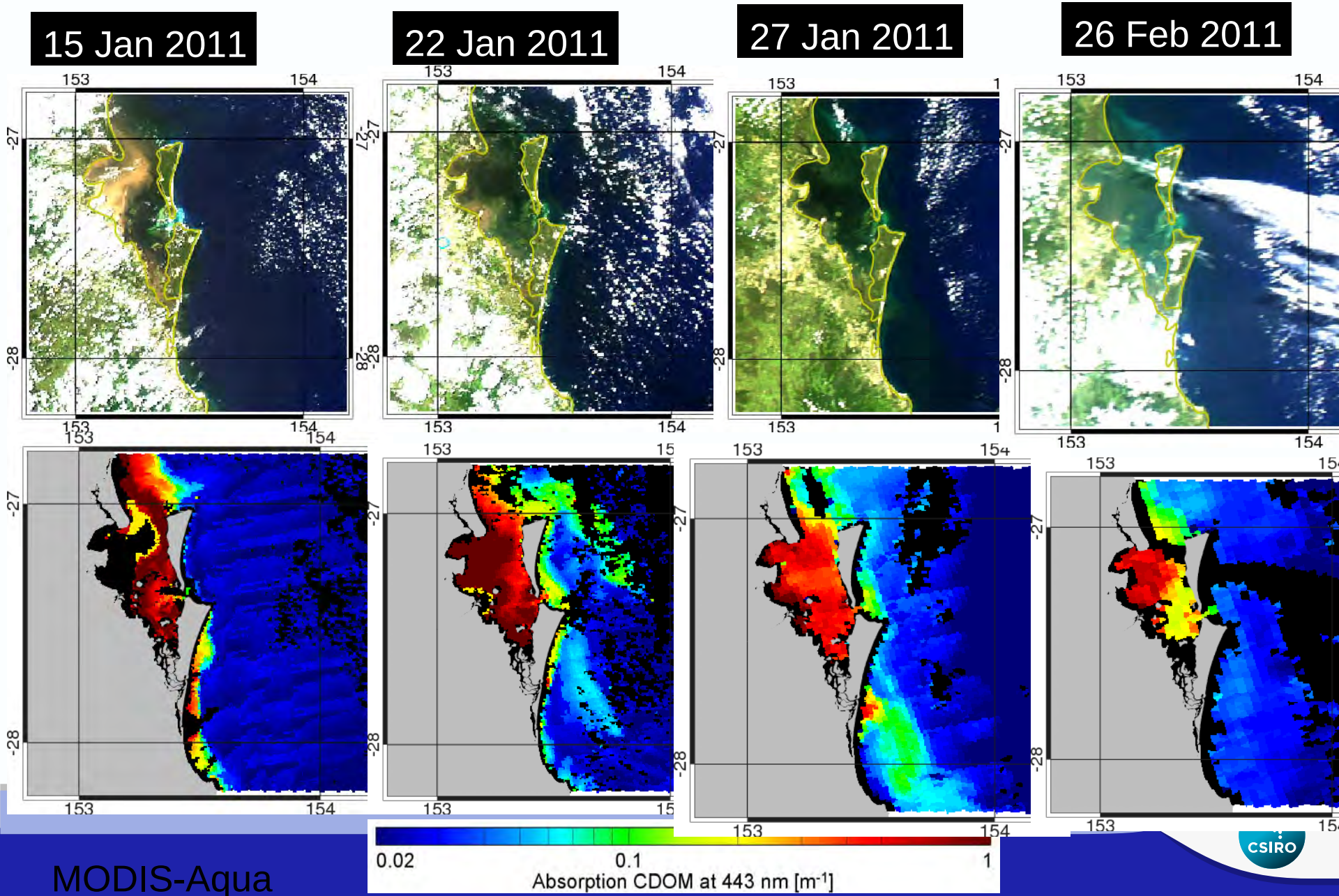
Sampling

- 13 fixed repeated stations for biogeochemical parameters sampled on 5 cruises over 11 months
- Underway monitoring
- Glider Deployments
- Seagrass abundance and composition
- Sediment Composition and coring

Sampling


Moreton Bay
Flood
Sampling
DEPTH (MSL)
Above MSL
-5
-10
-20
-30
-40
-50
Deep
Caboolture River
Pine River
Off Moreton Island
Central Bay
Brisbane R.
1
2
3
4
5
6
7
8
9
10
11
12
13
14

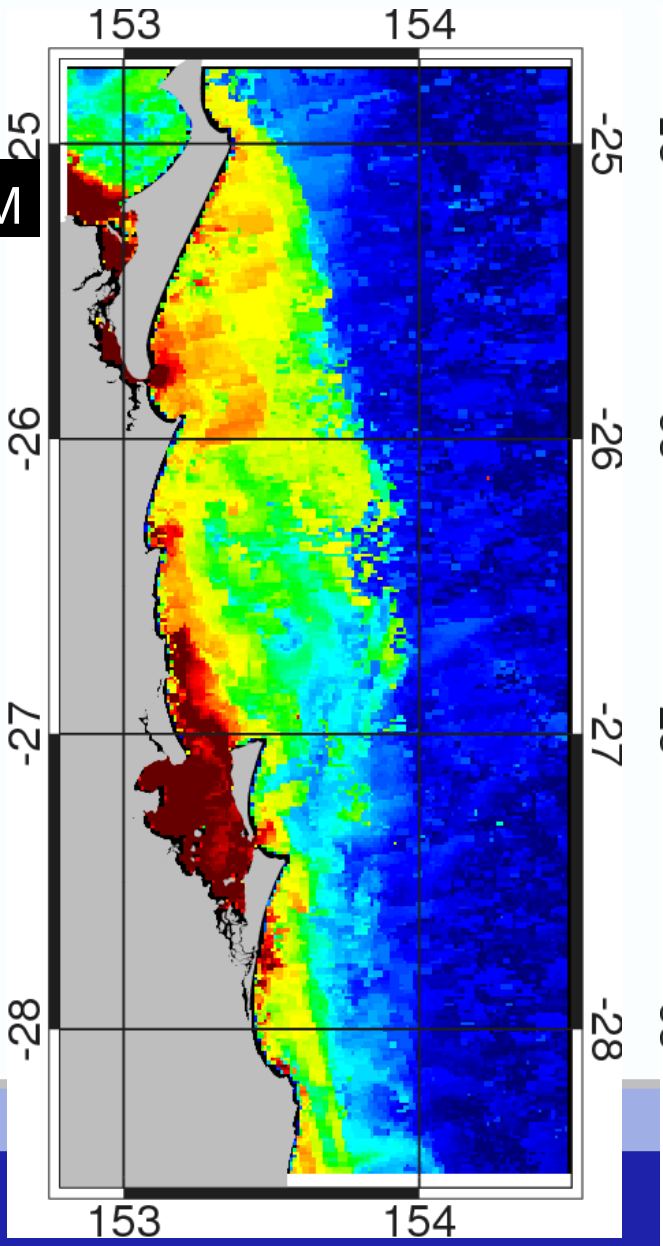
1. Extent of Plume



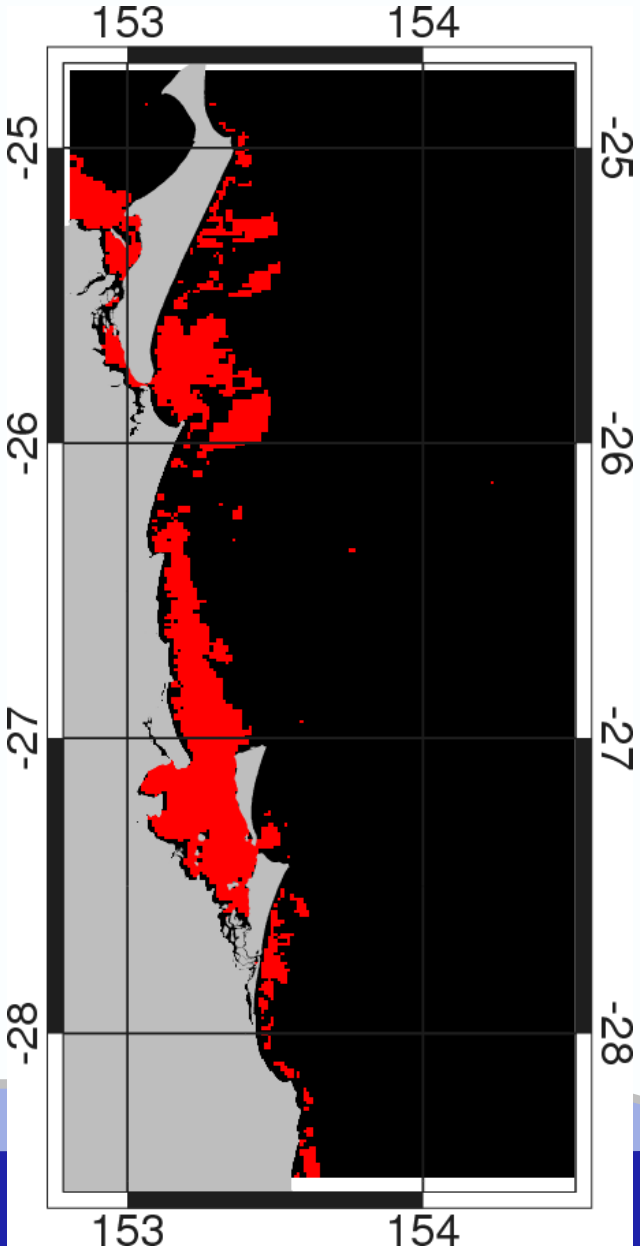
MODIS-Aqua

Extent to flood Plumes in Moreton Bay
15 Jan - 28 Feb Composite

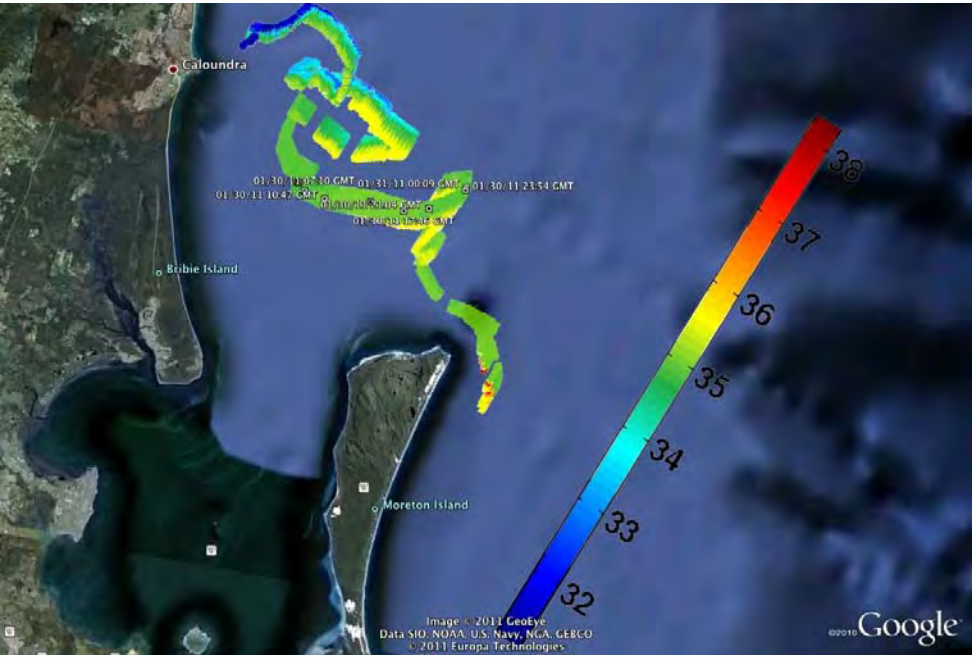
Max CDOM



Salinity <30

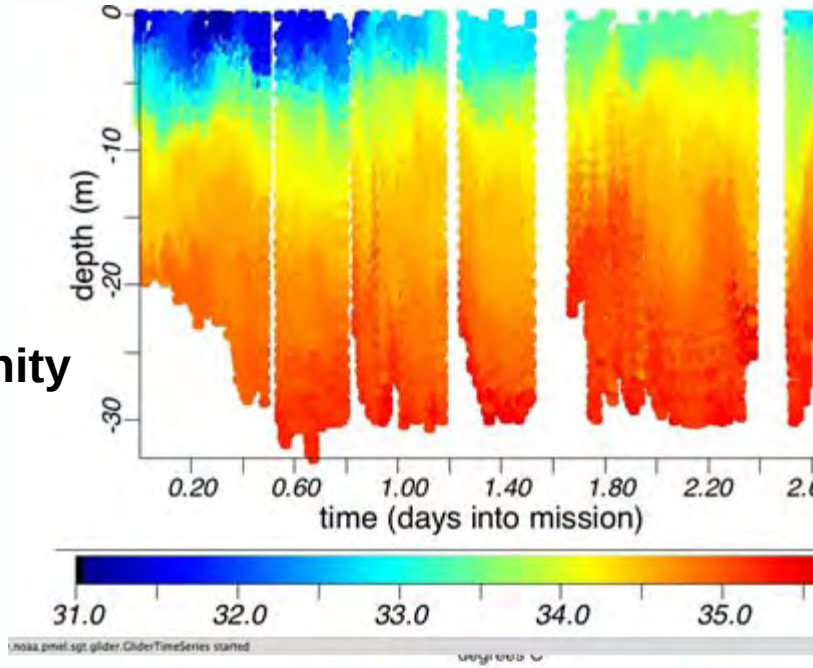


2. 3D Structure of Plume, 25-28 Feb

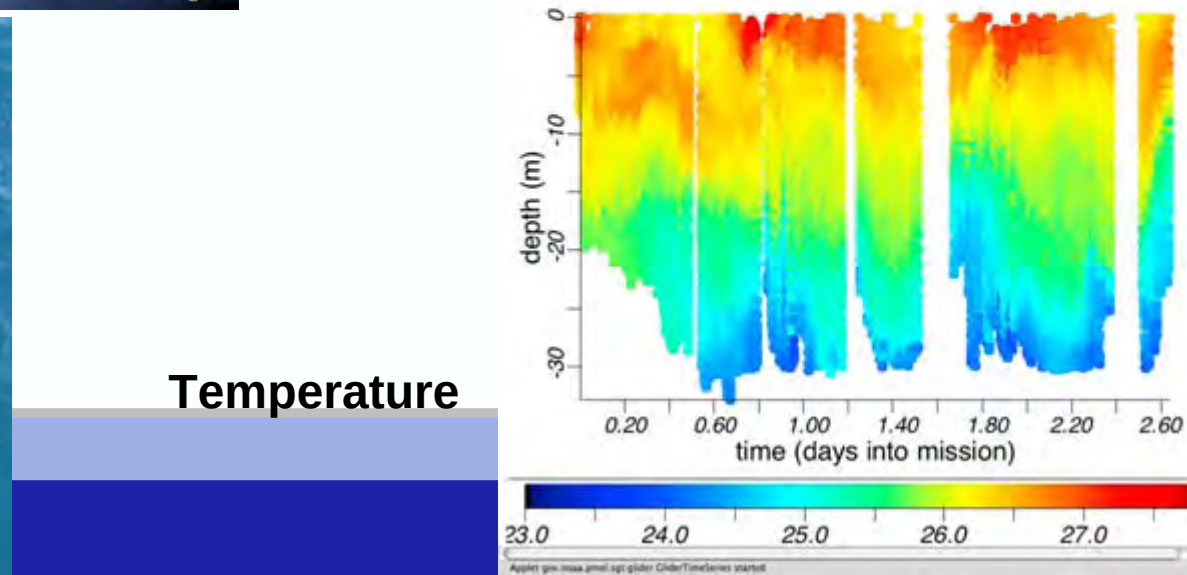


Salinity

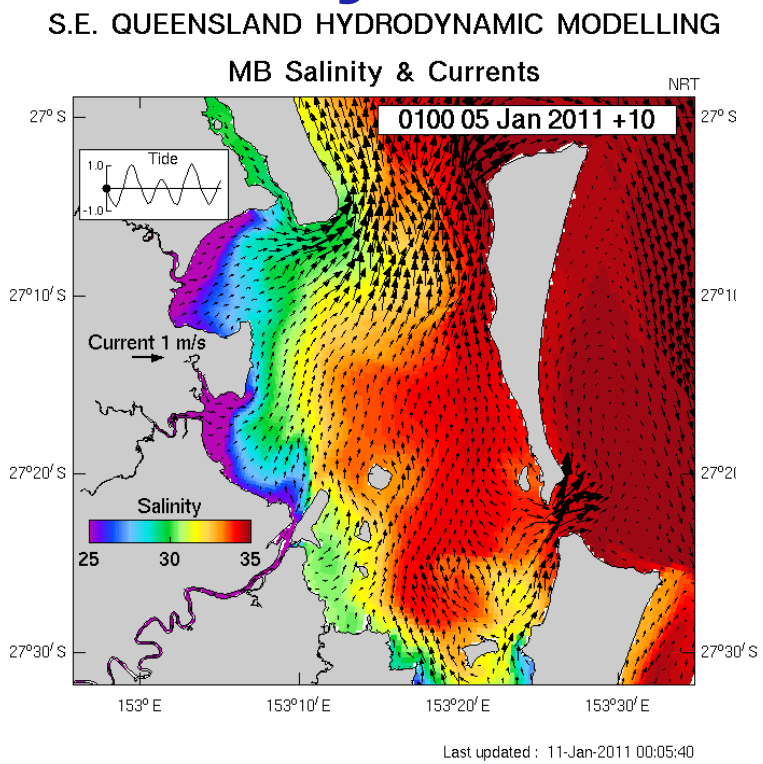
a

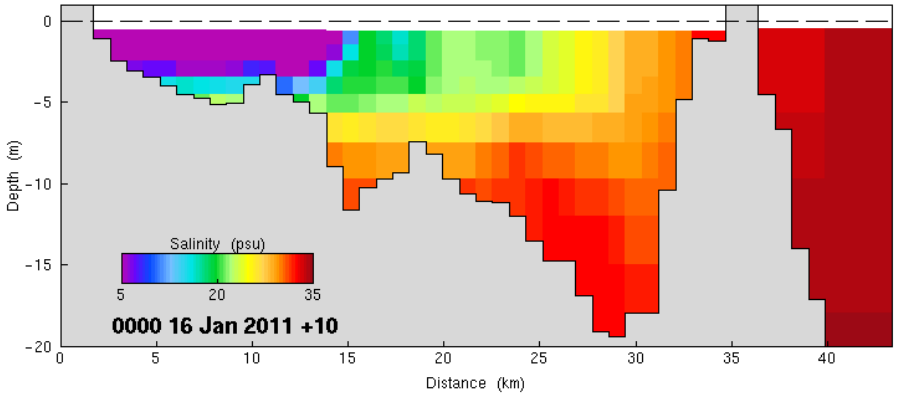


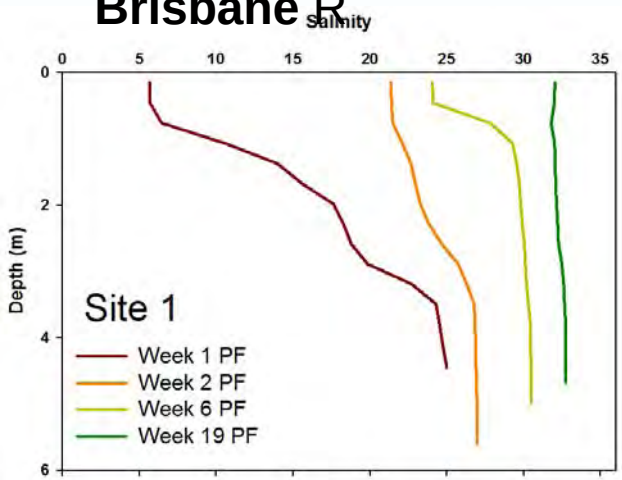
Temperature

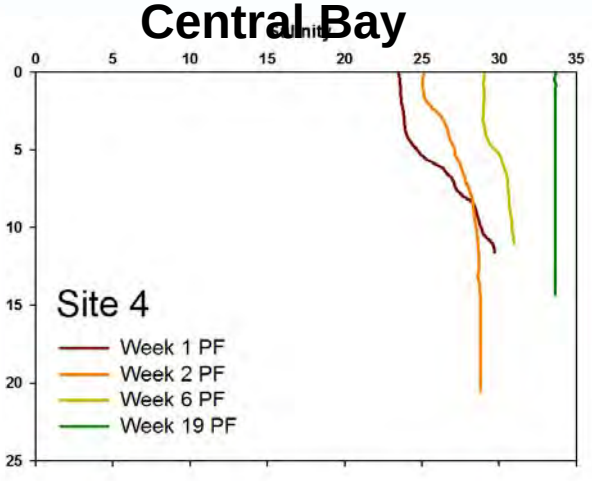


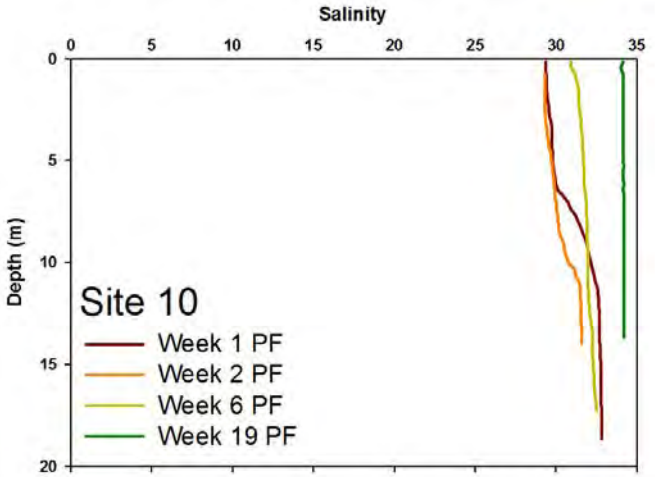
2b. Salinity Structure inside Moreton Bay



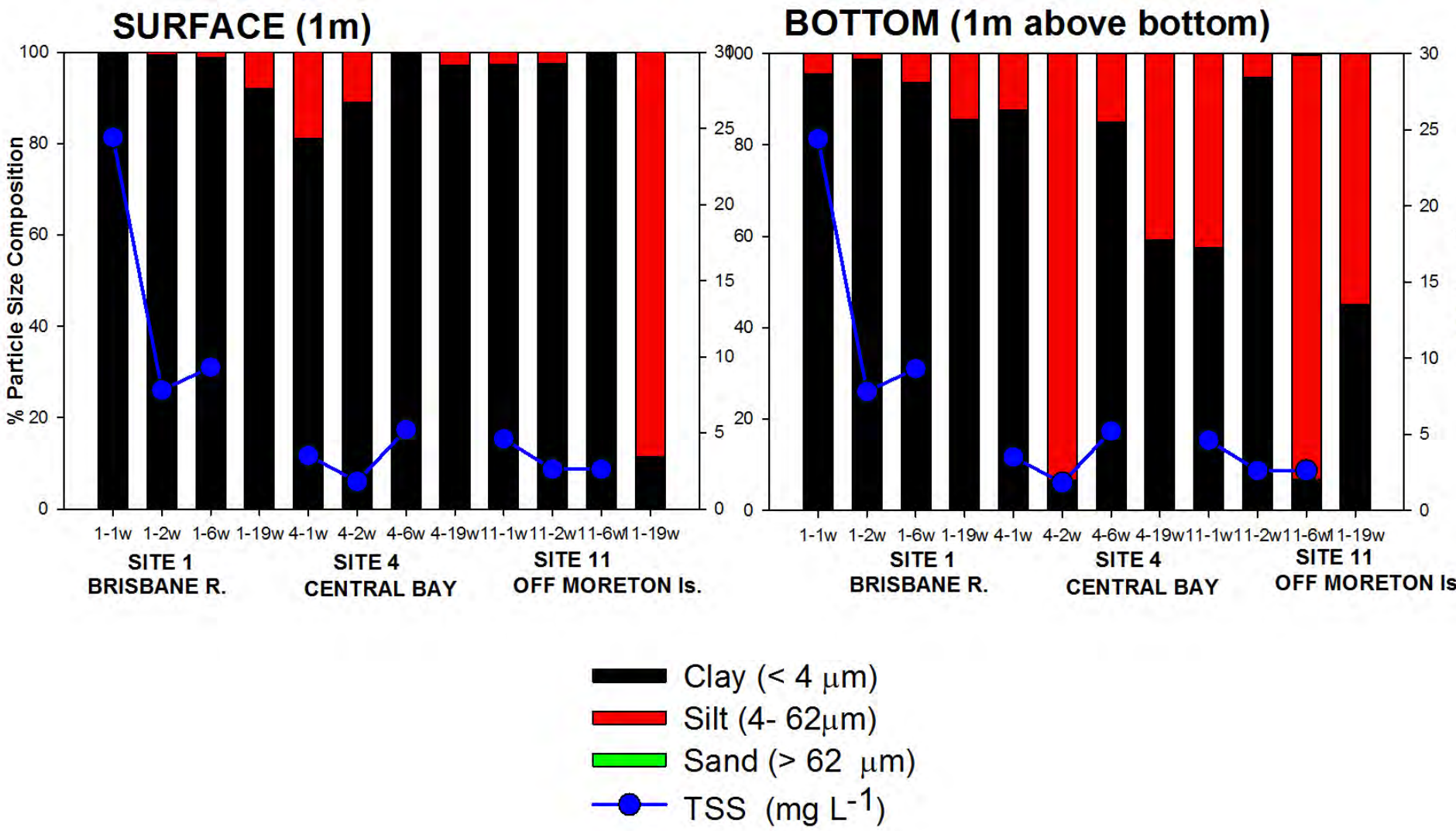




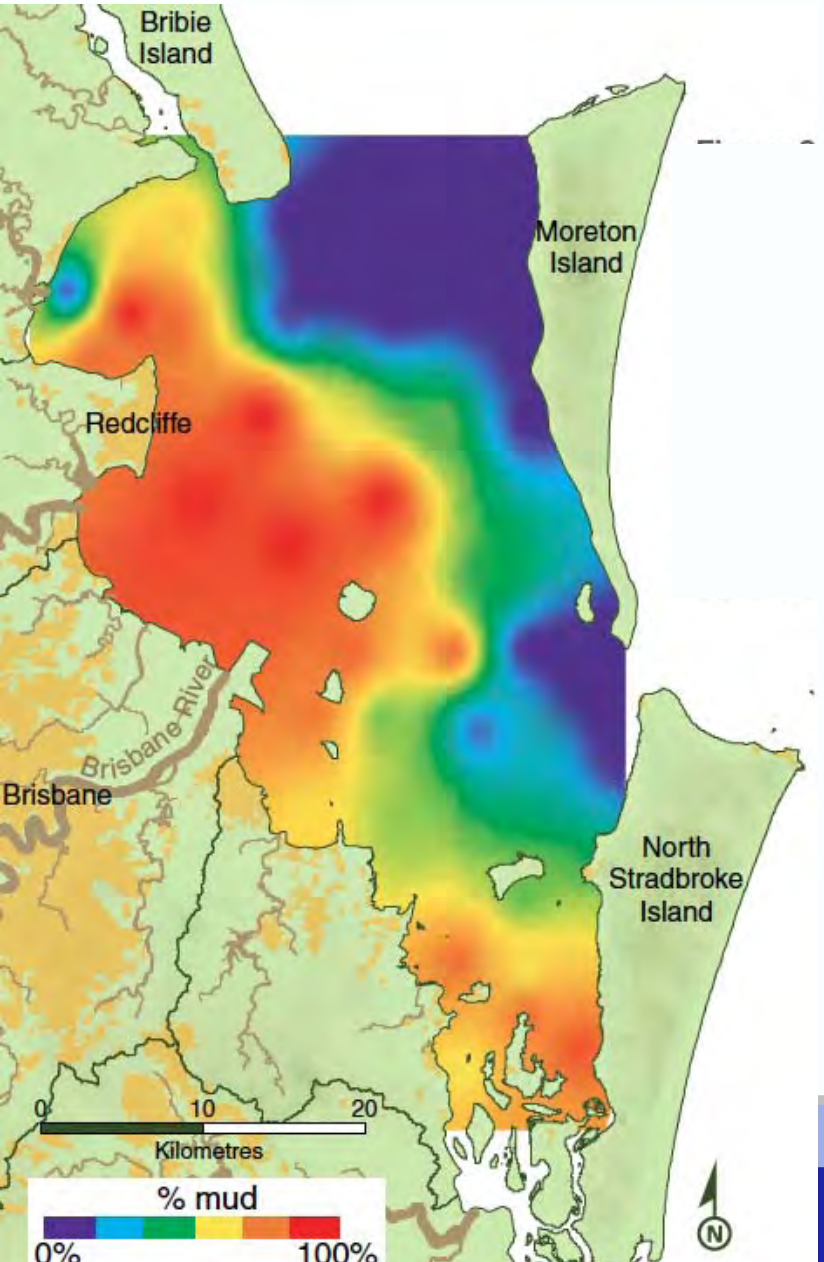




Suspended sediment Distribution & Composition

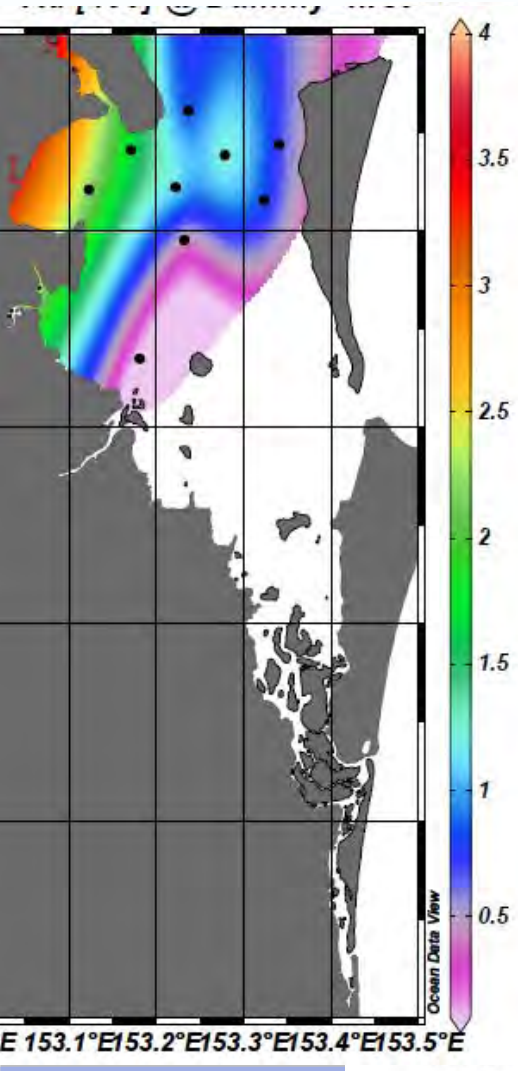


Sediment Distribution and composition

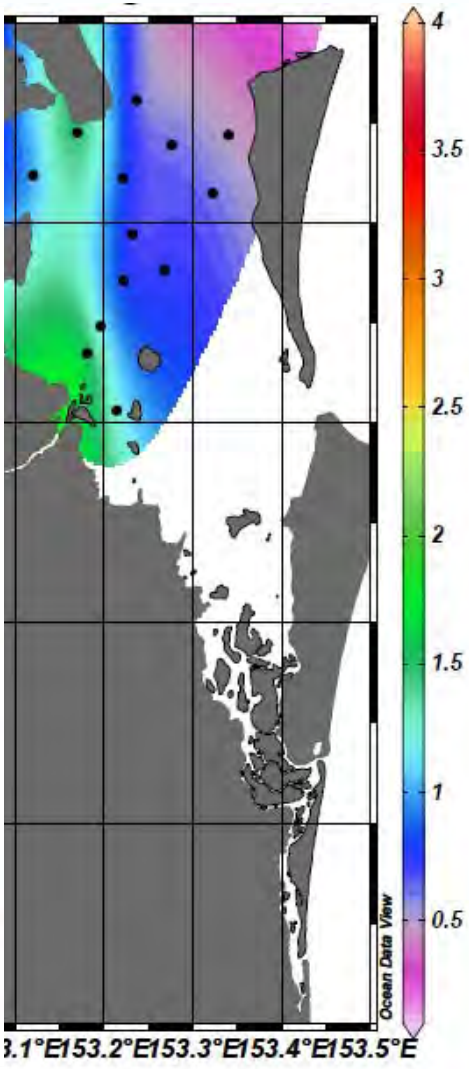


Light Attenuation : Kd(490 nm) [m^{-1}]

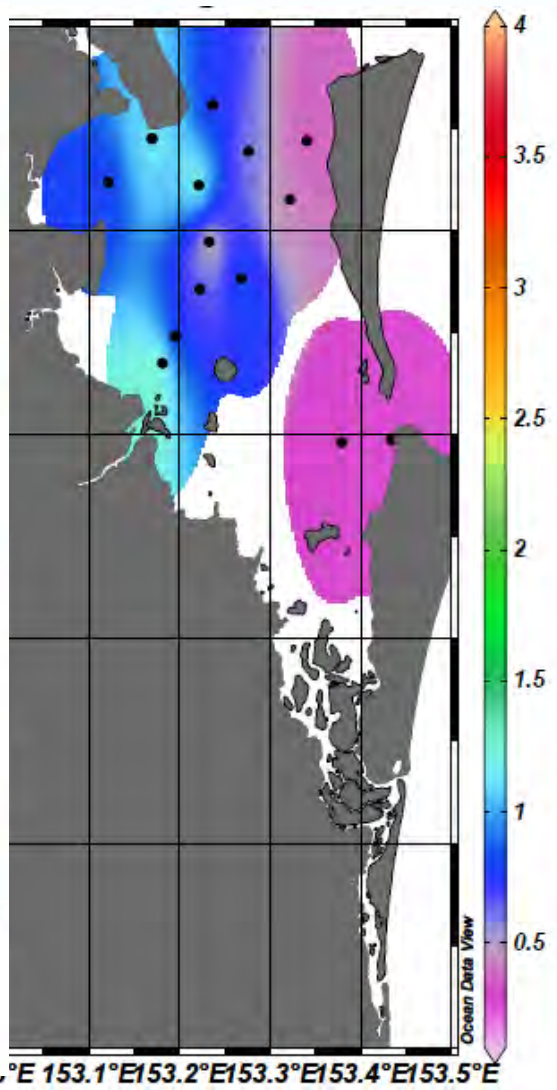
1 week



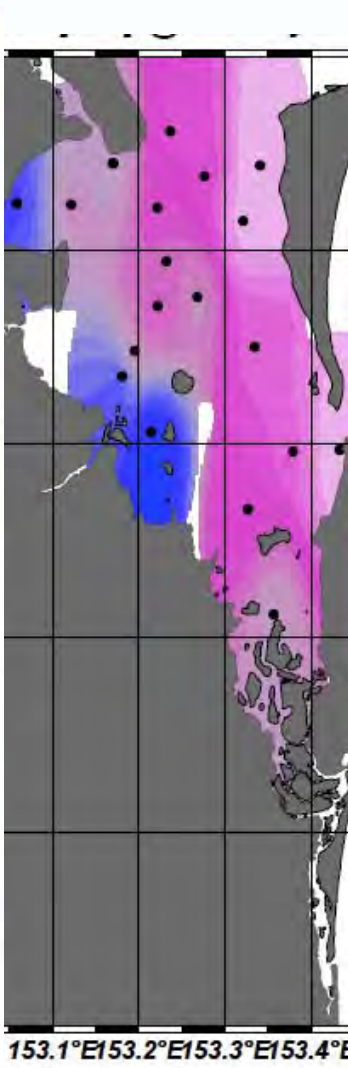
2 weeks



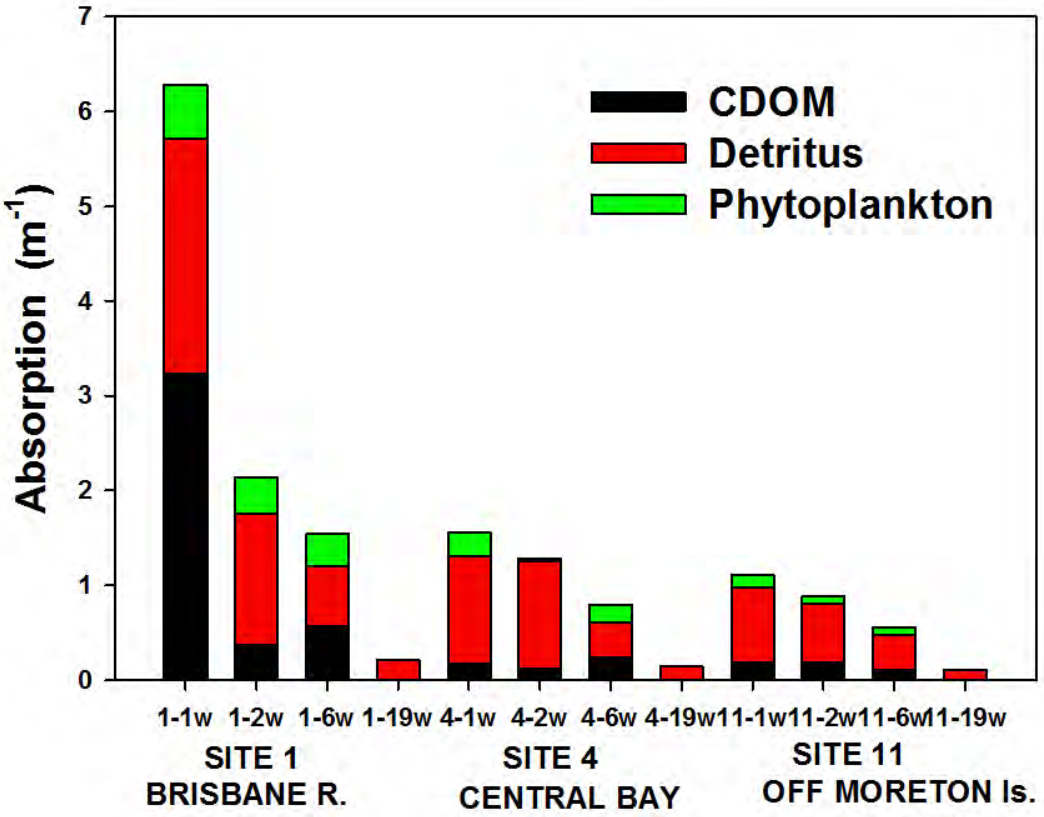
6 weeks



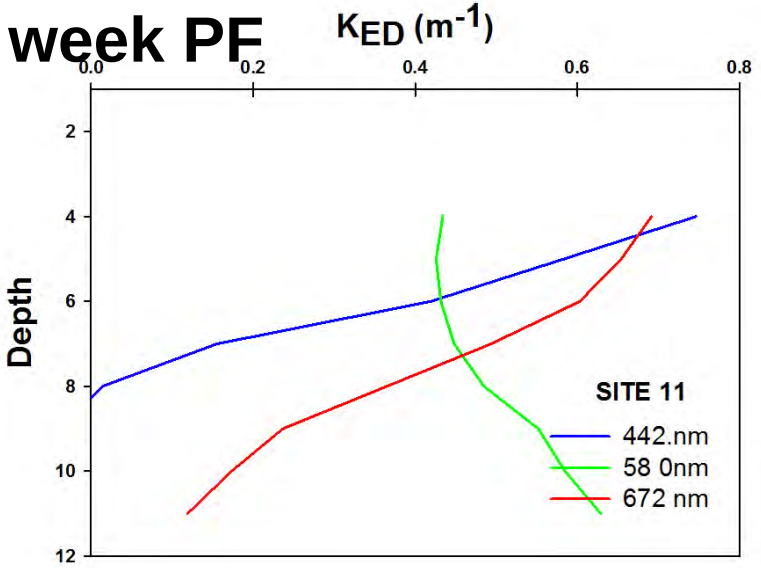
19weeks



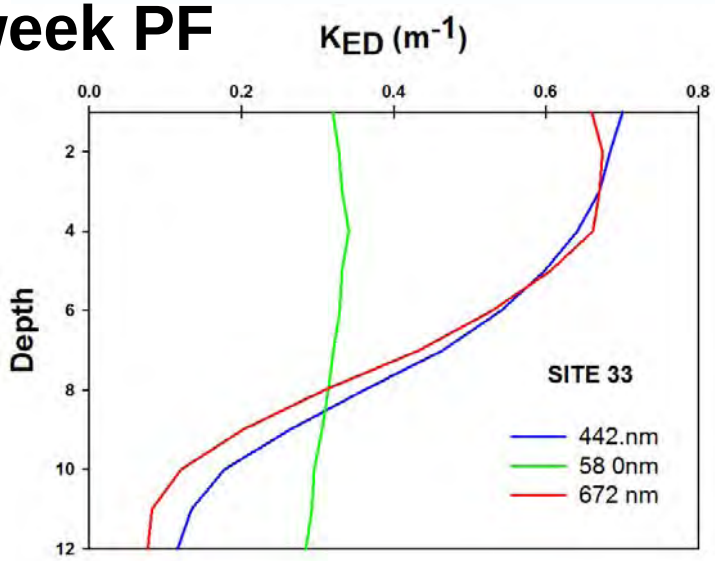
Light Absorption and spectral light quality coefficients (m^{-1})



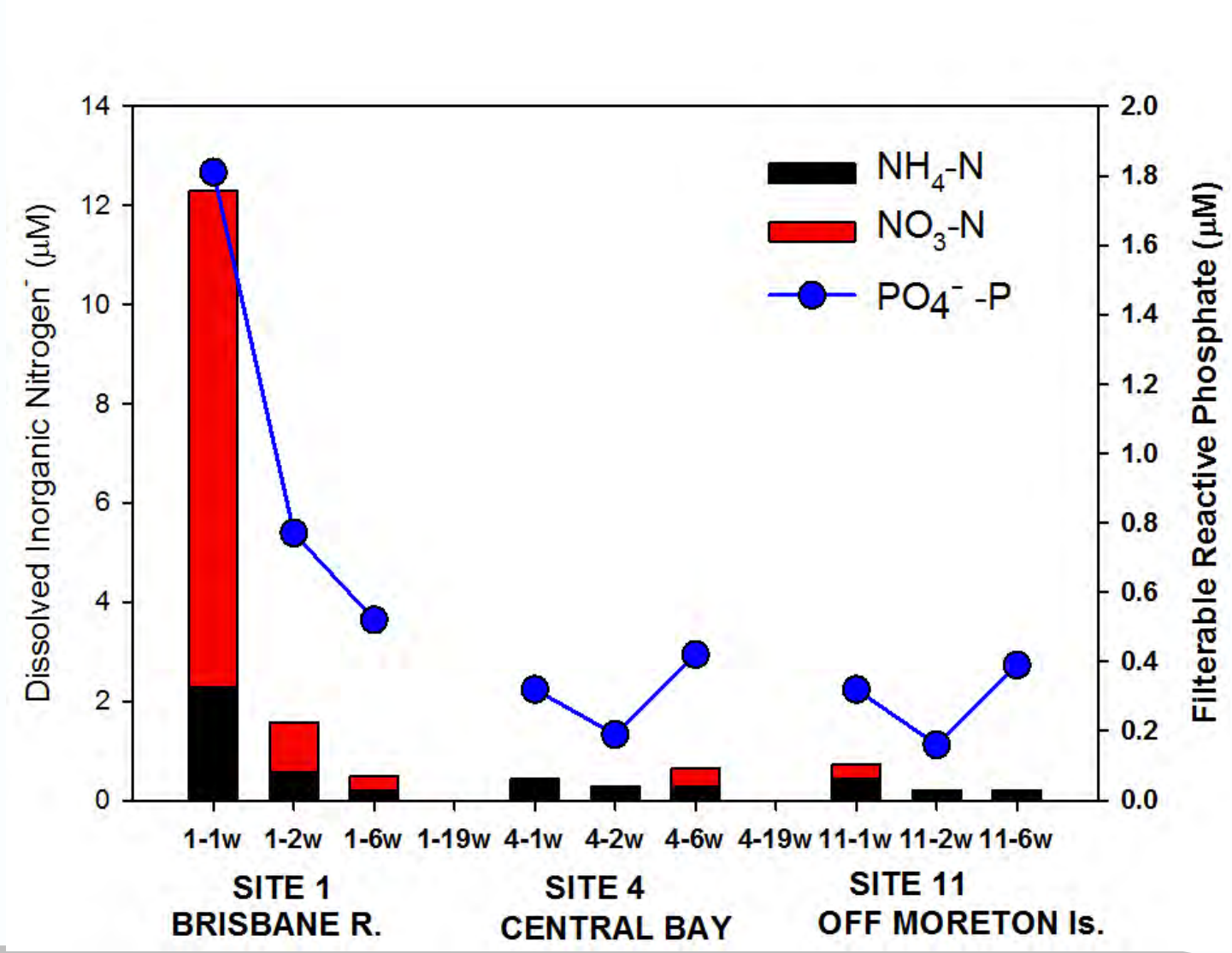
1 week PF



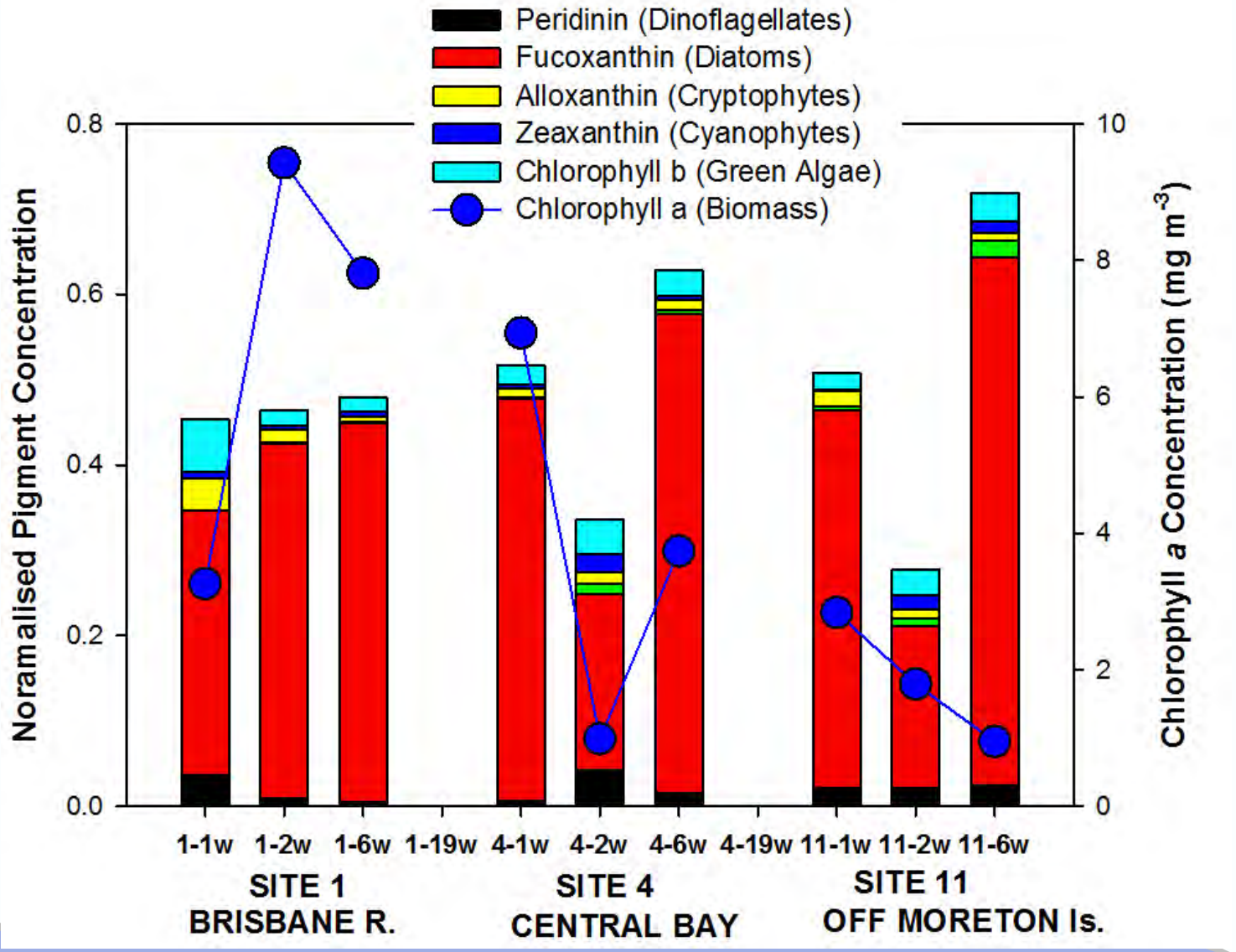
6 week PF



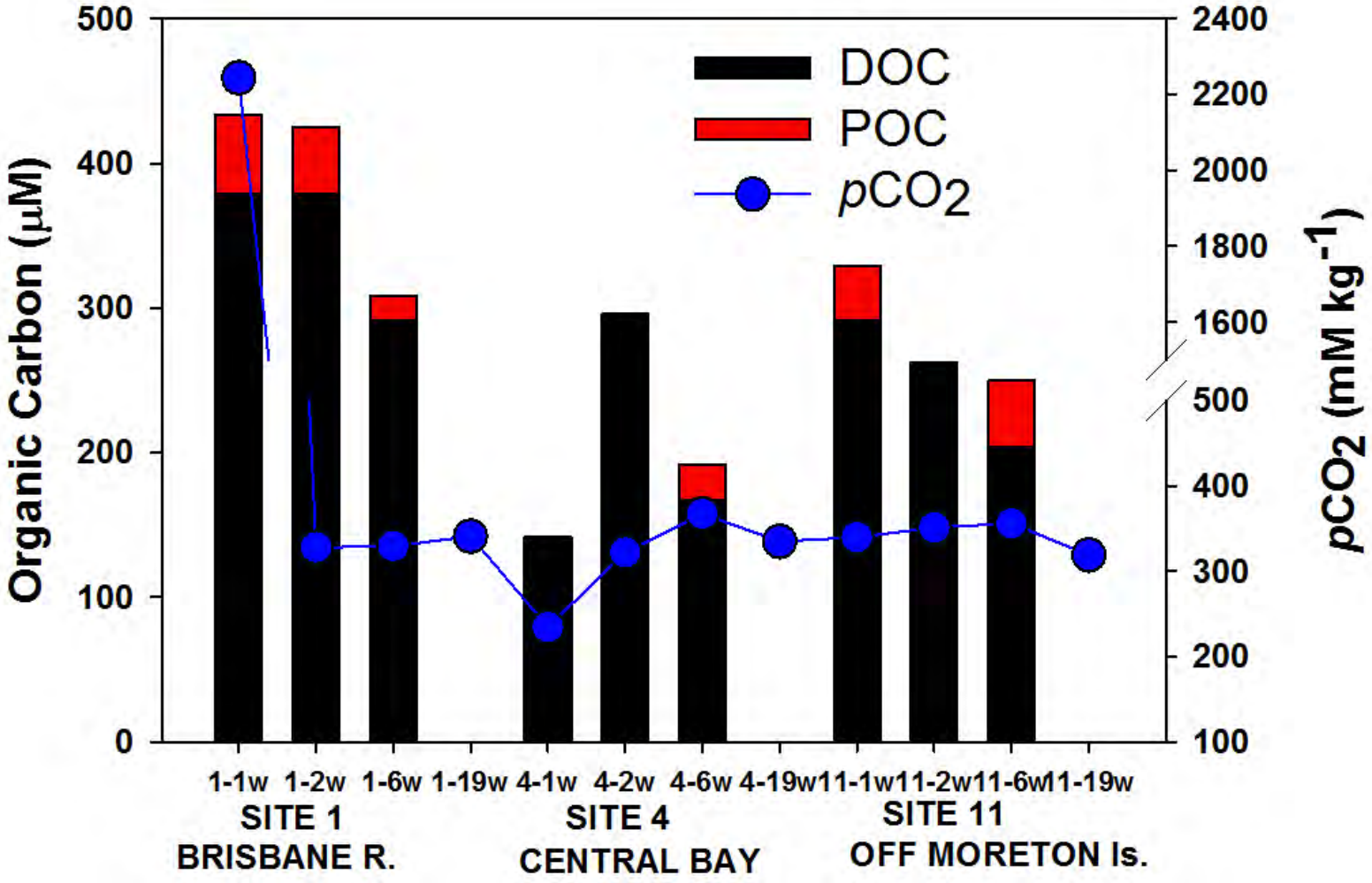
Dissolved Nutrients



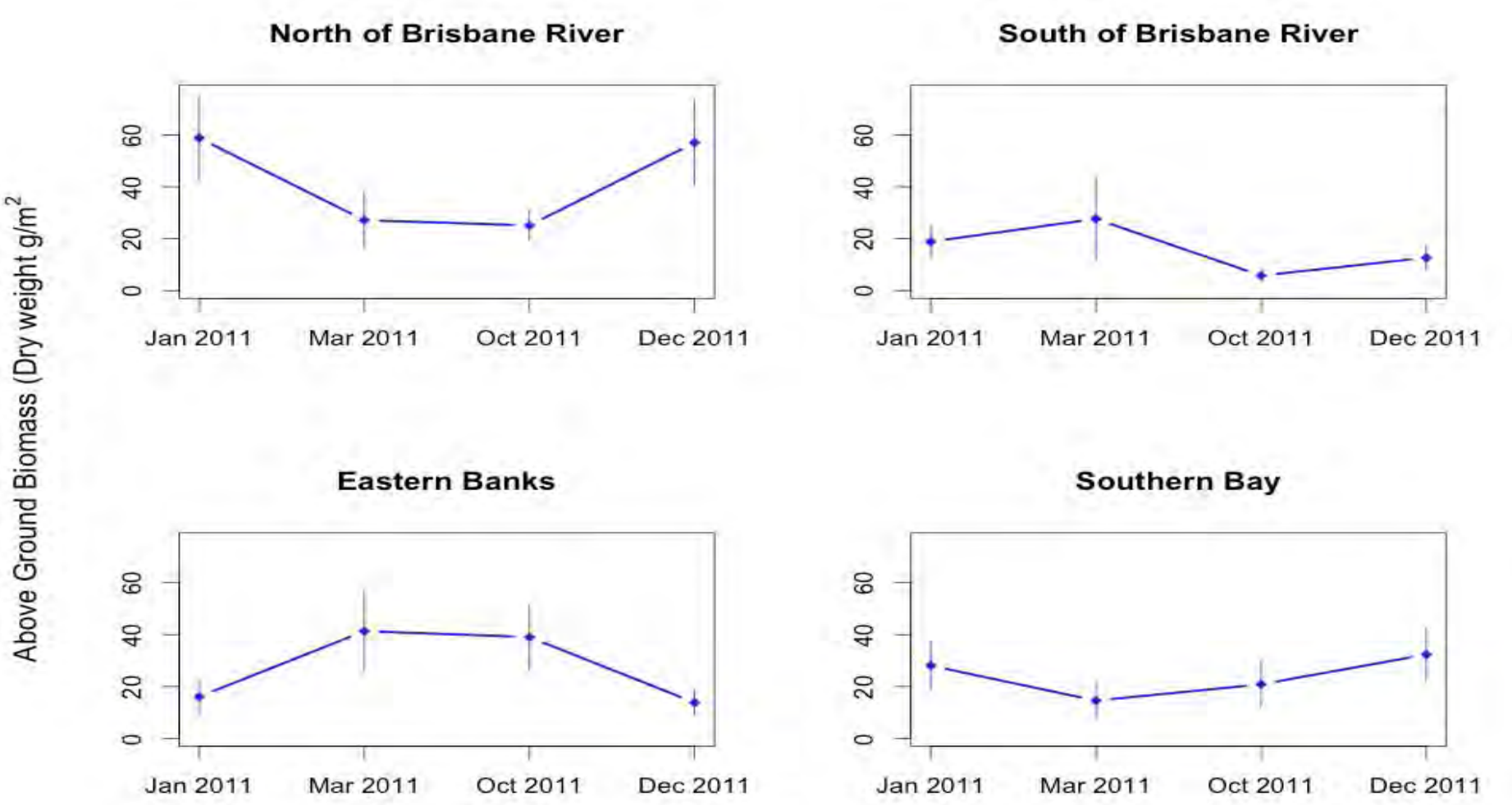
Chlorophyll and Phytoplankton Composition



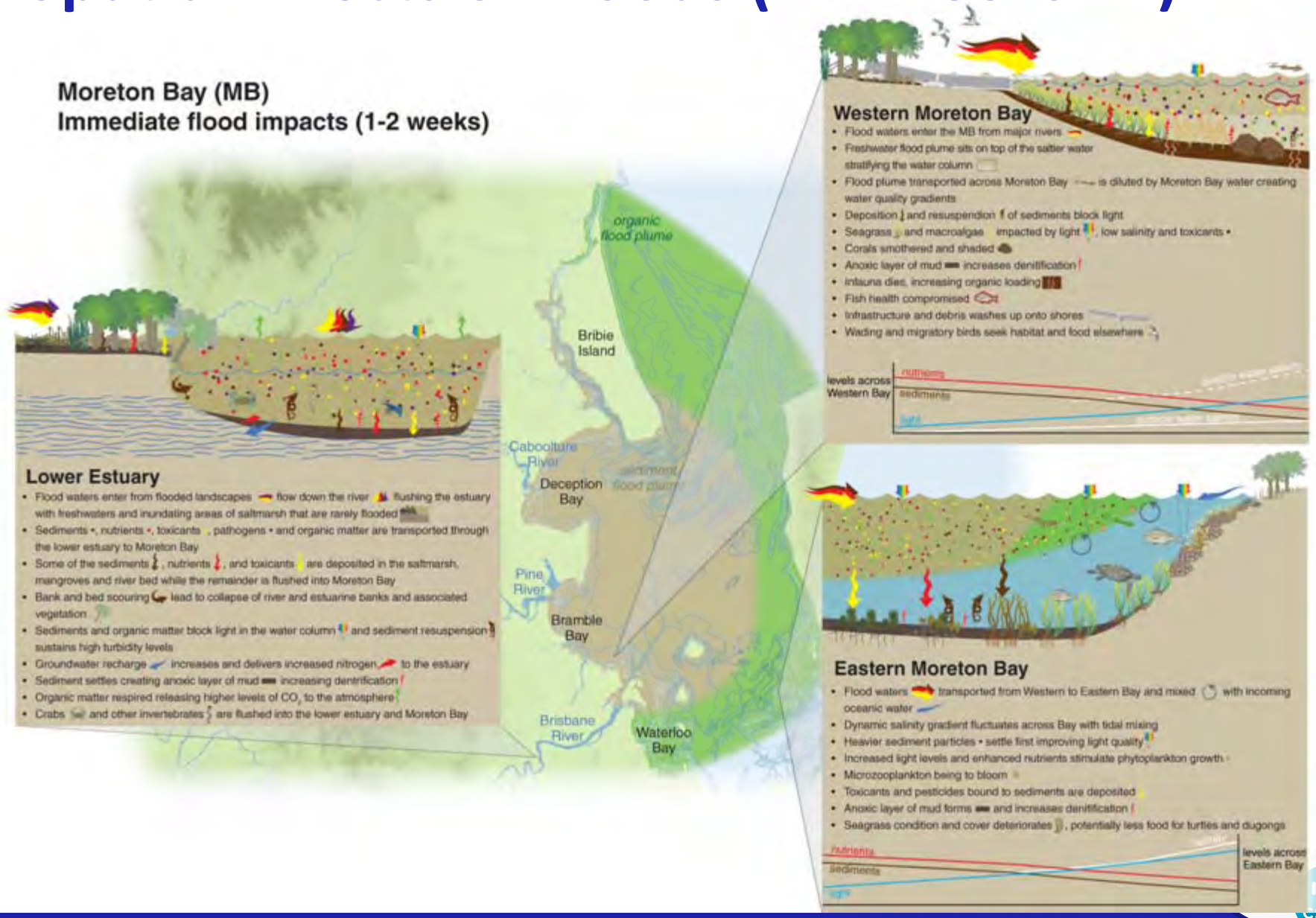
Carbon


DOC
POC
pCO2
Organic Carbon (µM)
pCO2 (mM kg-1)
0
100
200
300
400
500
100
200
300
400
500
1600
1800
2000
2200
2400
1-1w
1-2w
1-6w
1-19w
4-1w
4-2w
4-6w
4-19w
11-1w
11-2w
11-6w
11-19w
SITE 1
BRISBANE R.
SITE 4
CENTRAL BAY
SITE 11
OFF MORETON Is.

Seagrass Responses

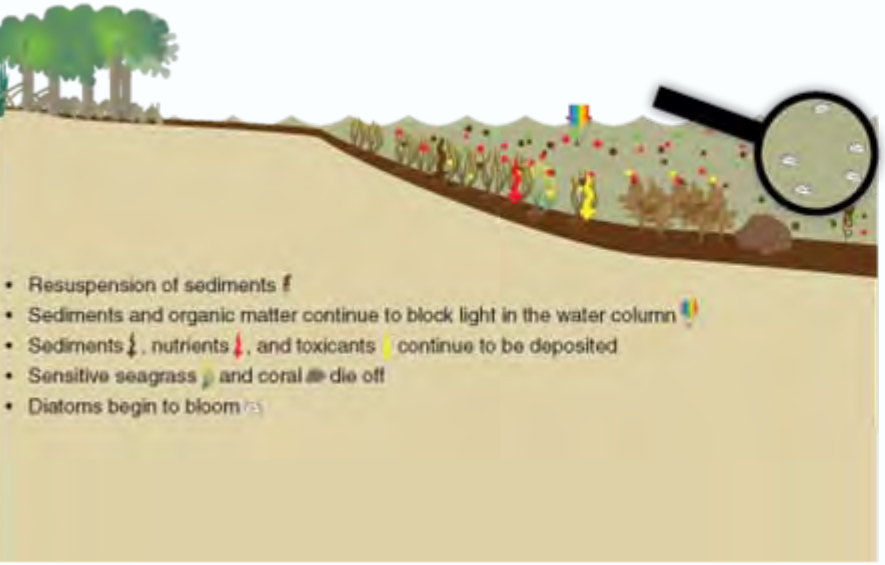


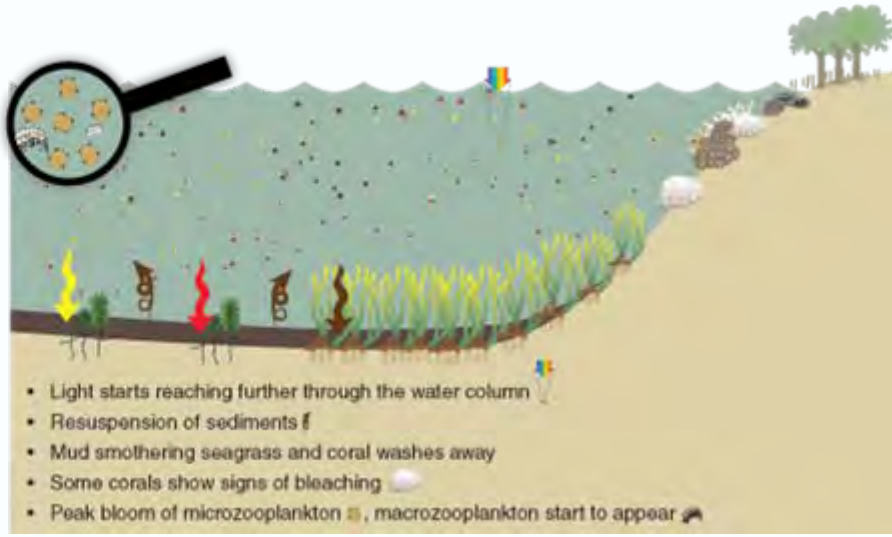
Spatial Effects of Floods (1-2 weeks PF)



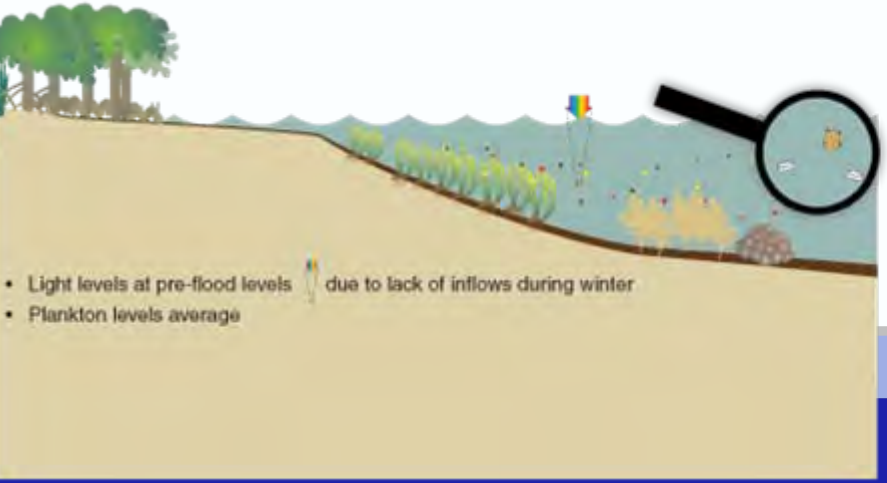
Post flood Effects, 1 and 3 months PF

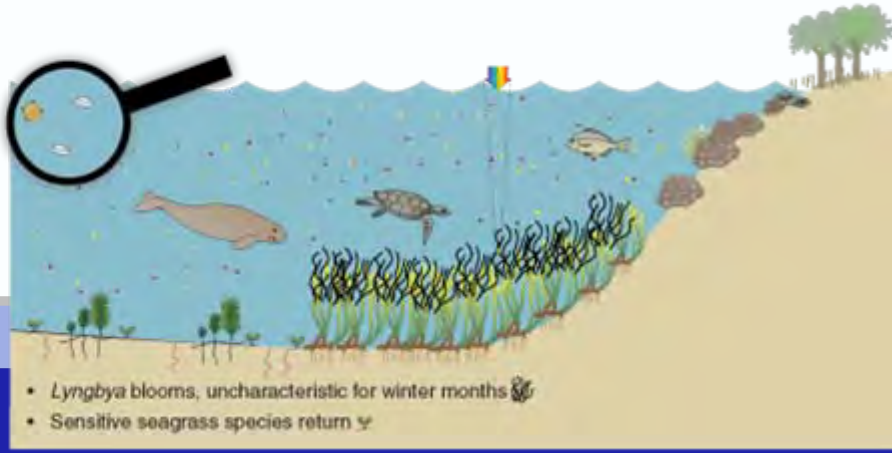
Four weeks post flood





Six months post flood



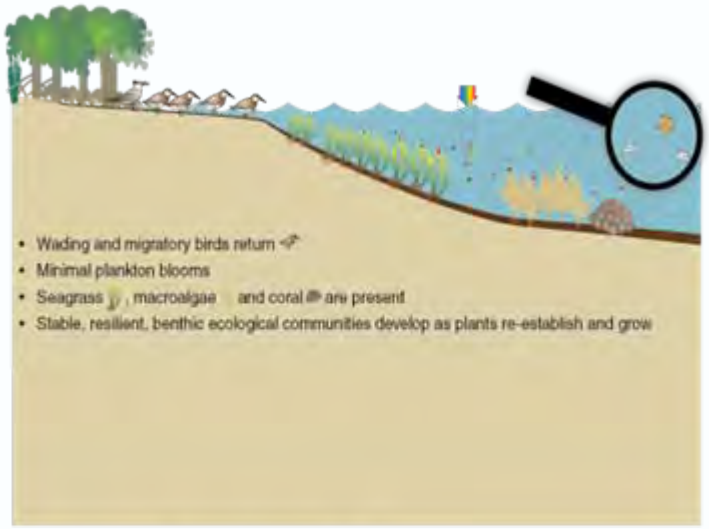


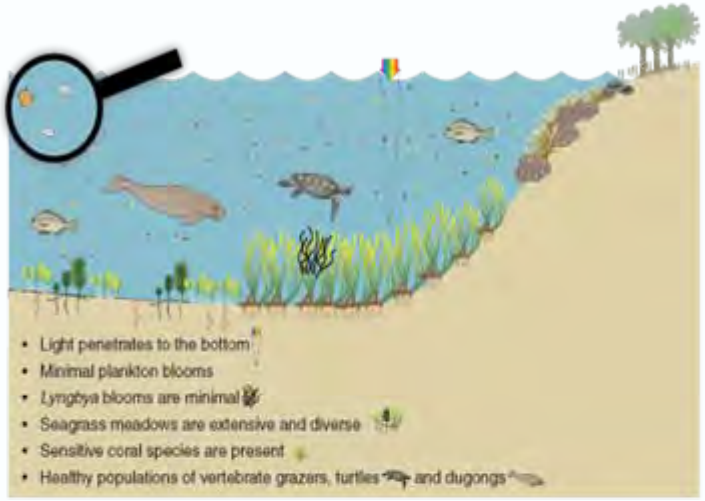
Future Scenarios of Flood Impacts

Western Moreton Bay

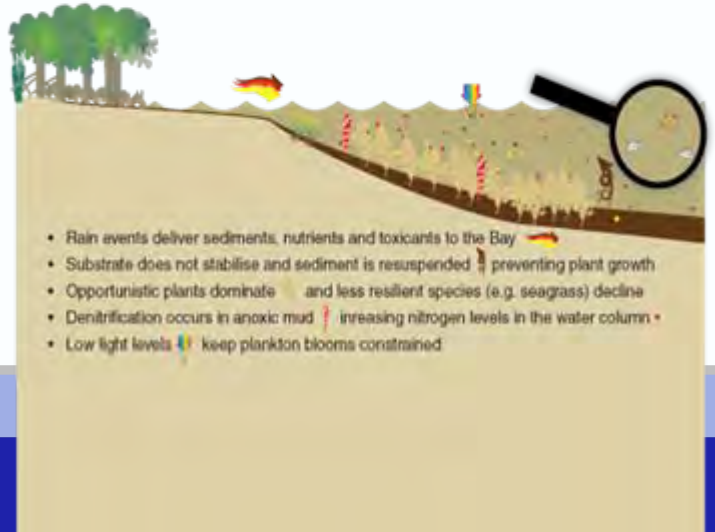
Eastern Moreton Bay

Future best case scenario





Future worst case scenario



Summary

- Plume extended beyond Moreton Bay and to a depth of 10 m
- Biochemical and bio-optical gradients in Moreton Bay persisted for more than 6 weeks
- After 19 weeks conditions similar to pre-flood
- 40% of seagrass area affected. Genrally recovered after 12 months
- 10% of corals bleached and some species offshore more vulnerable

Acknowledgements

- Thomas Schroeder Heidi Franklin
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- Lynsay McDonald, Rizwi Farhan, Rob Gregor
- Jon Olley, Rod Conolly
- Paul Hough, Mike Holmes
- Stuart Phinn, Chris Rolfesma

Thank You

andy.steven@csiro.au