

Evaluation of two sites for Ocean Color Validation in the Turbid waters of Río de la Plata (Argentina)

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Abstract The Río de la Plata (RdP) is a large-scale and shallow estuary carrying large amounts of dissolved and suspended particulate matter ($100\text{-}300\text{ g m}^{-3}$), representing an ideal scenario to test turbid water atmospheric correction algorithms for current and future OC missions, like S3-OLCI. Specially to validate 1020nm OLCI band and test it's usefulness to estimate turbidity [1]. With the aim of choosing the location to setup an autonomous validation site, two possible sites are characterized in terms of temporal, spatial and spectral variability of optical properties based on information from high (Landsat 8 / L8) and medium (MODIS-Aqua / MA) spatial resolution satellite sensors.

Fishermen Pier

FP located in Buenos Aires ($-34^{\circ} 33' 38.8$, $-58^{\circ} 23' 55.6''$) in $\sim 2\text{ m}$ depth, 500 m from land.

Instruments at the end of the pier. RGB Pan-sharpened Pléiades image on 23/04/2015 at 14:04 GMT

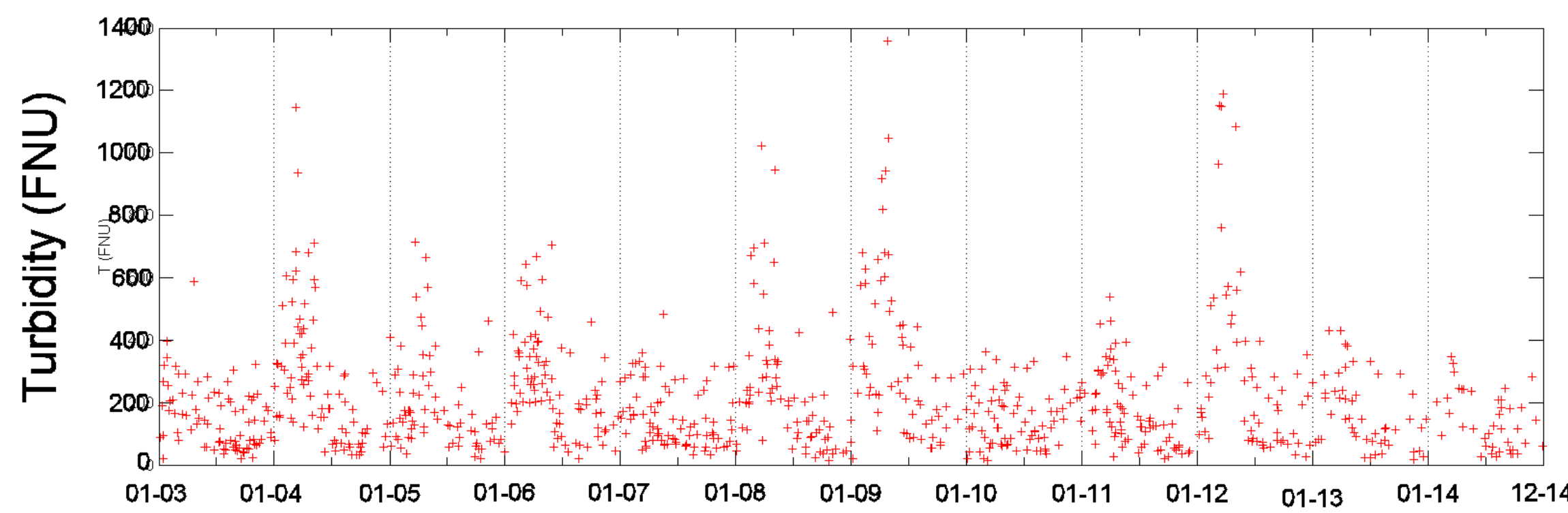


Pilote Norden

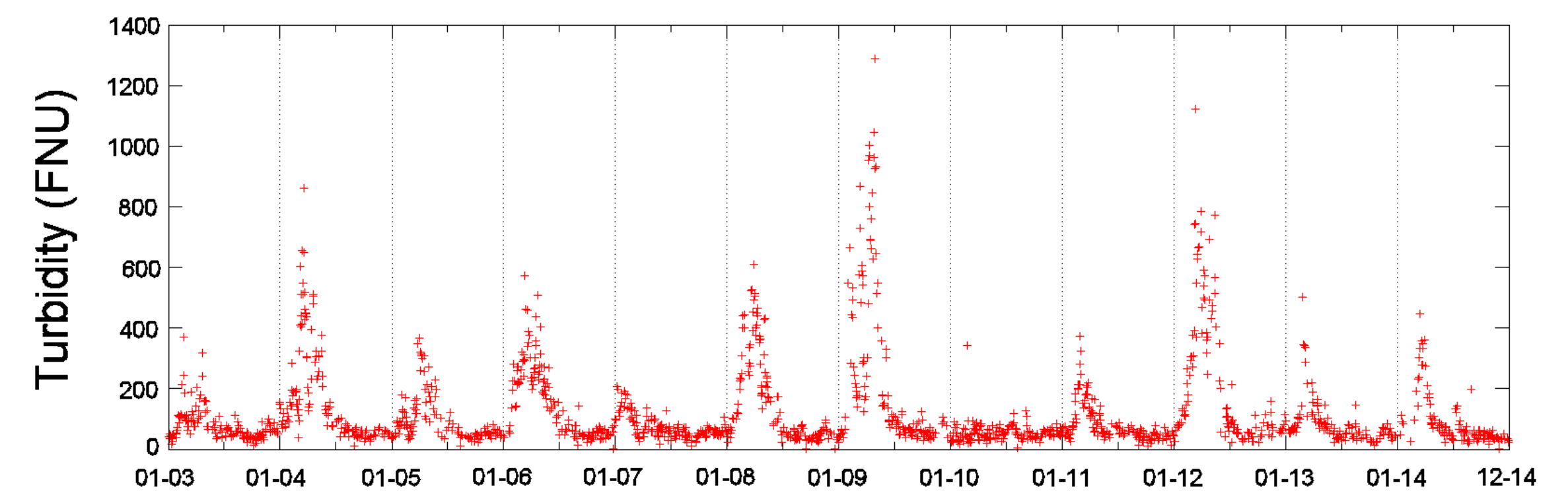
PN, pole located in the middle of RdP ($-34^{\circ} 37' 46.2''$, $-57^{\circ} 55' 10.9''$) in 5 m depth and 19.5 Km from land. Water height, wind and current intensity and direction are measured. Proposed bi-national monitoring site (Argentina-Uruguay).



Temporal Variability

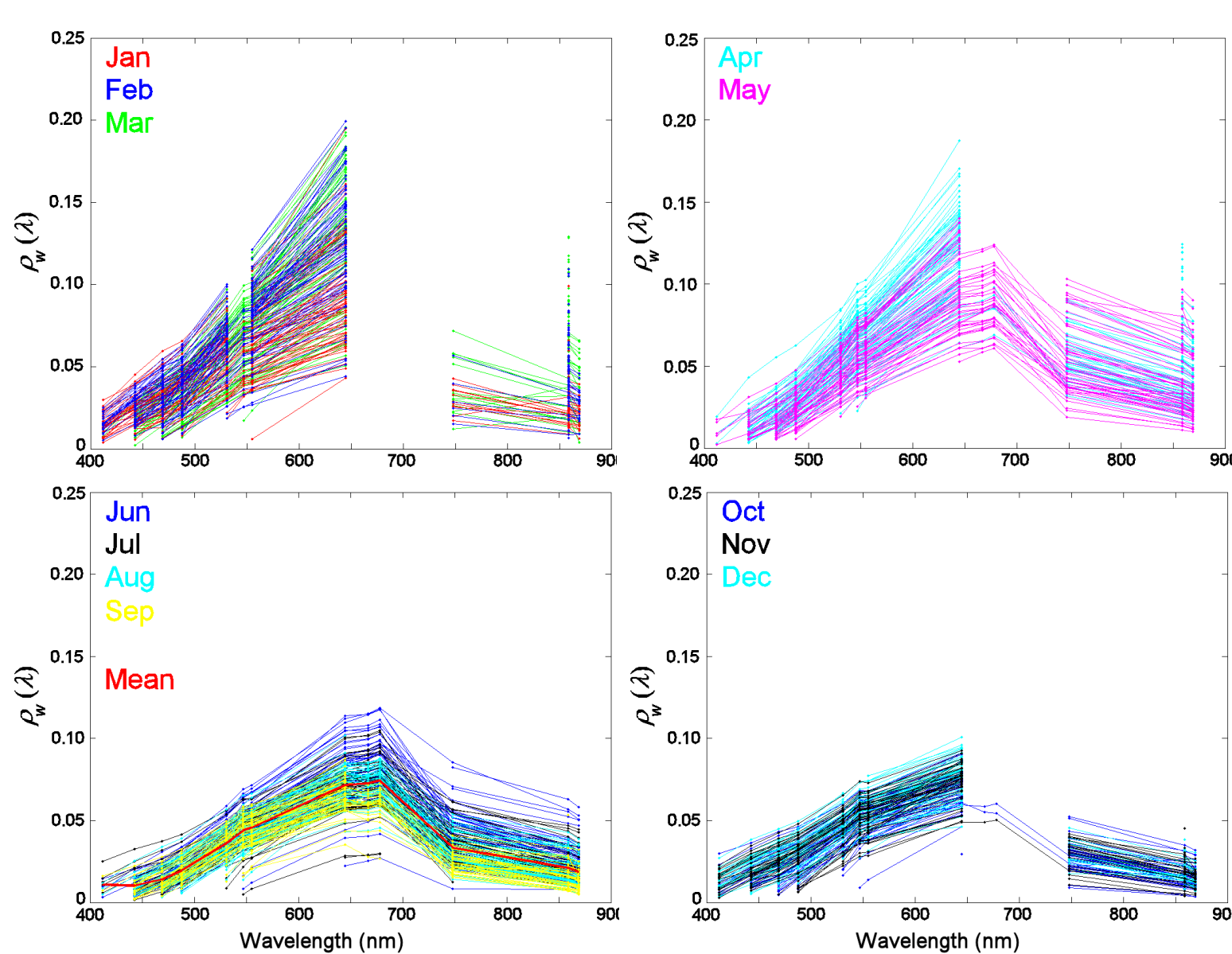


Time series of turbidity (T) using the 859nm band [2] at the FP from 1 km MODIS-Aqua (NIR-SWIR AC) over the period 2003-2014.

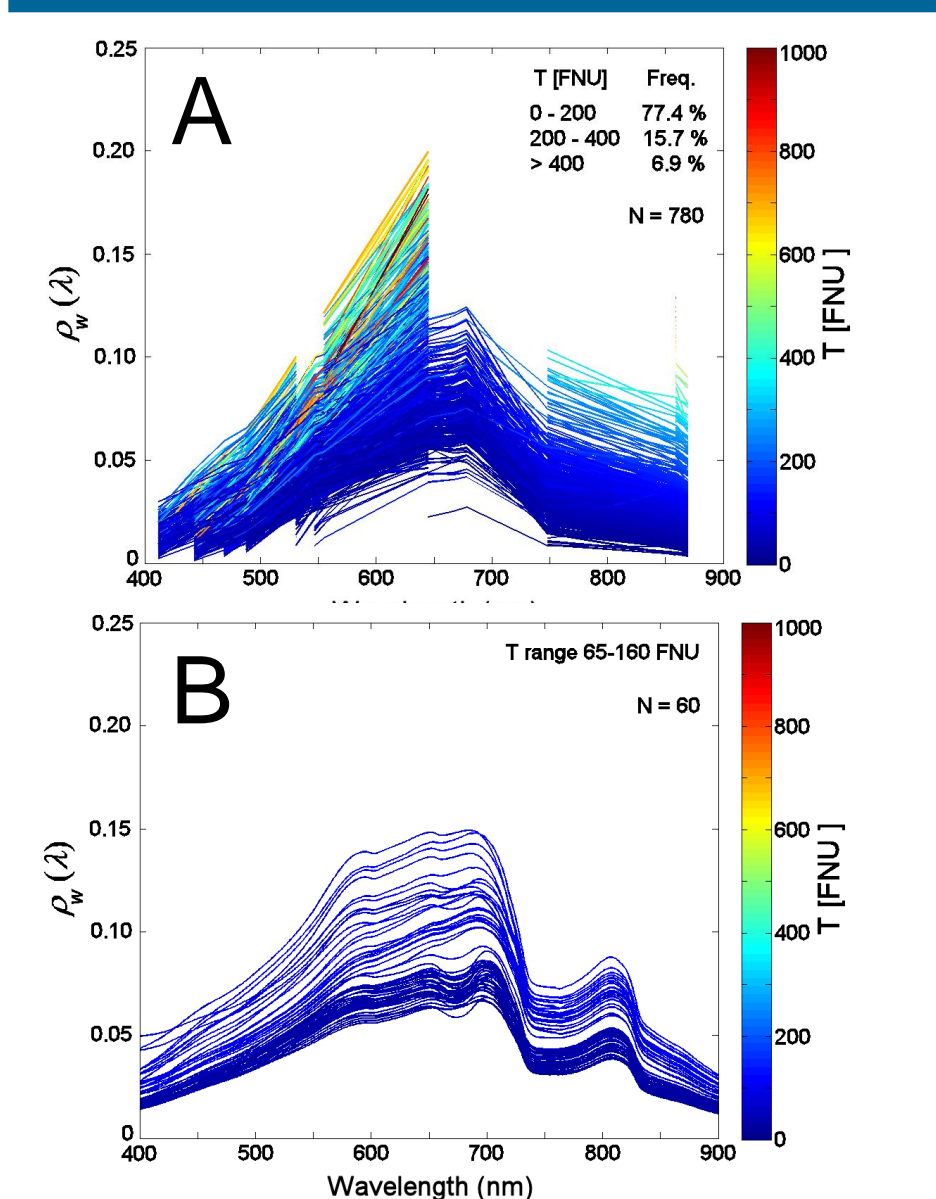


Time series of turbidity (T) using the 859 nm band [2] at the pole PN from 1 km MODIS-Aqua (NIR-SWIR AC) over the period 2003-2014.

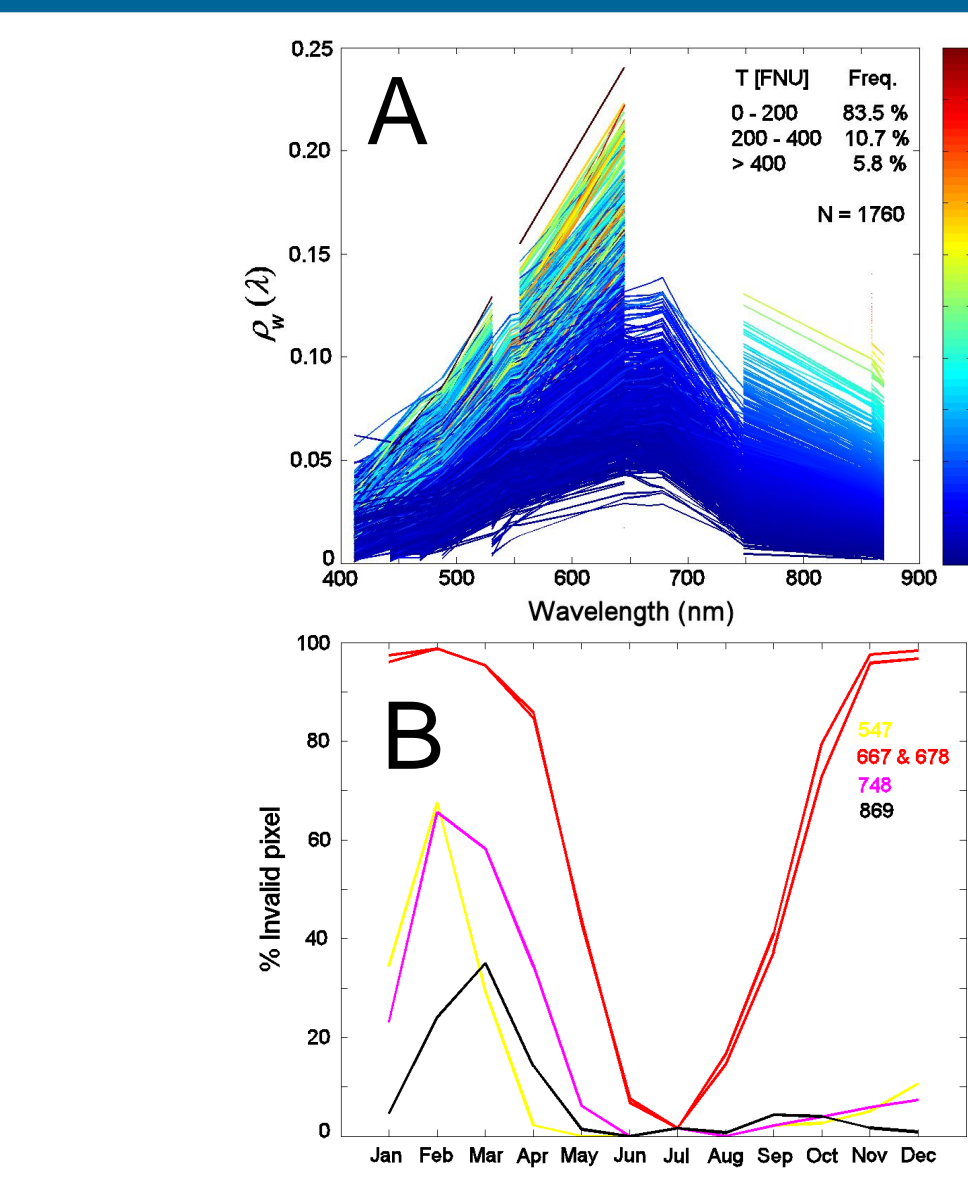
Spectral Variability



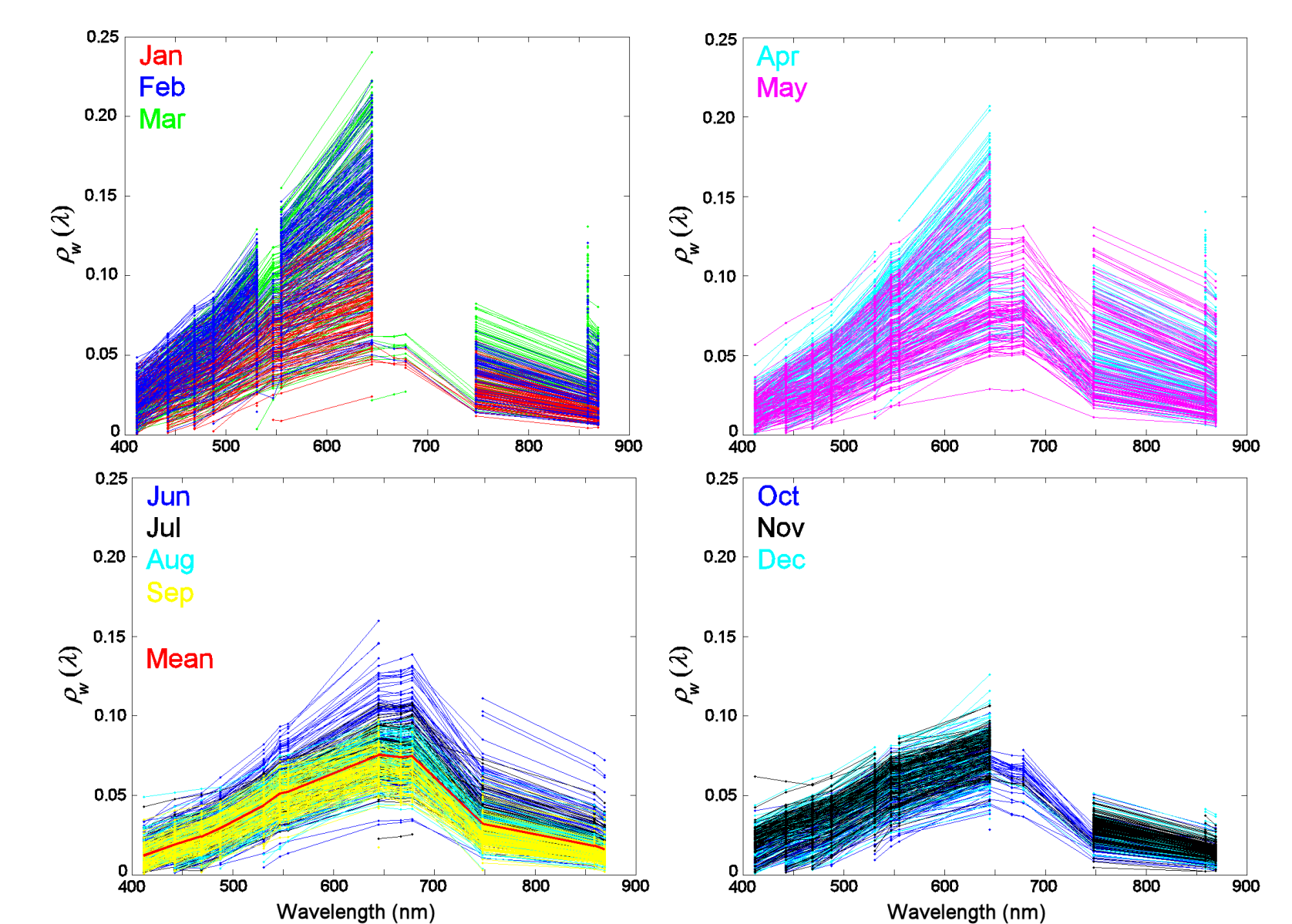
MODIS-Aqua (MA) water reflectance (NIR-SWIR AC) at FP for different months



A) MA Water reflectance (2003-2014) at FP; B) field data between 2012-14

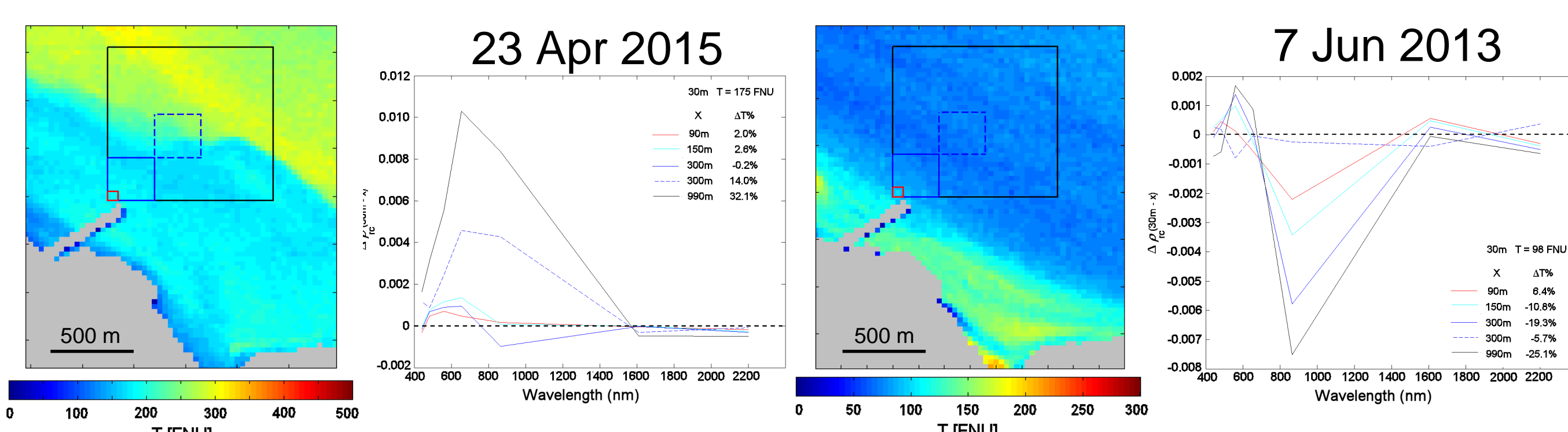


A) MA water reflectance (2003-2014) at PN B) % invalid pixels p/ month (excl. clouds)

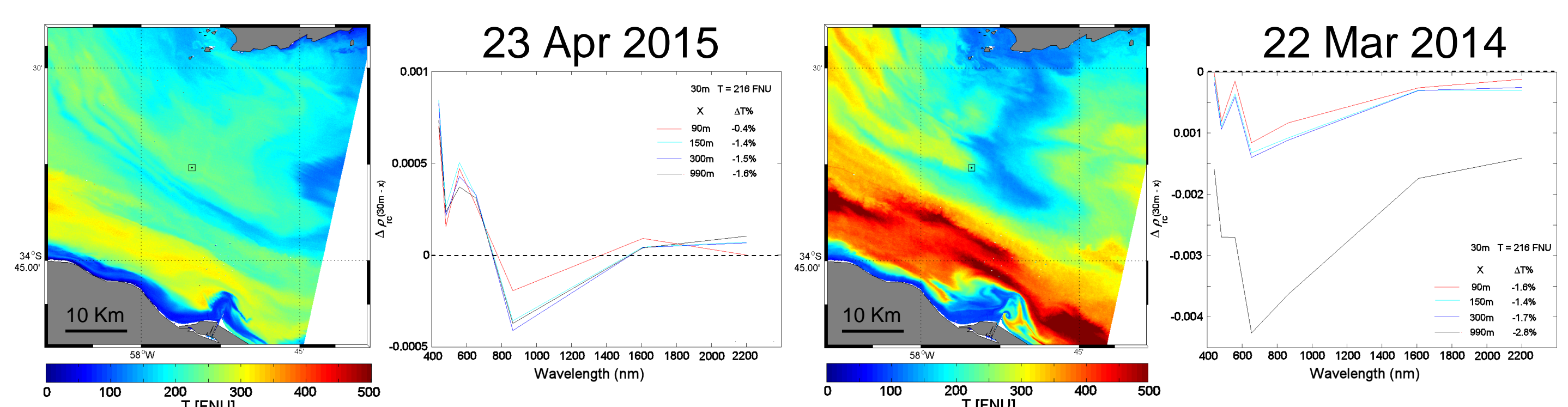


MA water reflectance (NIR-SWIR AC) at the PN for different months

Spatial Variability



Turbidity maps and Rayleigh-corrected reflectance spectral difference between different window sizes and a single Landsat-8 pixel (30m) at FP for 23/4/2015 and 7/6/2013 processed using ACOLITE [3]



Turbidity maps and Rayleigh-corrected reflectance spectral difference between different window sizes and a single Landsat-8 pixel (30m) at PN for 23/4/2015 and 22/3/2014 processed using ACOLITE [3]

Conclusions

- The FP is located close to land, thus less pixels are available for match-up due to masking, and in shallow waters, thus presents high temporal T variability due to re-suspension and wind mixing
- There is a turbidity front (coastal current) with variable position, thus using a close-by pixel is less reliable for satellite data validation

- The PN, located far from land, shows a high number of valid pixels for match-up and a clear seasonal T variability with $T > 400$ FNU 6% of the time in Apr-May.
- The pole probably does not contaminate the 30m pixel (not identified in L8), and the spatial variability of T is low up to 300m (0.4-2.8%)

References

- [1] Knaeps et al. A SWIR based algorithm to retrieve TSM in extremely turbid waters. Rem. Sen. Env. (accepted)
- [2] Dogliotti, A., Ruddick, K., Nechad, B., Doxaran, D., Knaeps, E., 2015. A single algorithm to retrieve turbidity from remotely-sensed data in all coastal and estuarine waters. Remote Sens. Environ. 156, 157–168.
- [3] Vanhellemont, Q., Ruddick, K. 2015. Advantages of high quality SWIR bands for ocean colour processing: Examples from Landsat-8. Remote Sens. Environ. 161, 89–106.

Acknowledgements

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