

“New” marine processes and features observed at <1 - 10 m resolution

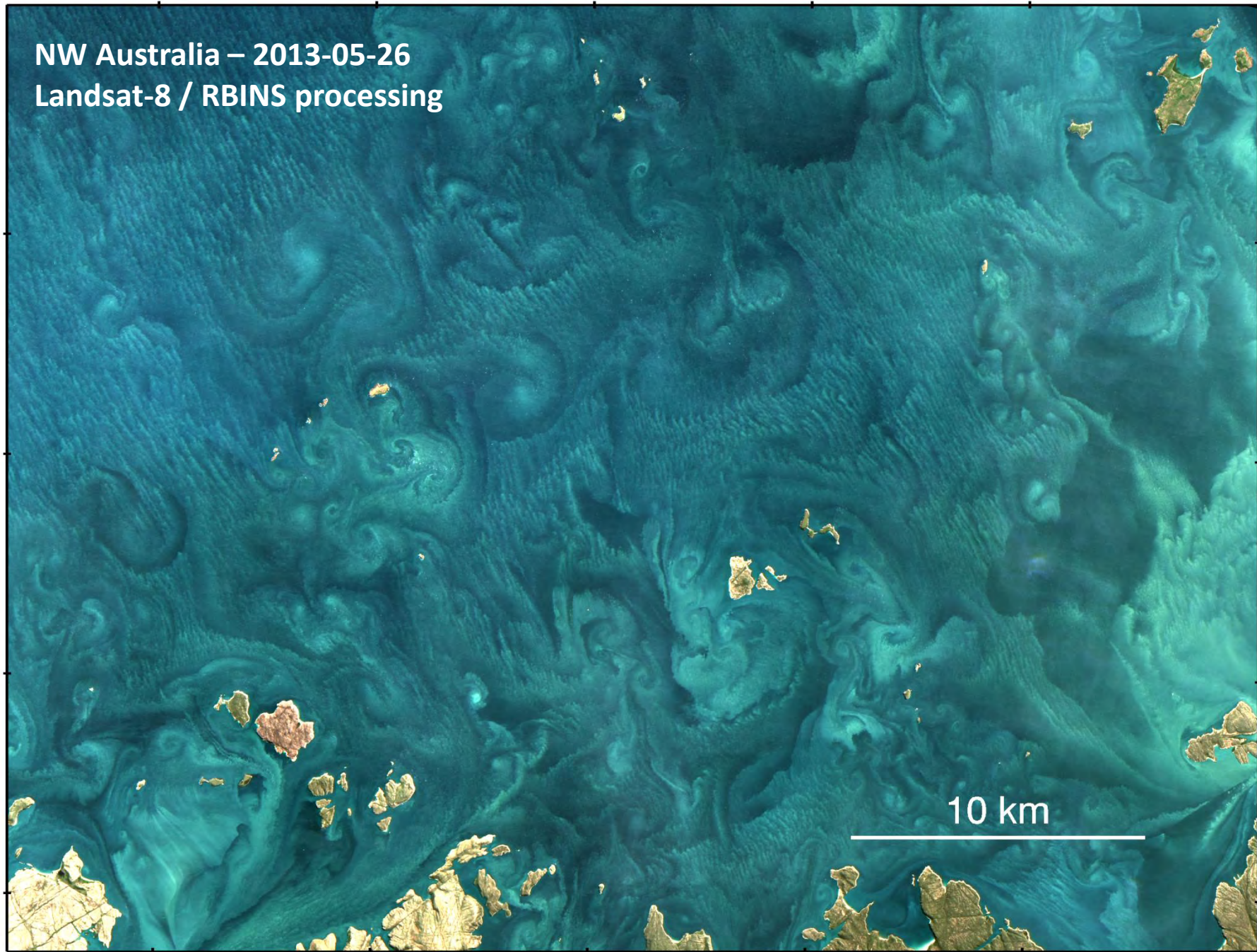
**Quinten Vanhellemont
RBINS/DO Nature**

Presented at IOCS 16 June 2015

Landsat-8 « Gallery »

NW Australia – 2013-05-26
Landsat-8 / RBINS processing

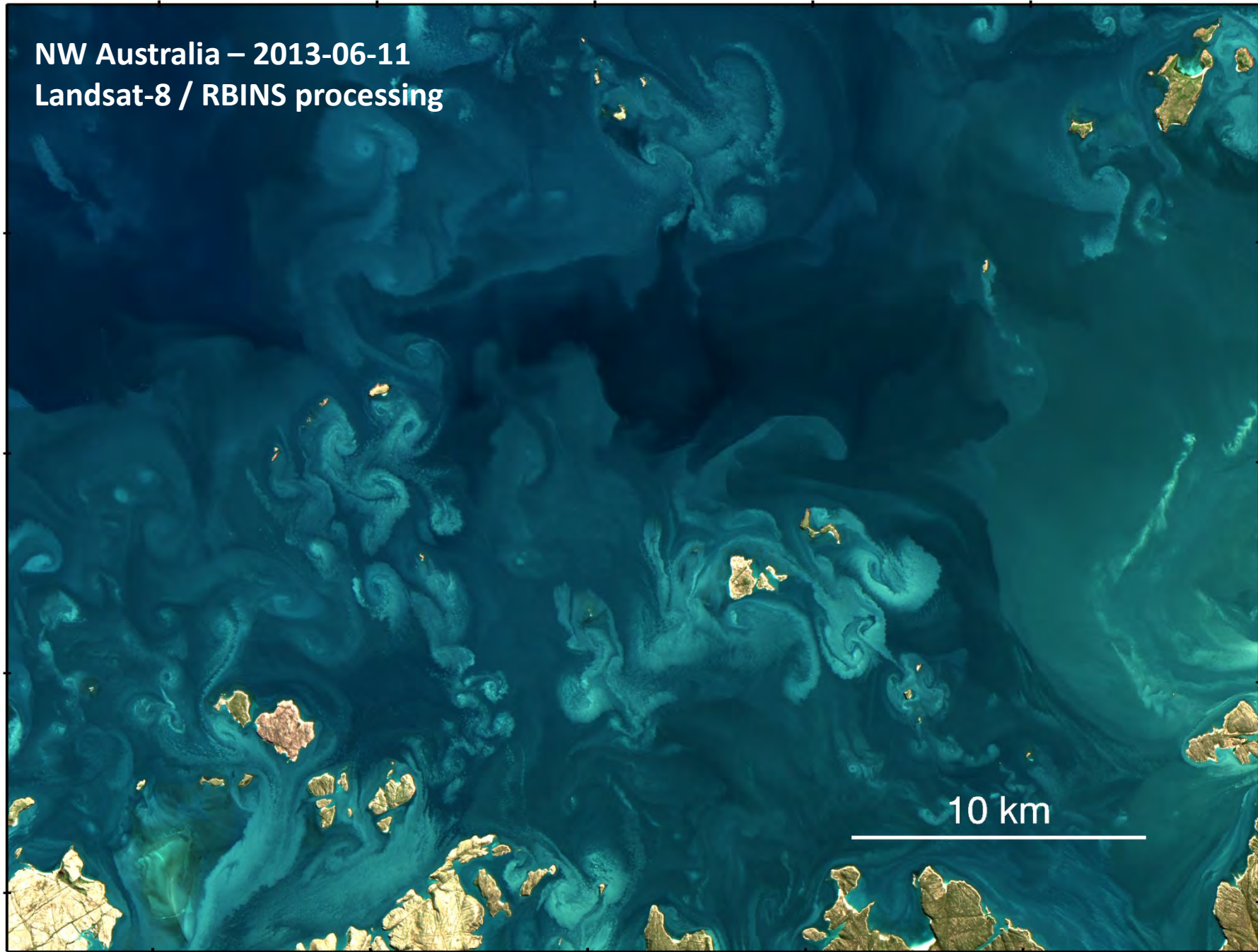
15°4'S
15°8'S
15°12'S
15°16'S



124°28'E 124°32'E 124°36'E 124°40'E 124°44'E

NW Australia – 2013-06-11
Landsat-8 / RBINS processing

15°4'S
15°8'S
15°12'S
15°16'S



124°28'E 124°32'E 124°36'E 124°40'E 124°44'E

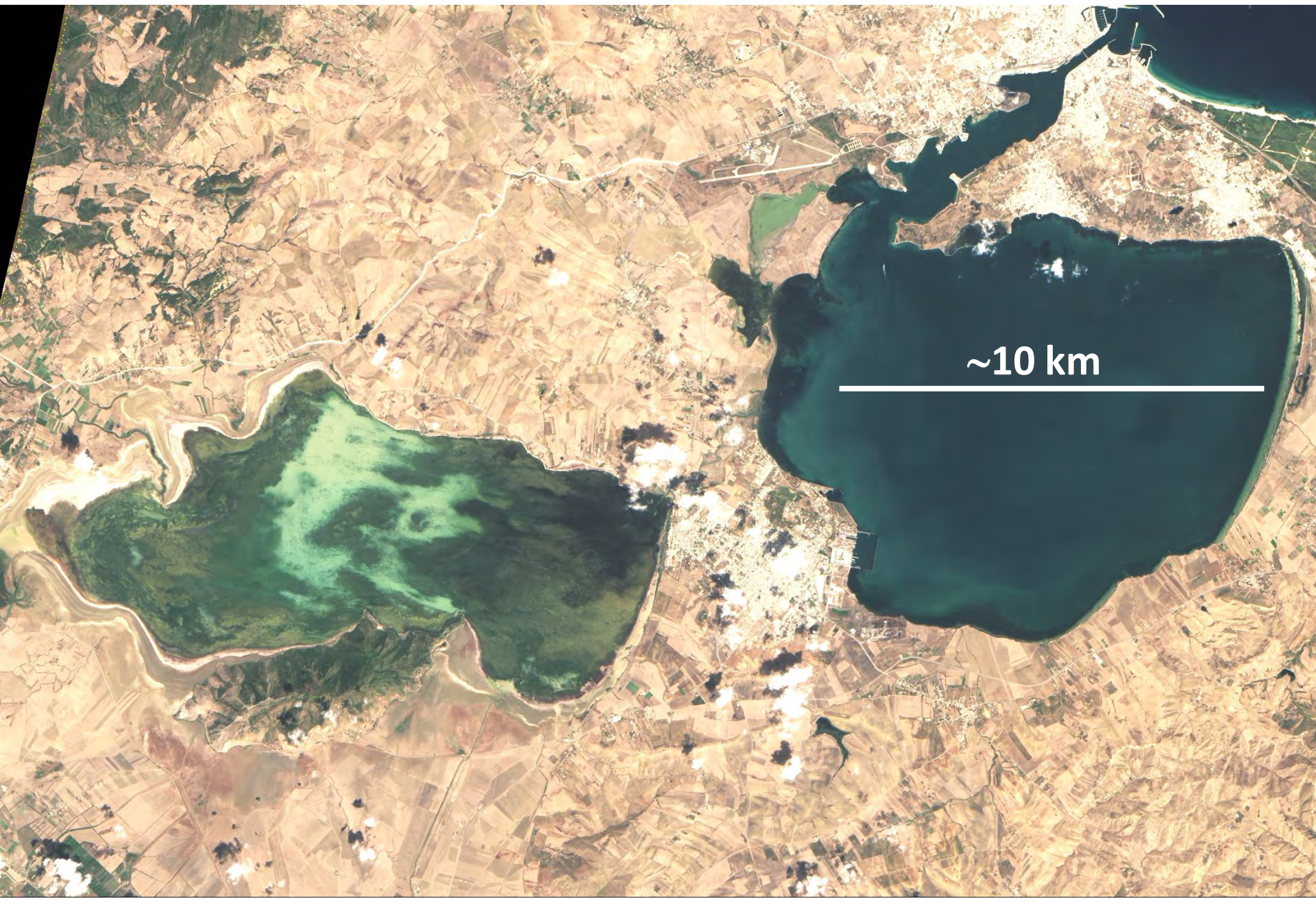
Alaska – 2014-09-06

Landsat-8 / RBINS processing



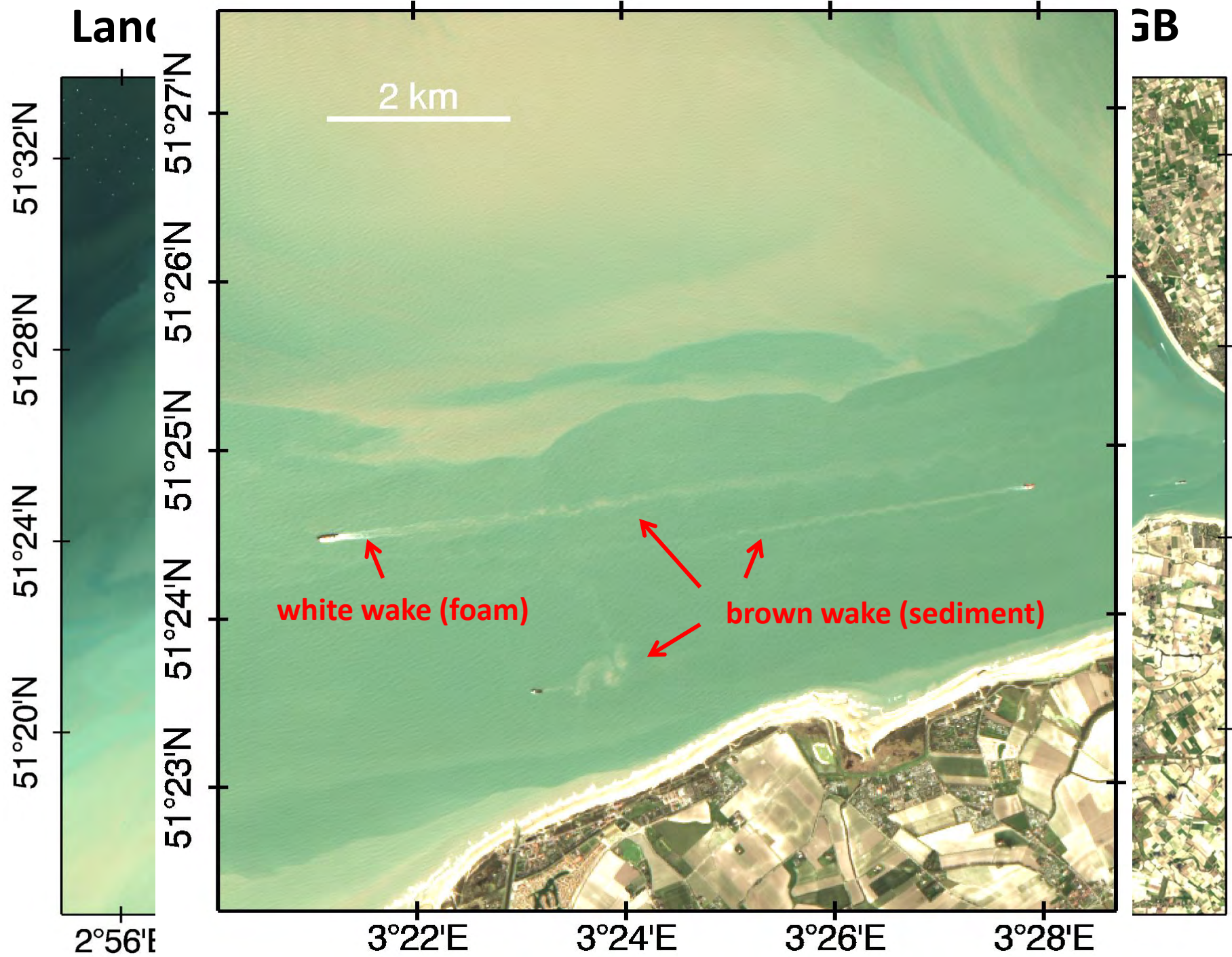
Tunisia/Lake Icheul and Lake Bizerte – 2013-08-28

Landsat-8 / RBINS processing



Tunisia/Lake Icheul and Lake Bizerte – 2014-03-24
Landsat-8 / RBINS processing





A satellite image of the Thames Estuary, showing complex sediment patterns in shades of blue and green. The patterns include swirling eddies and elongated features. Two specific areas are labeled: 'Gunfleet Sands' in the upper left and 'London Array' in the lower right.

Gunfleet Sands

London Array

Thames Estuary – 2014-08-21
Landsat-8 / RBINS processing



Venezuela/Lake Maracaibo— 2014-02-27
Landsat-8 / RBINS processing

gas flares



smoke

oil slicks?



Belgium/AOC Zeebrugge – 2013-08-04
Landsat-8 / RBINS processing

Aeronet-OC MOW1

51°19'N 51°20'N 51°21'N 51°22'N 51°23'N 51°24'N

3°2'E 3°4'E 3°6'E 3°8'E 3°10'E 3°12'E



Belgium/AOC Zeebrugge – 2013-10-07
Landsat-8 / RBINS processing

Aeronet-OC MOW1

51°19'N 51°20'N 51°21'N 51°22'N 51°23'N 51°24'N

3°2'E

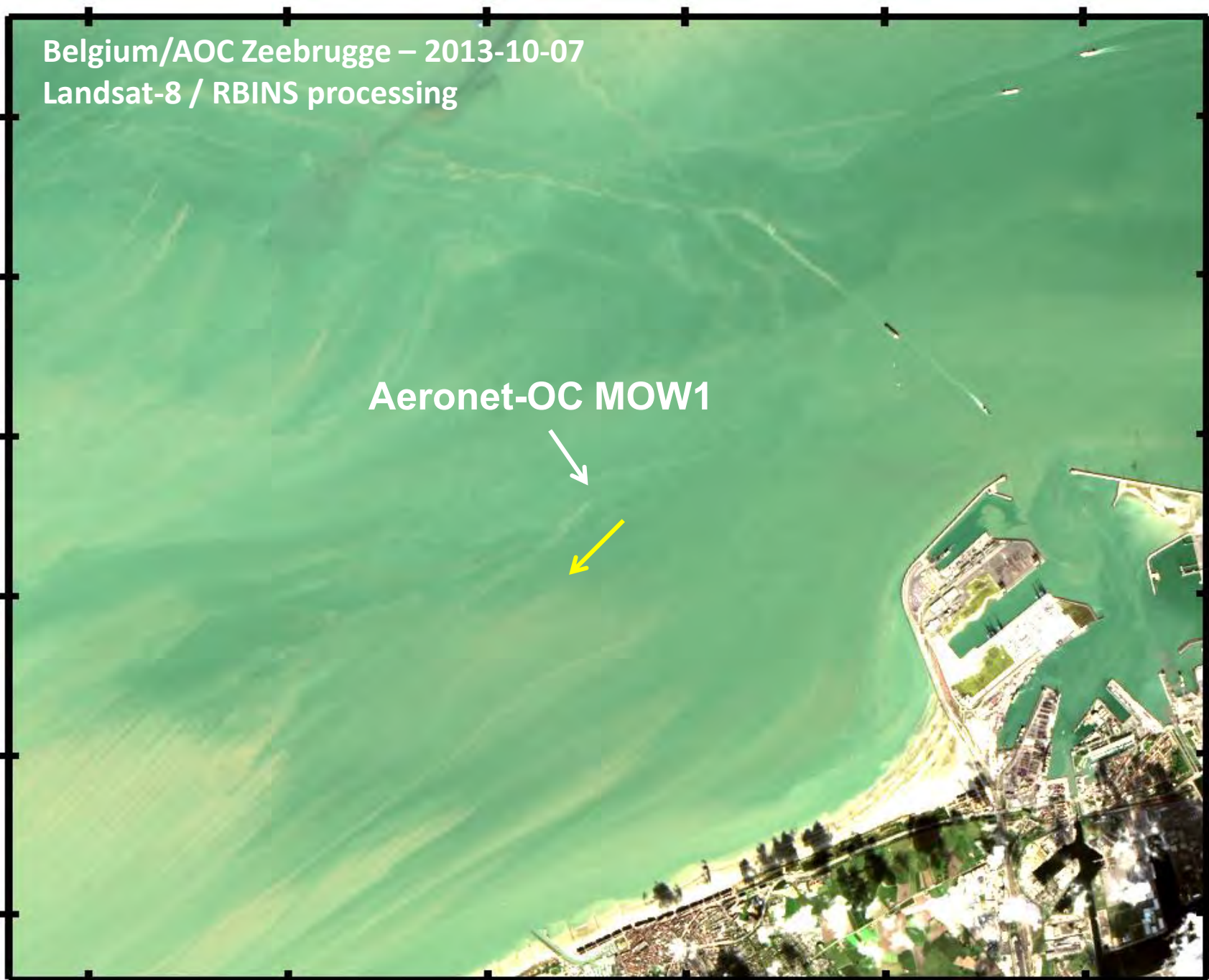
3°4'E

3°6'E

3°8'E

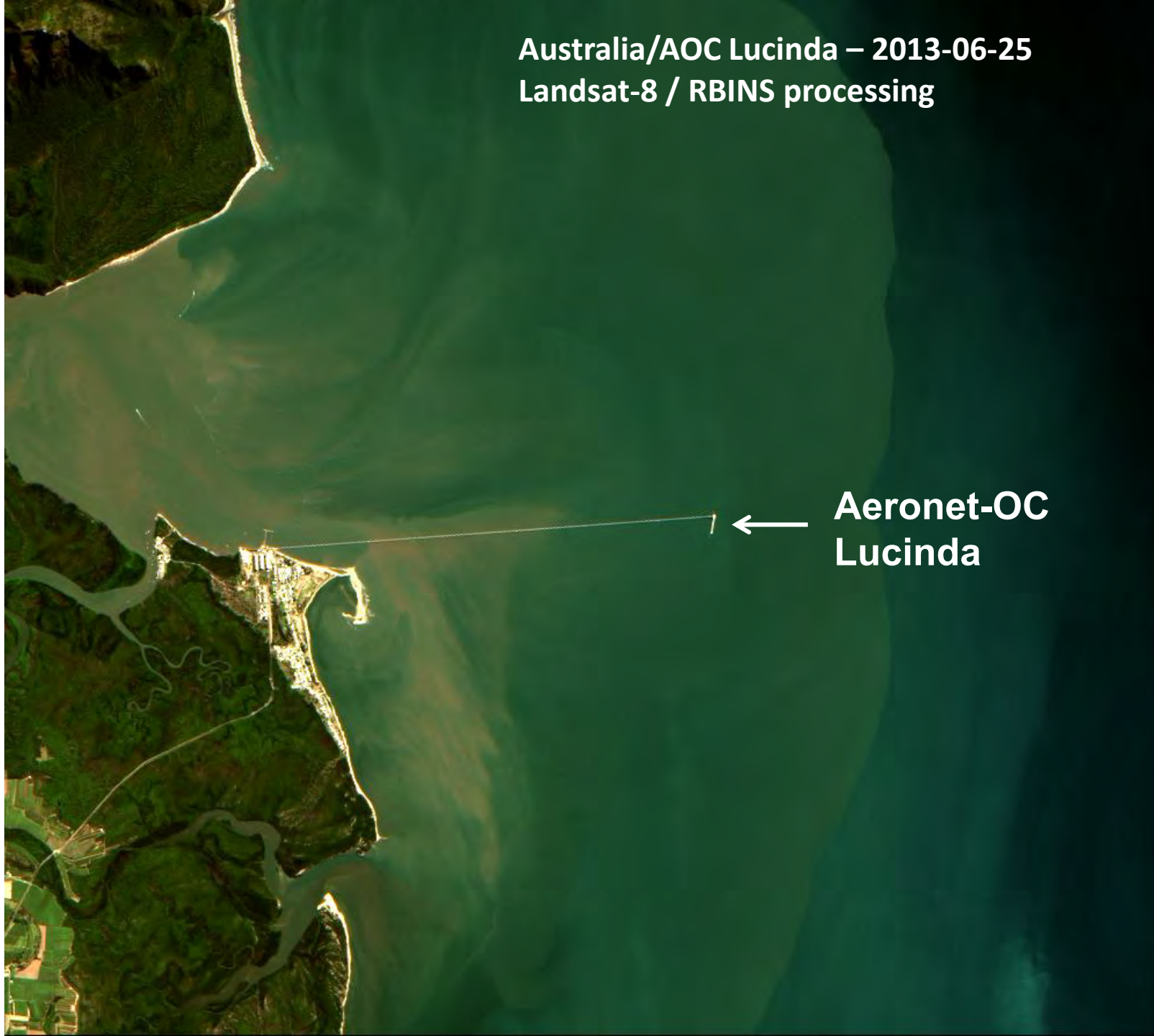
3°10'E

3°12'E



Australia/AOC Lucinda – 2013-06-25
Landsat-8 / RBINS processing

Aeronet-OC
Lucinda



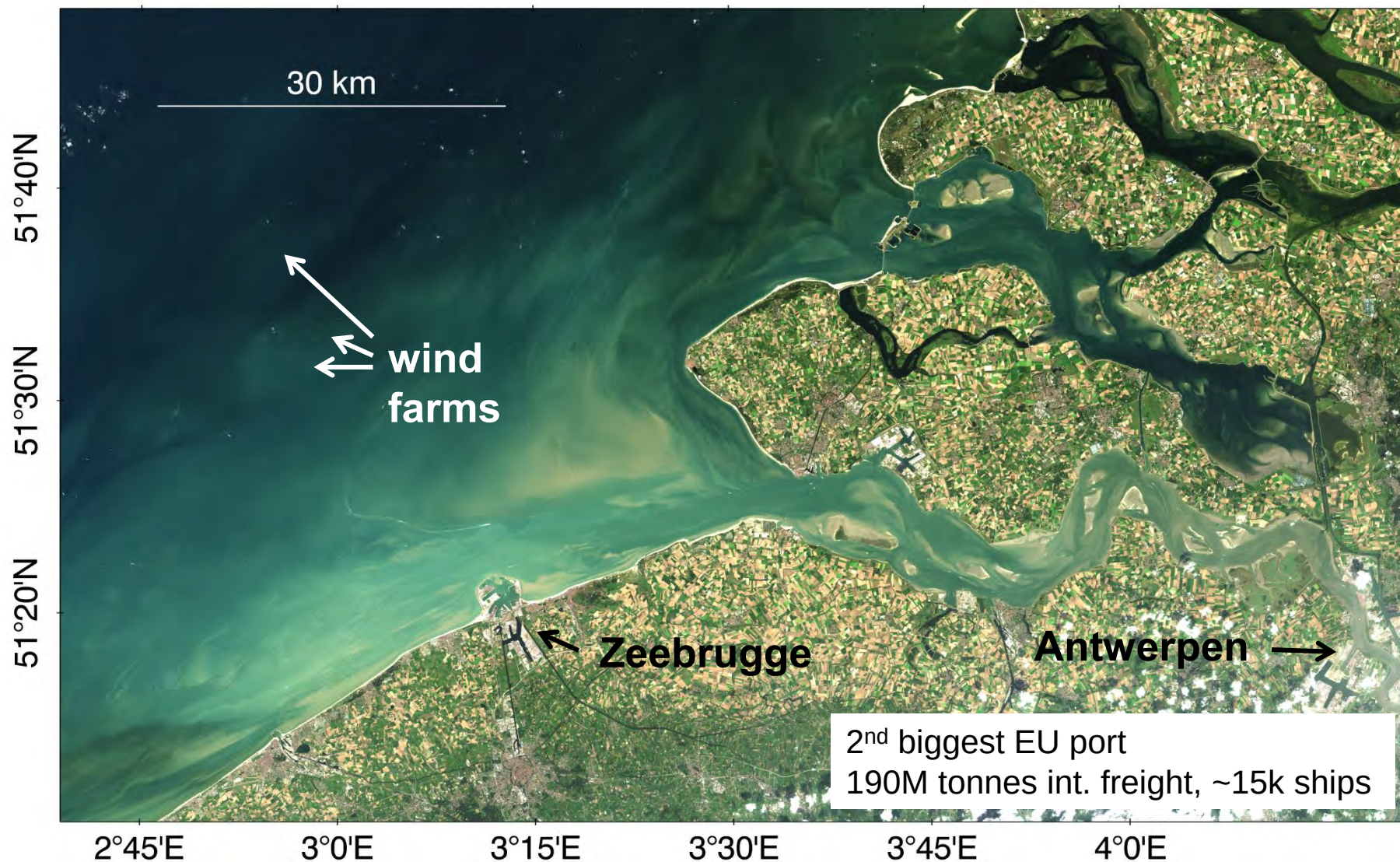
Sweden/AOC Gustav Dalen – 2014-07-21
Landsat-8 / RBINS processing

Aeronet-OC Gustav Dalen

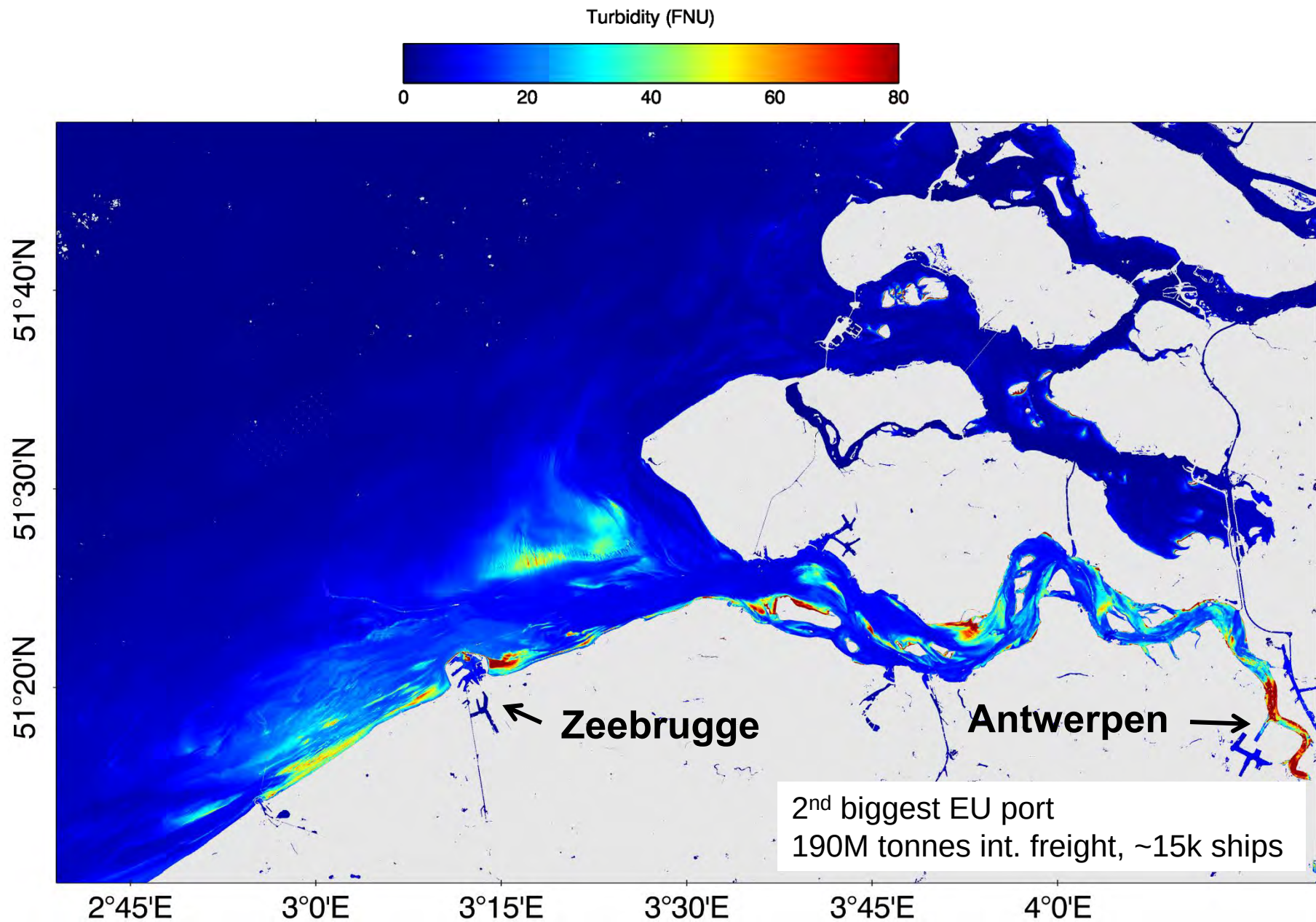


Landsat-8 « Applications »

Belgian/Dutch coastal zone and Western Scheldt Estuary

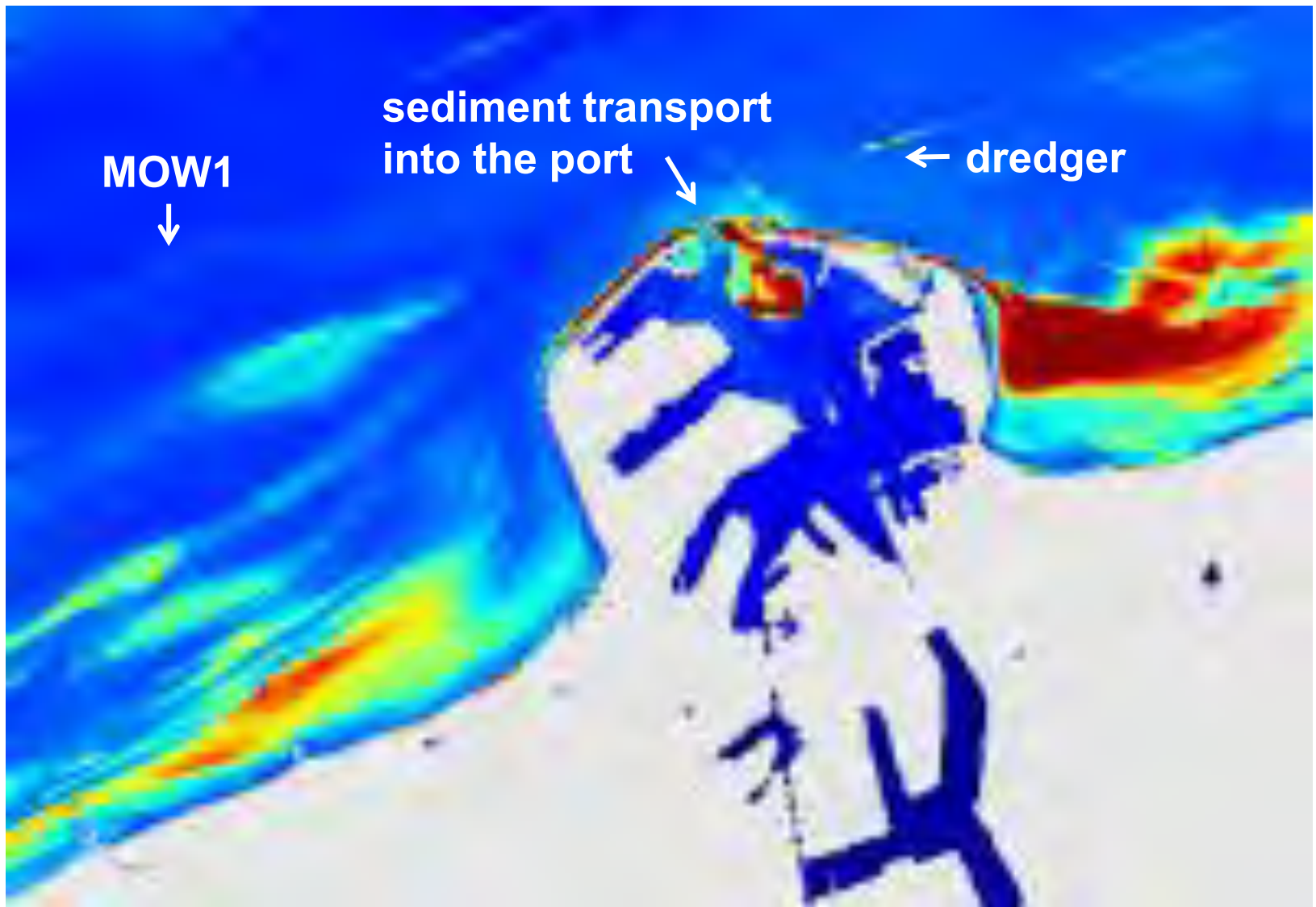
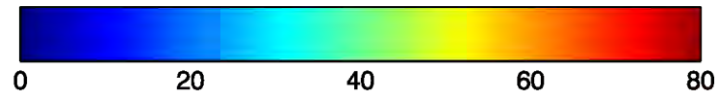


Landsat-8/OLI Rayleigh corrected RGB 2014-09-08



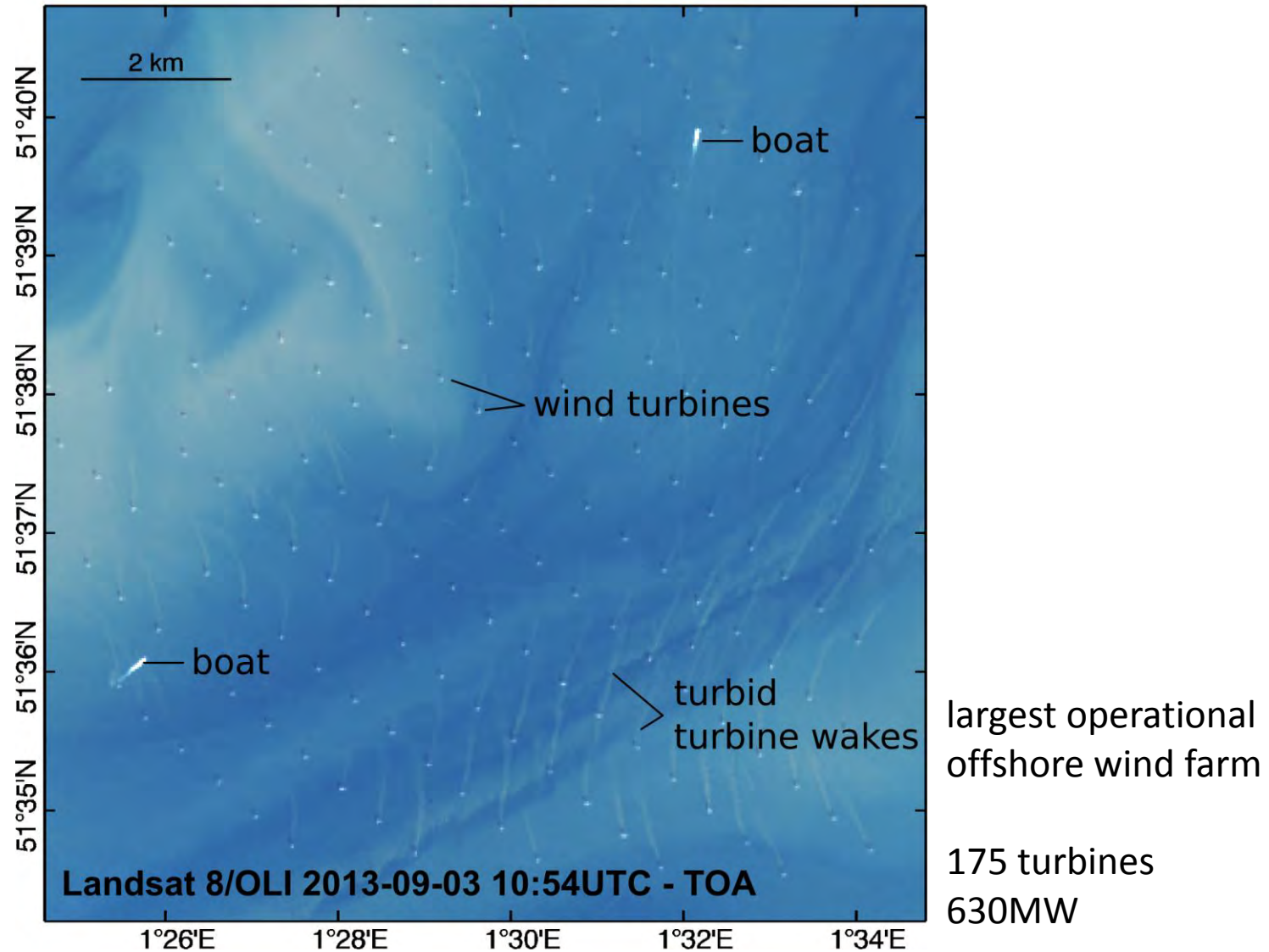
Landsat-8/OLI Turbidity (V2015+D2015) 2014-09-08

Turbidity (FNU)

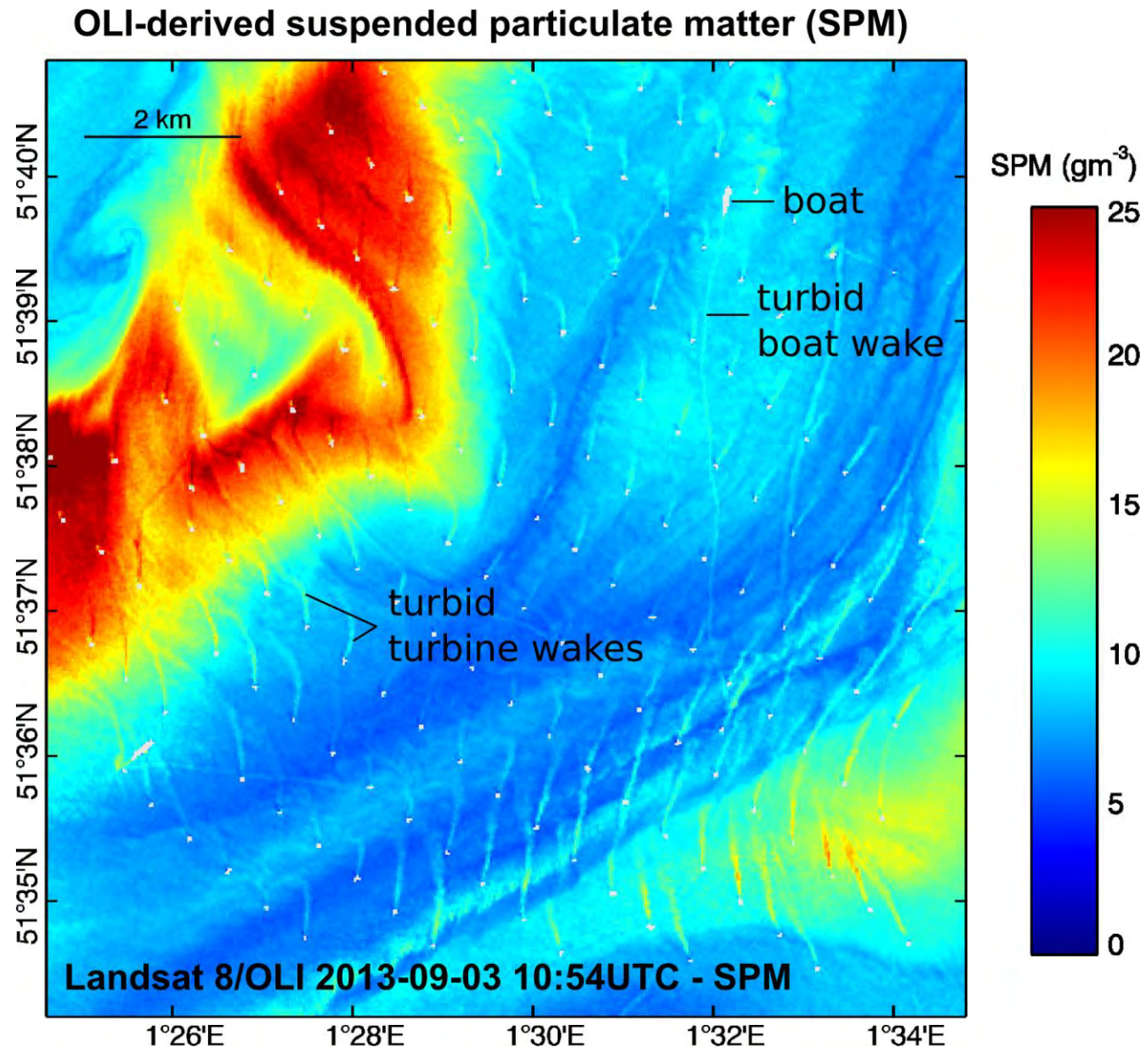


Landsat-8/OLI Turbidity (V2015+D2015) 2014-09-08

London Array offshore wind farm



Vanhellemont, Q., Ruddick, K., 2014a. **Turbid wakes associated with offshore wind turbines observed with Landsat 8.** Remote Sens. Environ. 145, 105–115.

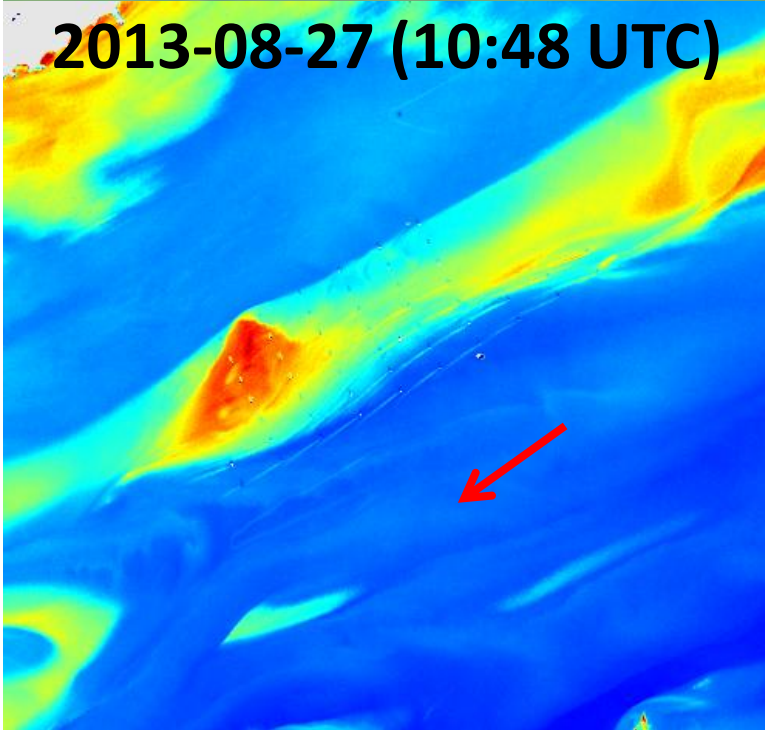


Vanhellemont, Q., Ruddick, K., 2014a. **Turbid wakes associated with offshore wind turbines observed with Landsat 8**. *Remote Sens. Environ.* 145, 105–115.

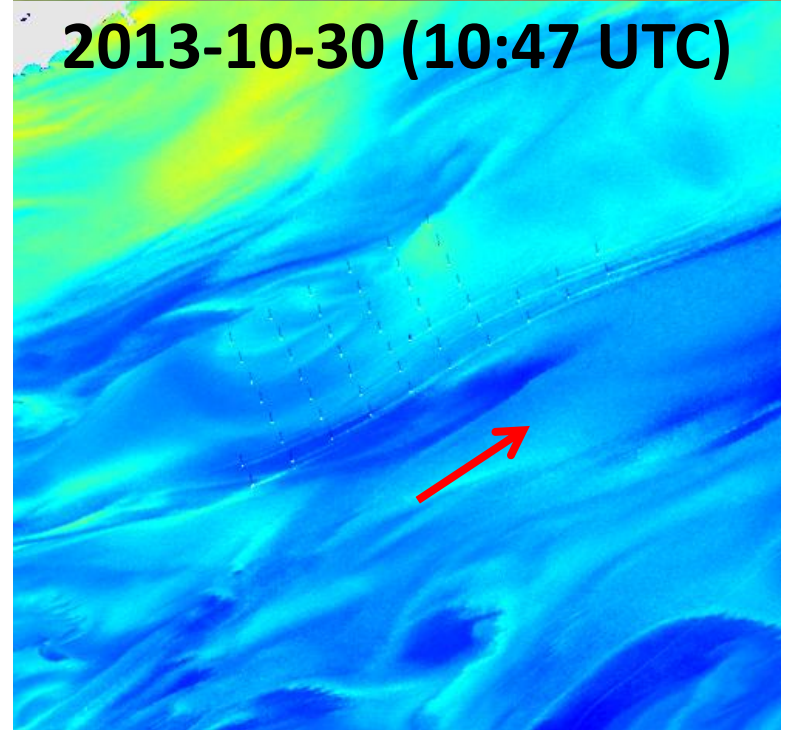
Gunfleet Sands wind farm (UK)



2013-08-27 (10:48 UTC)

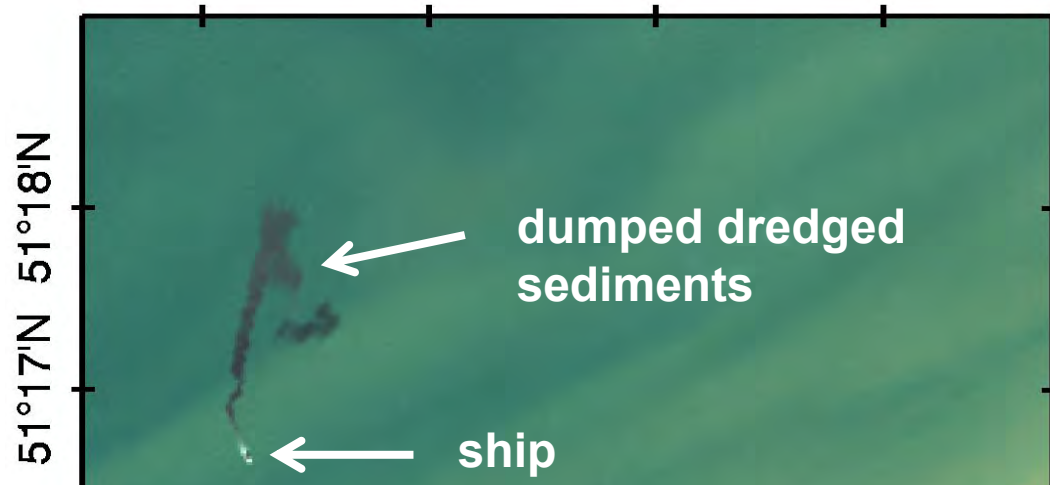


2013-10-30 (10:47 UTC)



Landsat-8/OLI 2013-10-30

Rayleigh corrected RGB



J.P. Vogt (RBINS) 2014-01-24

Vanhellemont, Q., Ruddick, K., 2014b. **Landsat-8 as a Precursor to Sentinel-2: Observations of Human Impacts in Coastal Waters.**, in: ESA Special Publication SP-726.

Simple detection algorithm for high concentrations of black sediments

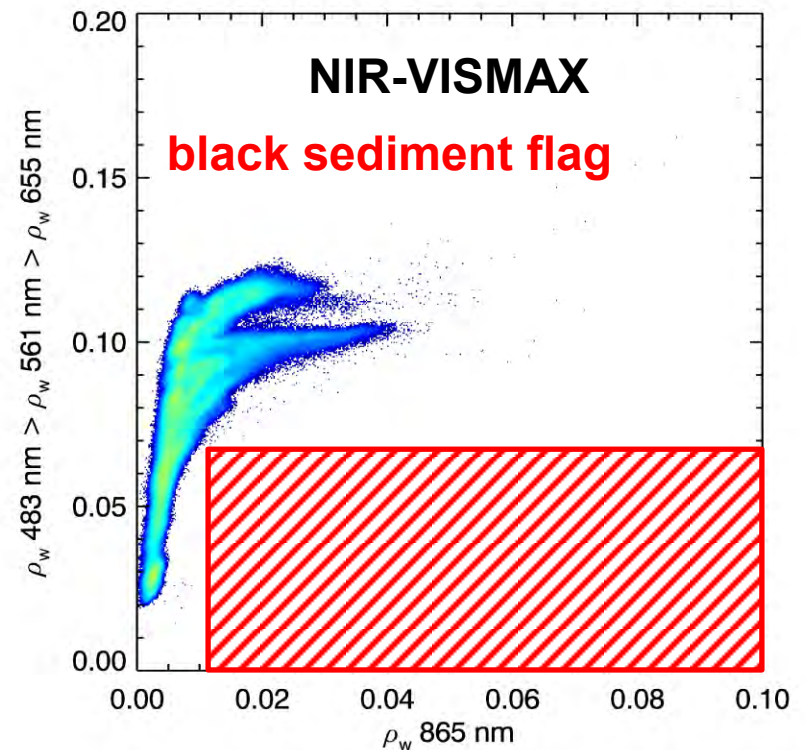
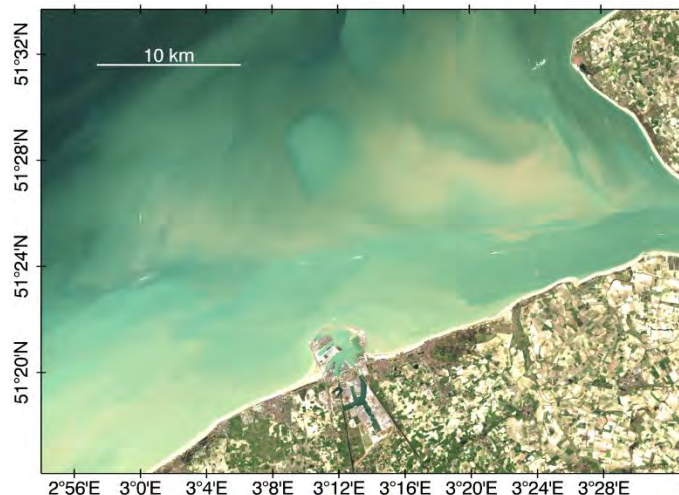
the NIR marine reflectance is greater than a threshold for turbid waters:

$$\rho_w^5 > 0.01$$

the maximum marine reflectance in three visible bands is low for this turbidity:

$$\max(\rho_w^2, \rho_w^3, \rho_w^4) < 0.07$$

L8/OLI 2014-03-16



Landsat-8/OLI 2013-10-30



Vanhellemont, Q., Ruddick, K., (2015a). **Advantages of high quality SWIR bands for ocean colour processing: examples from Landsat-8.** <http://dx.doi.org/10.1016/j.rse.2015.02.007>

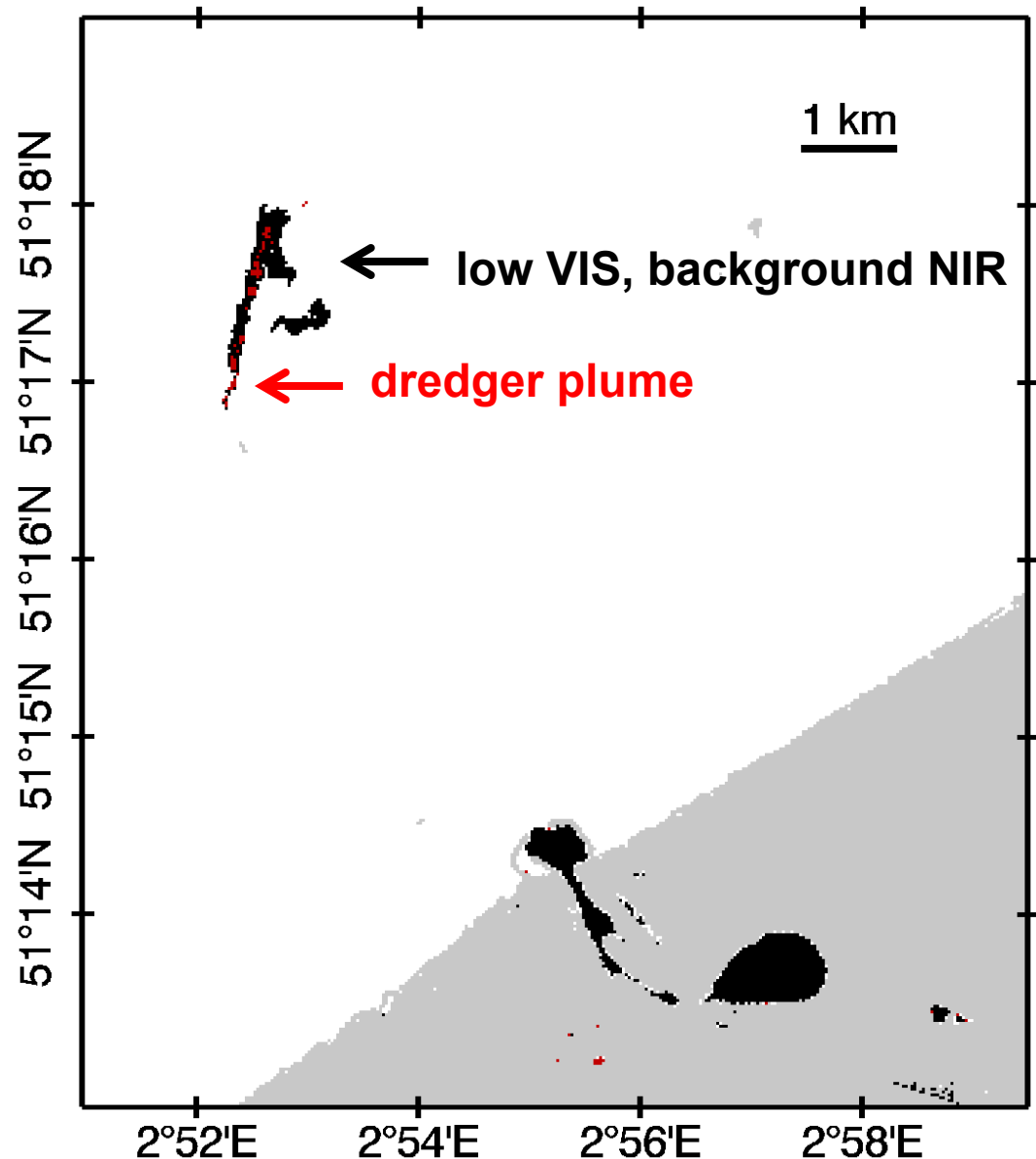
Landsat-8/OLI 2013-10-30

$$\rho_w^5 > 0.01$$

$$\max(\rho_w^2, \rho_w^3, \rho_w^4) < 0.07$$

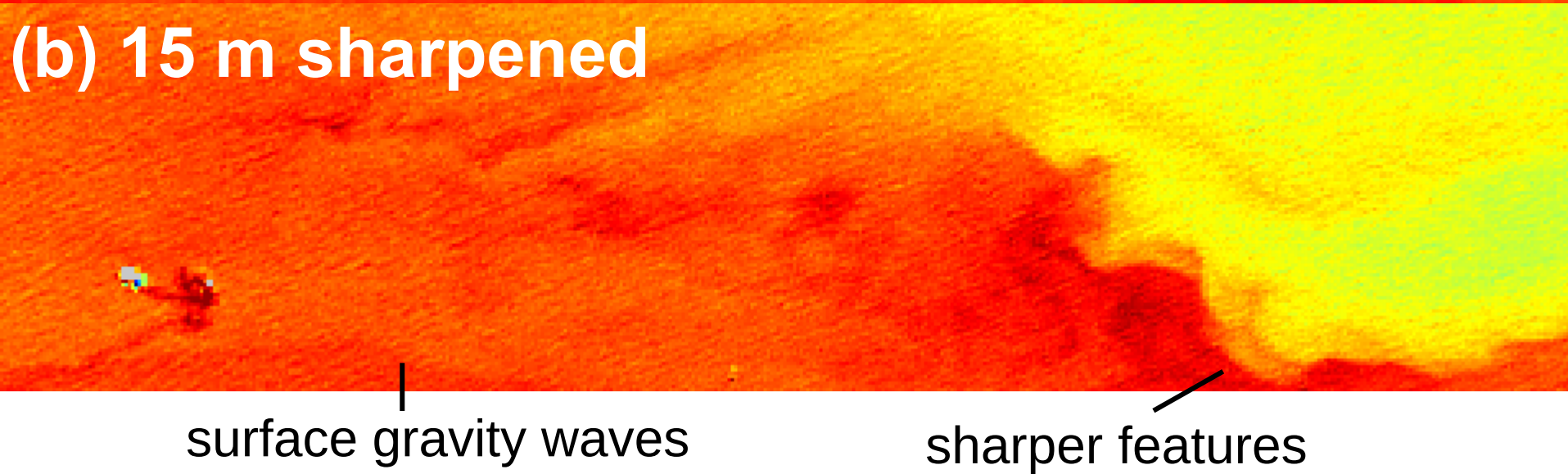
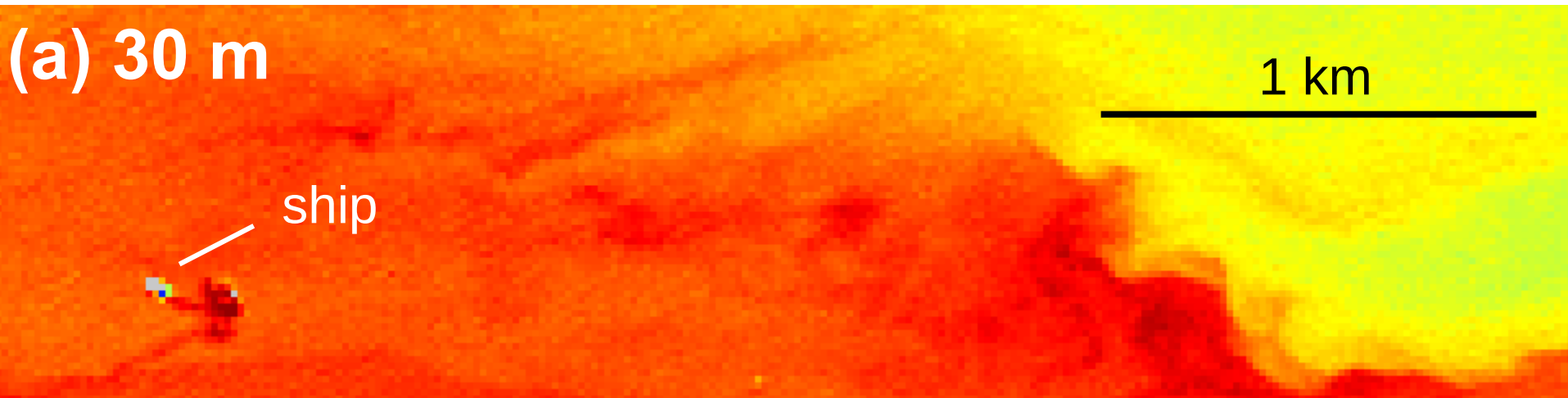
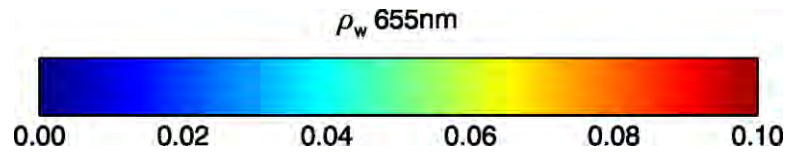
$$\rho_w^5 > 0.001 \approx \text{ambient}$$

$$\max(\rho_w^2, \rho_w^3, \rho_w^4) < 0.07$$



Higher resolution?

Pan-sharpening for marine applications (details on poster)



Pléiades very high resolution (2.8 m MS, 0.7 PAN)





Zeebrugge – harbour entrance (PANs)
Pléiades 2014-09-08 – RBINS processing

www.deme-group.com



Zeebrugge – dredger (PANs)
Pléiades 2014-09-08 – RBINS processing

Zeebrugge – patchy SPM (PANs)
Pléiades 2014-09-08 – RBINS processing



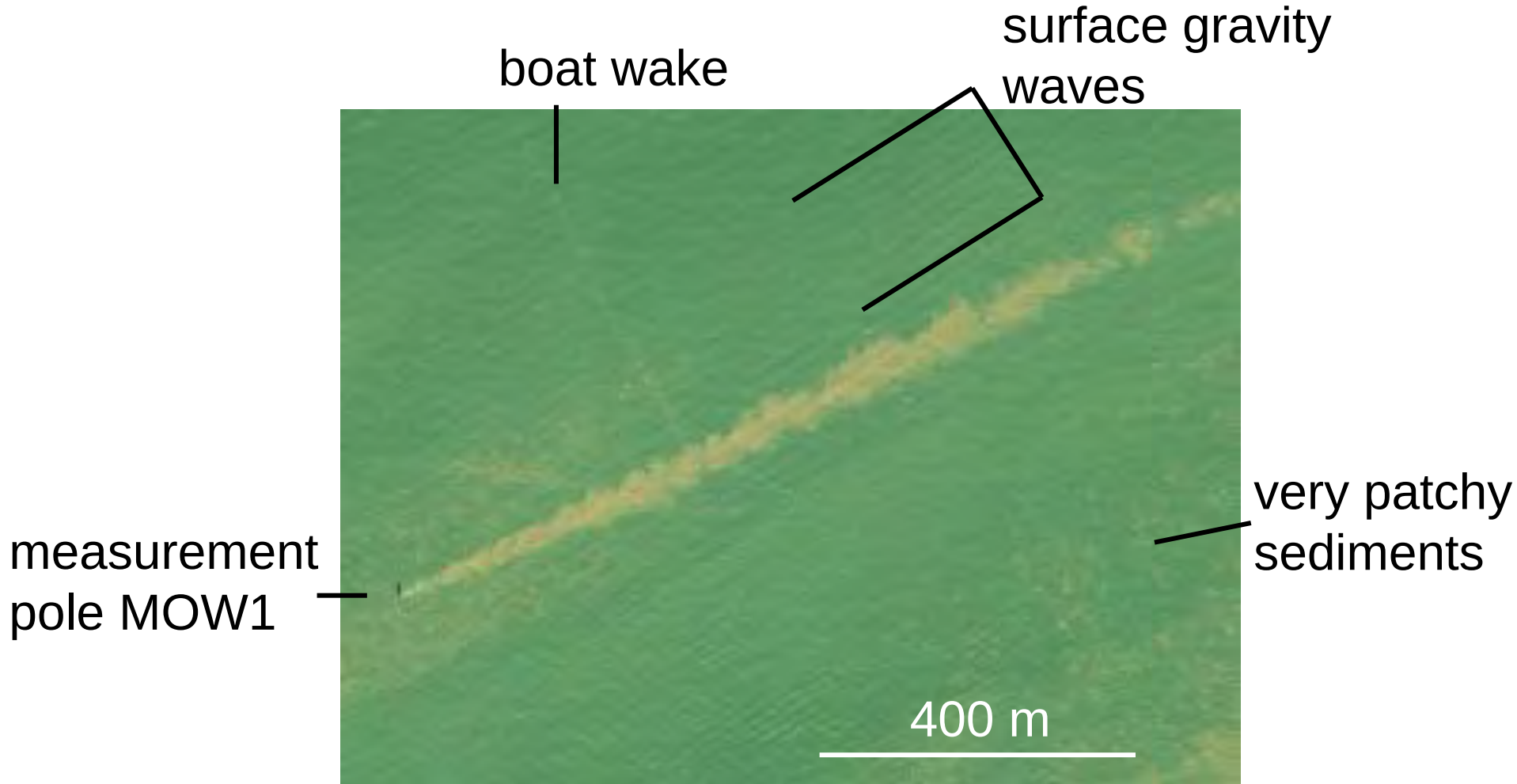
Patchy surface suspended sediment concentration
RV Belgica campaign April 2015

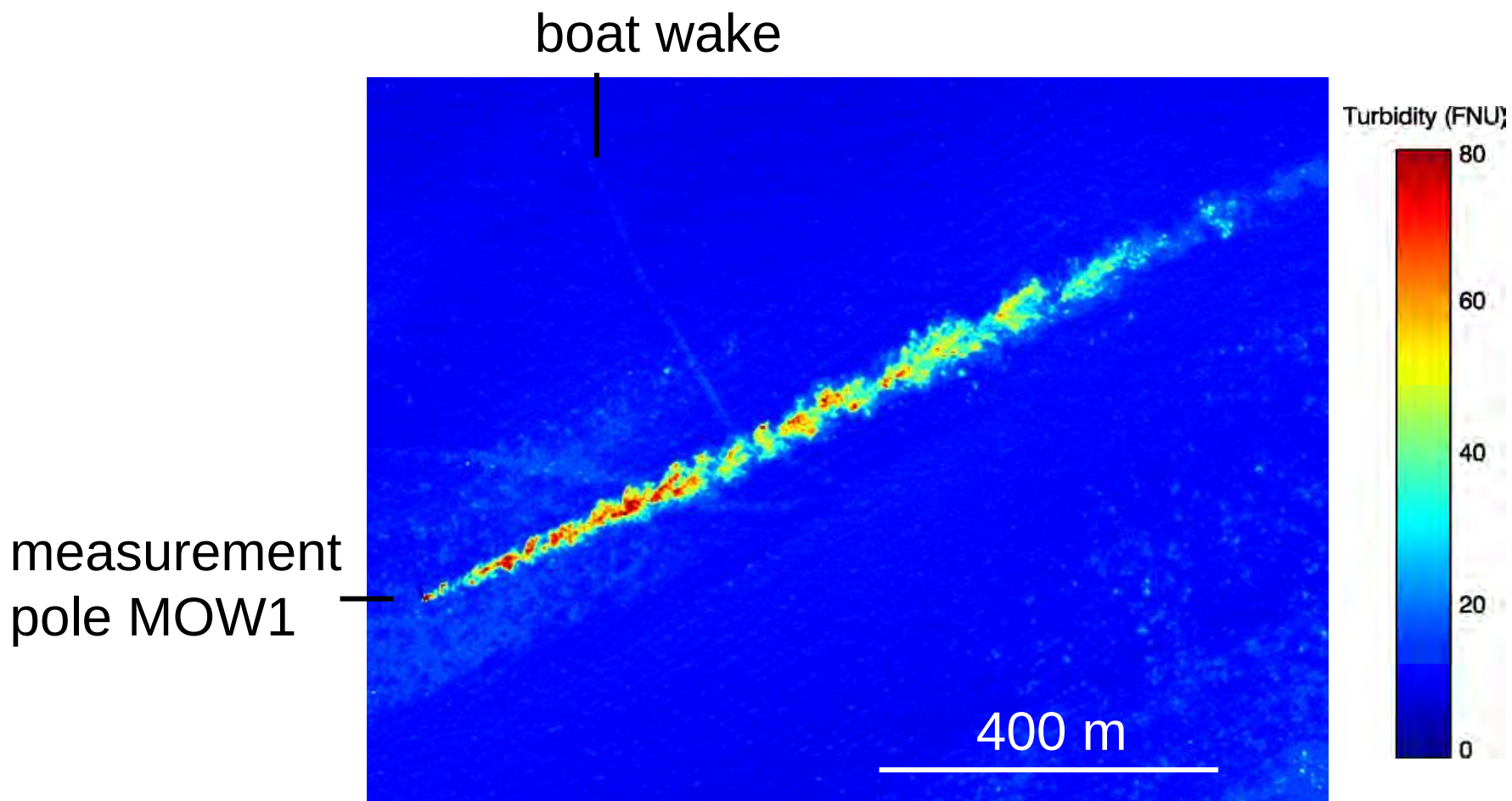


building
shadow

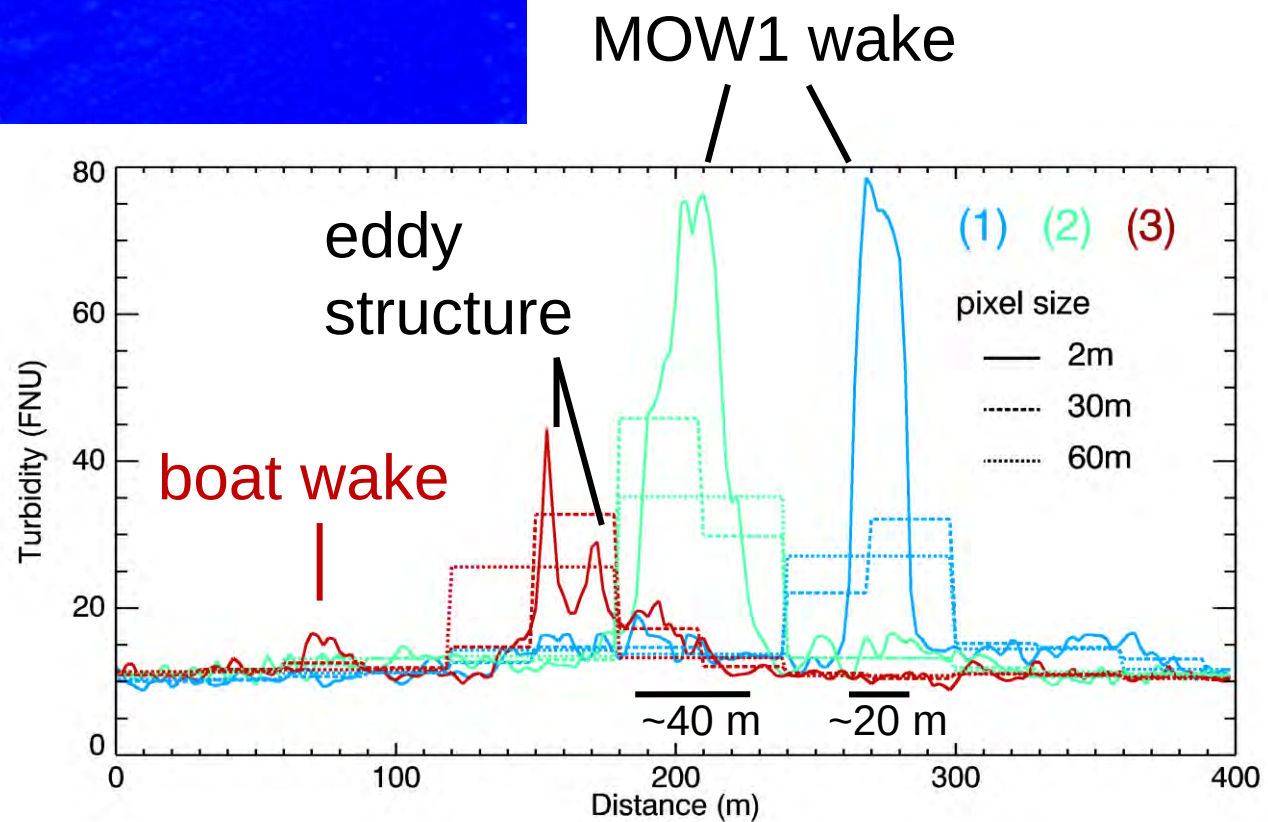
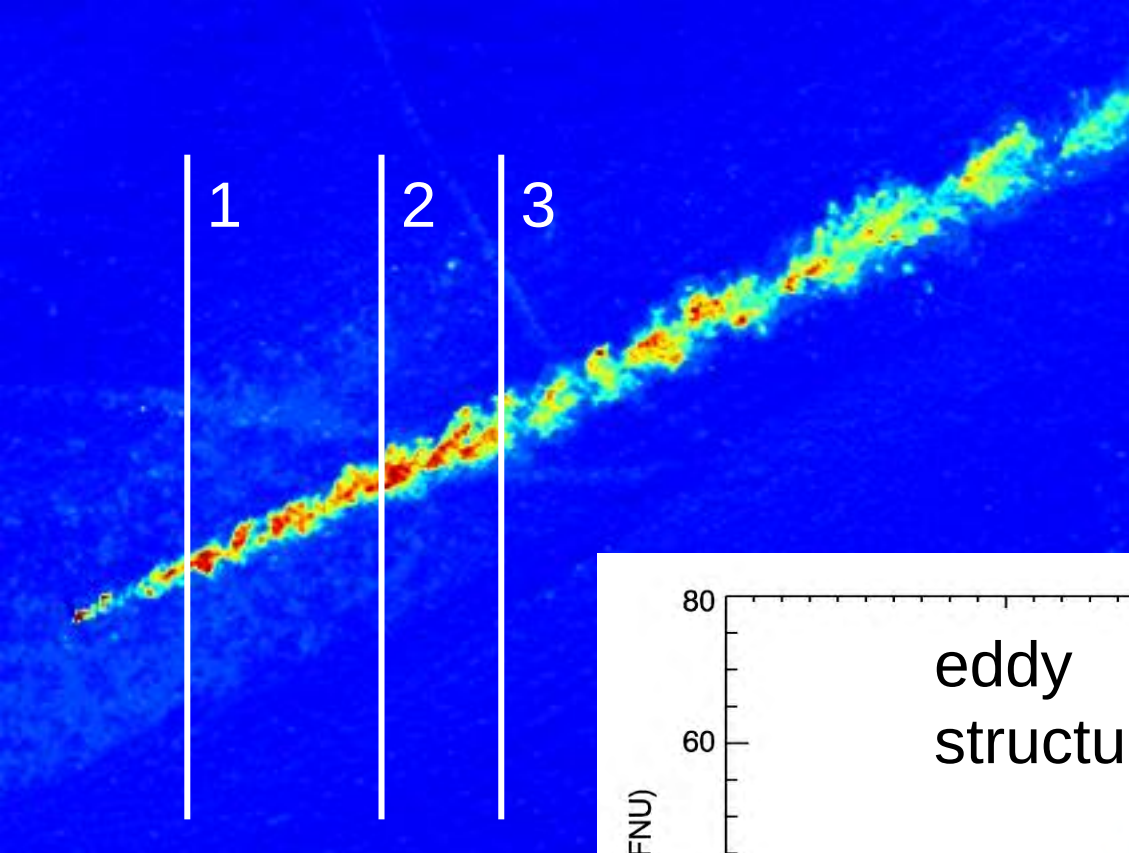
Zeebrugge – MOW1 tidal wake (PANs)
Pléiades 2014-09-08 – RBINS processing

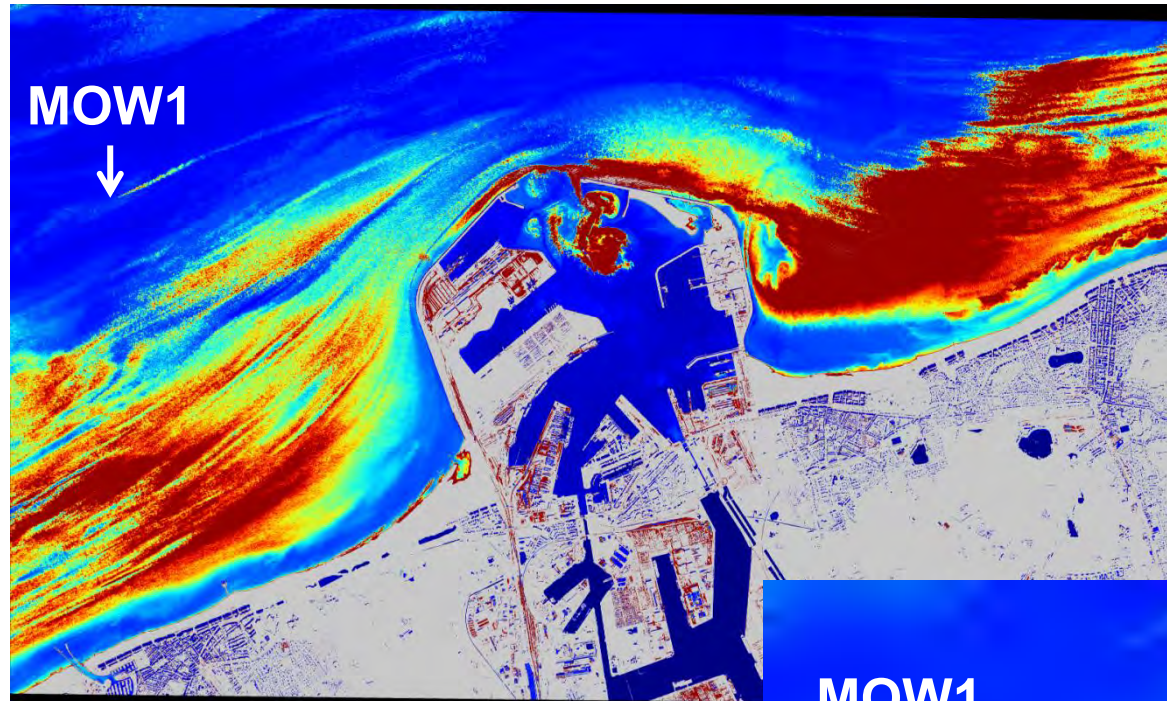






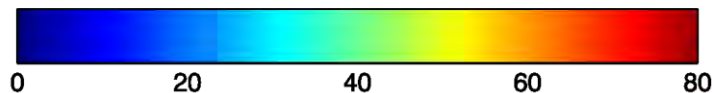
Pléiades Turbidity (ACOLITE a/c + D2015) 2014-09-08



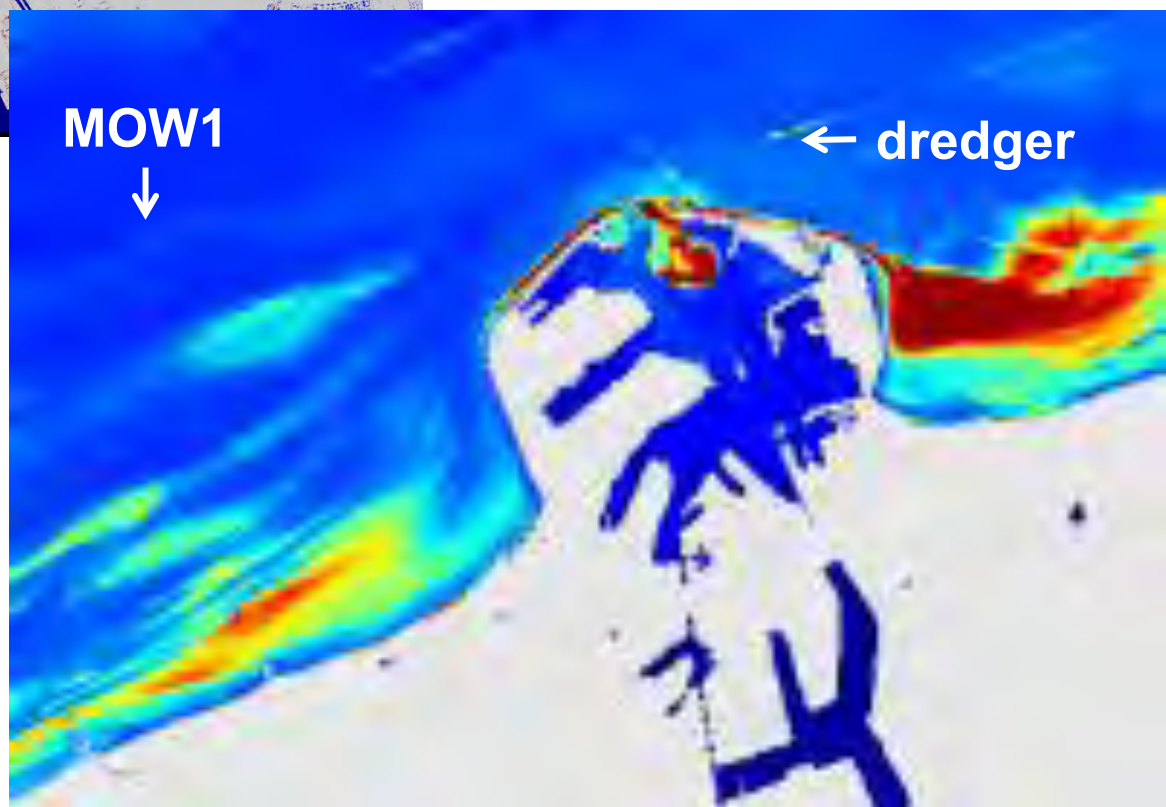


building shadows
& dark (rail)roads

Turbidity (FNU)



Pléiades 2014-09-08 11:10 UTC



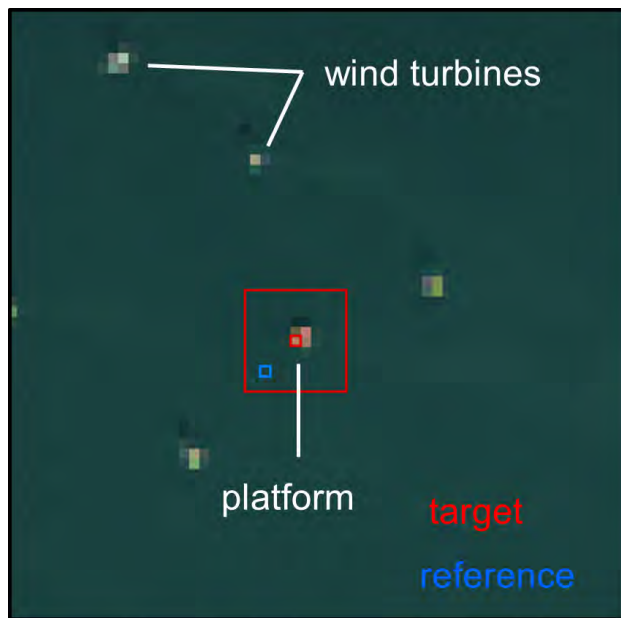
Landsat-8 2014-09-08 10:40 UTC

C-Power Offshore Transformer Station (PANs)
Pléiades 2015-04-14 / RBINS processing



Aeronet-OC





Platform impact on moderate resolution pixel (see poster)

Landsat-8/OLI data

