

Using High Spatial Resolution Satellite Imagery to detect Fine Scale Sediment Features in the Río de la Plata Turbid Waters

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Abstract The Río de la Plata (RdP), located at 35°S on the Atlantic west coast, is considered among the most turbid waters of the world. The capital cities of Argentina (Buenos Aires) and Uruguay (Montevideo), the most important harbors of the region, and many industrial poles are located on its coasts. Moreover, the estuary constitutes the main source of drinking water for the millions of inhabitants in the region. As a consequence the river is constantly under pressure from human activities and environmental changes. In this study, we analyzed the capability of sensors originally designed for land observations for detecting fine scale structures in the turbid waters of RdP and describe their potential use.

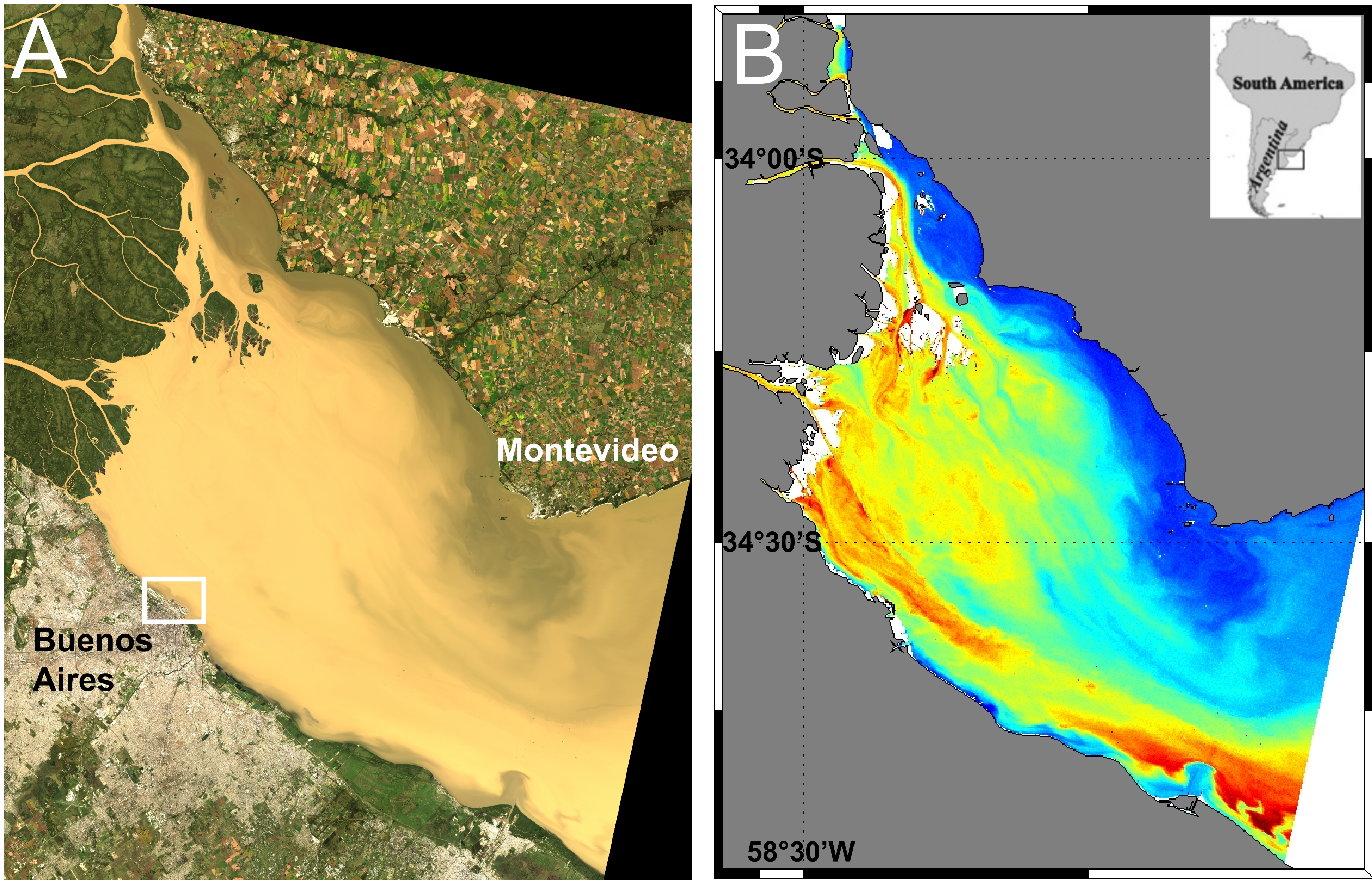


Figure 1: A) Landsat 8/OLI Rayleigh-corrected RGB image of upper RdP on 20/4/2013. B) Turbidity estimated using [1 & 2]. C) Schematic representation of the path of the plumes of the RdP main tributaries (modified from [3]).

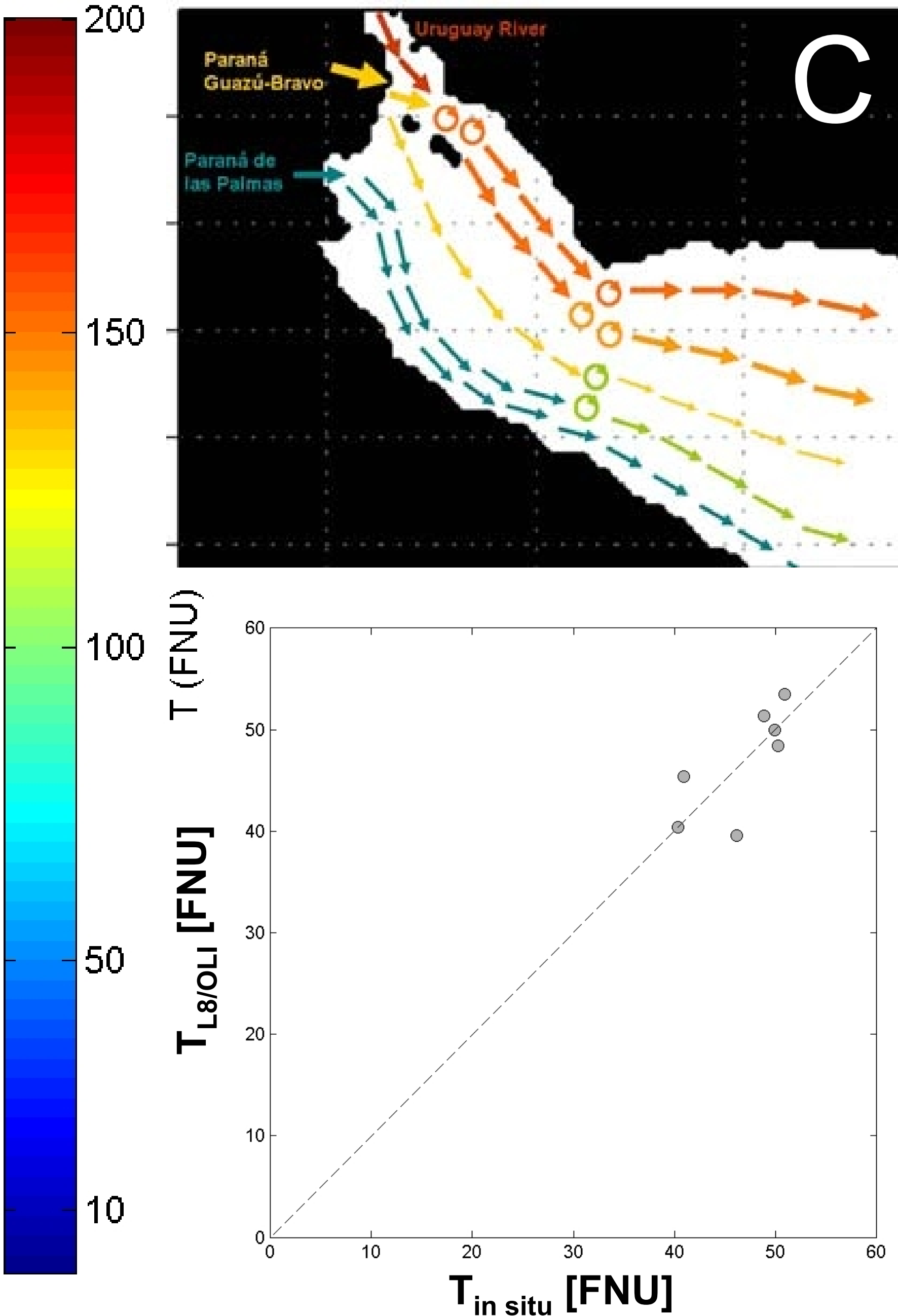


Figure 2. Scatter plot of field (HACH) & L8/OLI derived turbidity using [1 & 2].

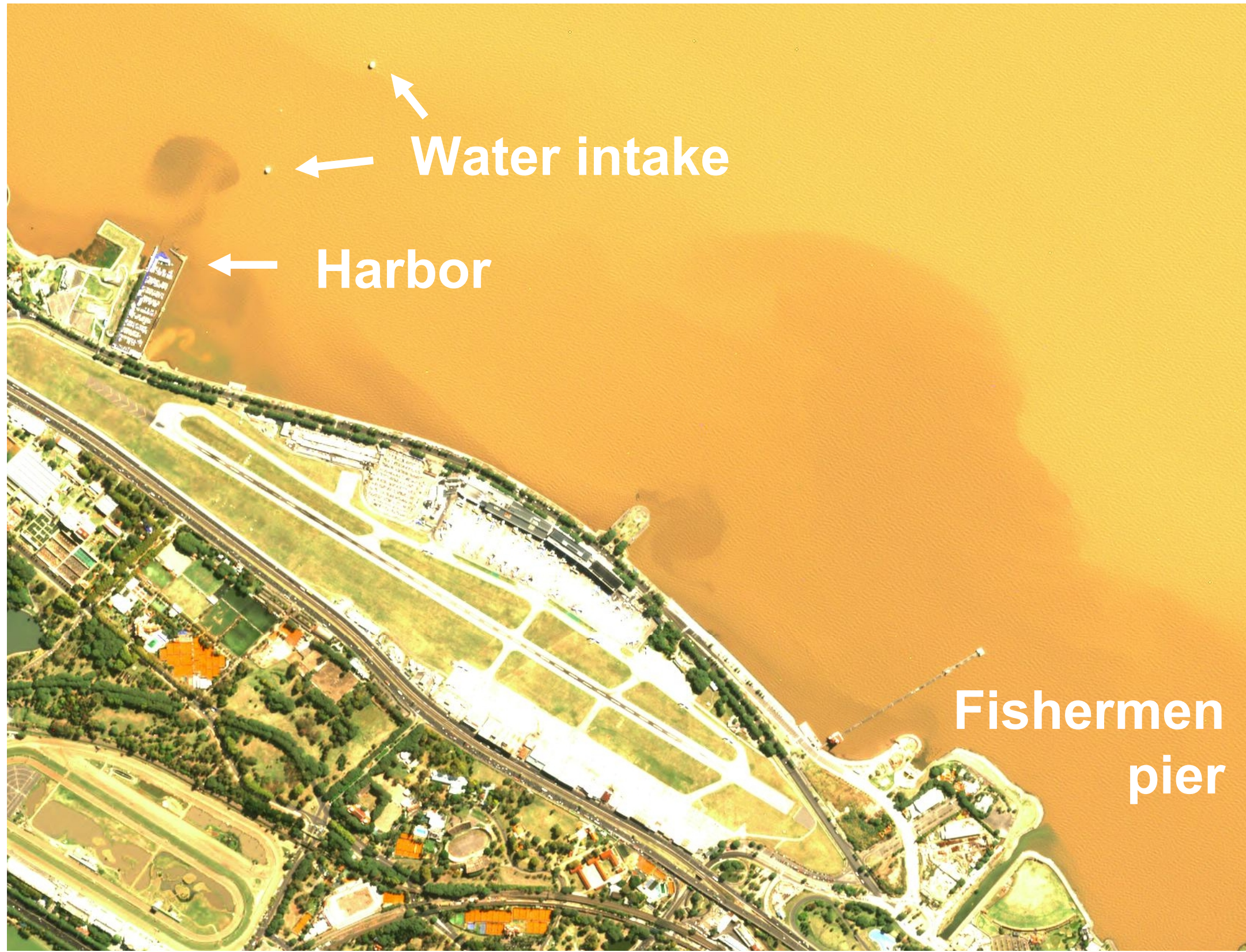


Figure 3. Pléiades (2m) Rayleigh-corrected RGB image on 24/4/2015 processed using ACOLITE (region indicated in Fig. 1).

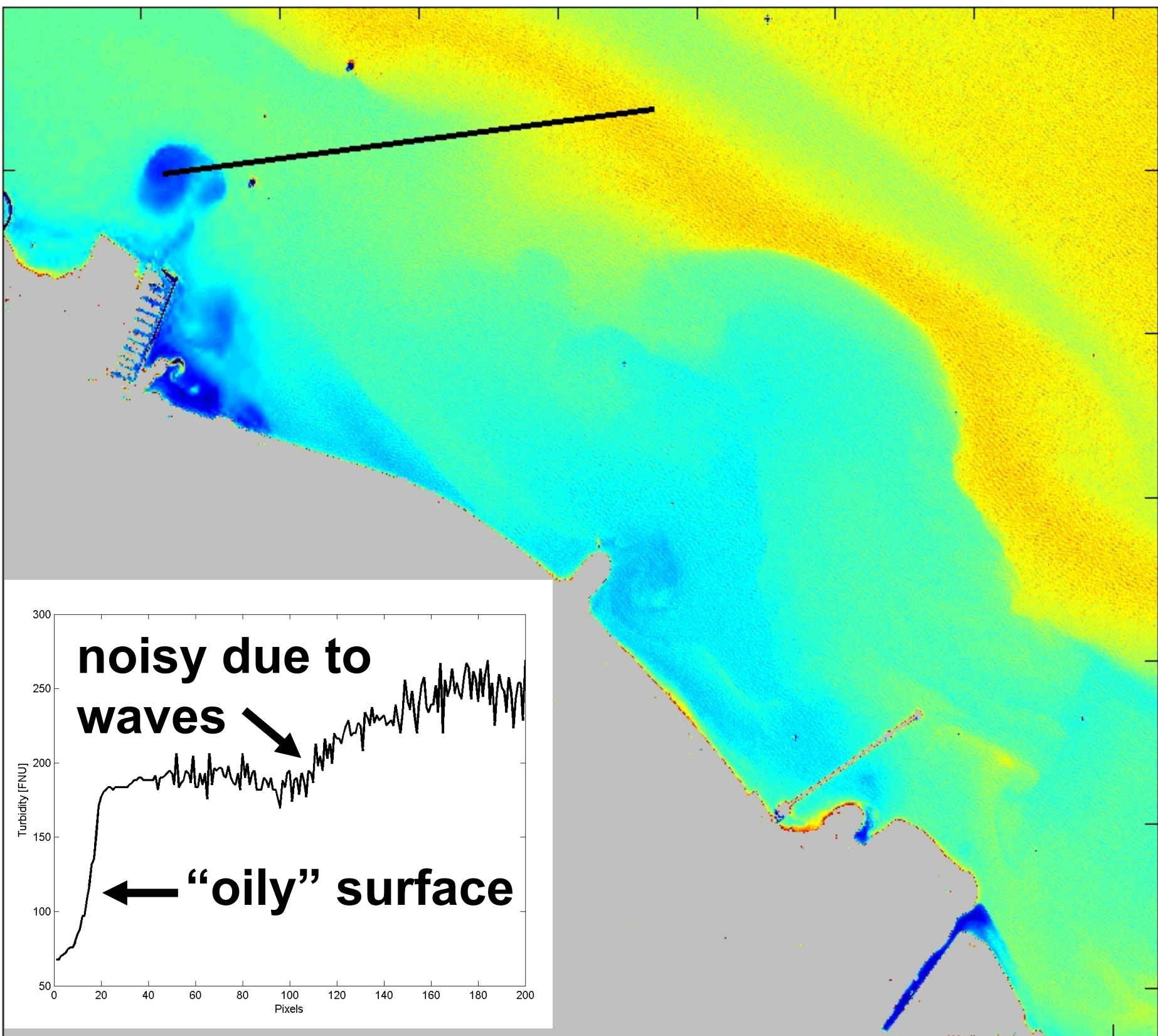


Figure 4. Turbidity estimated from Pléiades image using [1]. Inset plot shows turbidity values along the 400 m long transect (black line).

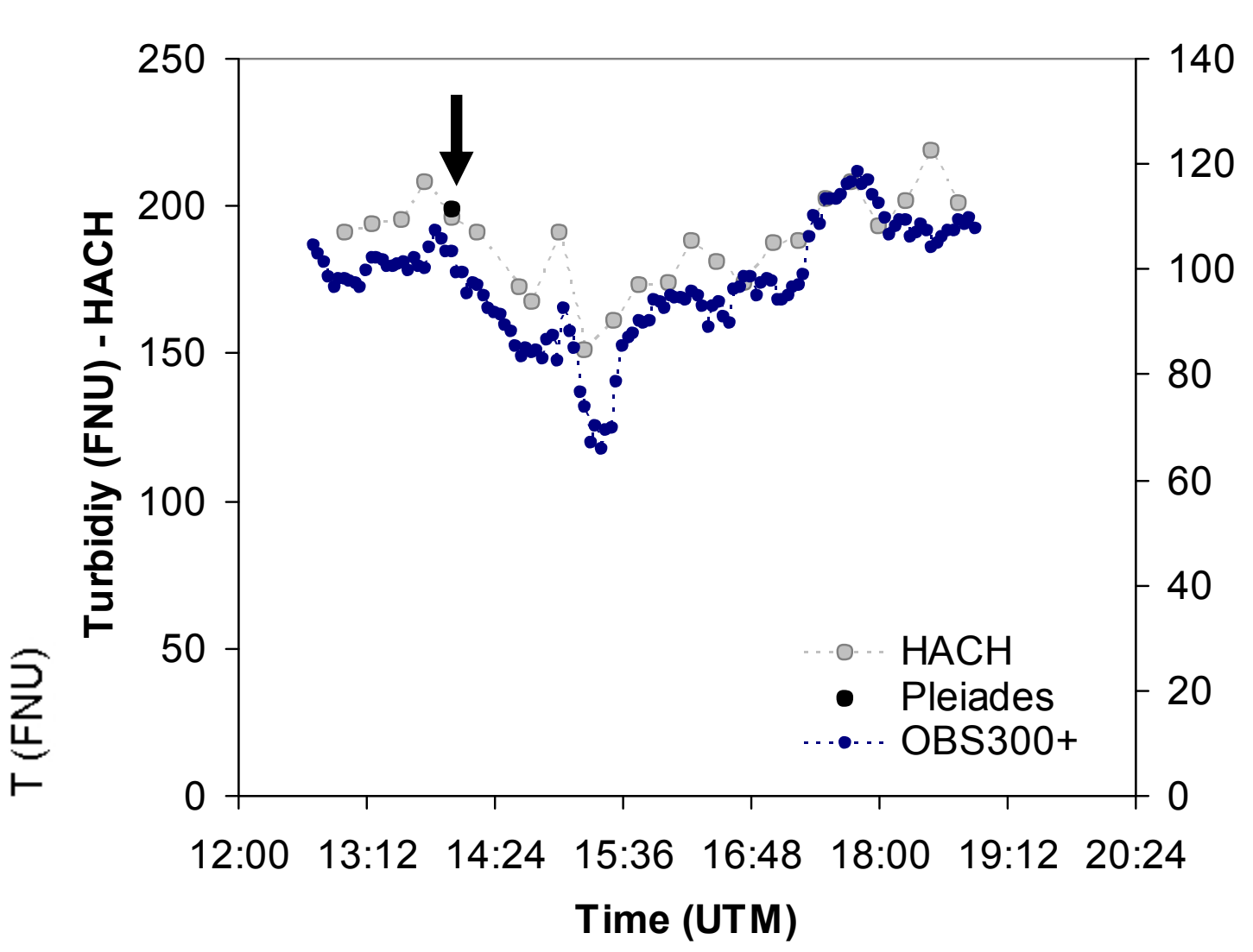


Figure 5. Field measurements of turbidity along a day (23/4/2015) using HACH and OBS300+ sensors from the end of the Fishermen Pier and Pléiades-derived turbidity using [1] (black arrow).

Conclusions

- Retrieved turbidity maps from L8/OLI and Pléiades showed good quality compared to in situ values in the highly turbid waters of RdP
- L8 images (30m) could provide quantitative information to sediment transport study to help understanding patterns of main tributaries plumes and to detect near shore currents and small water discharges.
- High spatial variability could also be observed in the Pléiades image and finer scale features could be detected that are useful for monitoring water quality in key regions, like water intakes. The influence of waves in this high resolution imagery needs further study.

References

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Acknowledgements

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