

Performance of VIS/NIR and NIR Turbidity and Total Suspended Matter concentration algorithms in 3 turbid waters: Scheldt, Gironde, Río de la Plata

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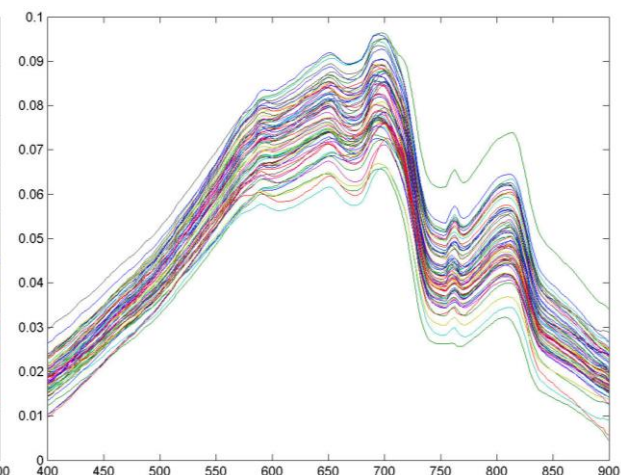
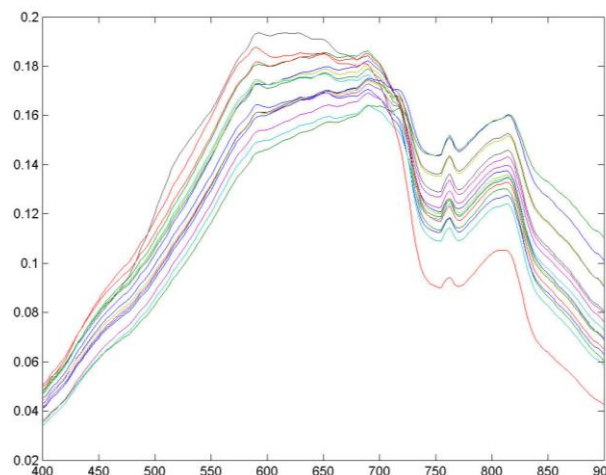
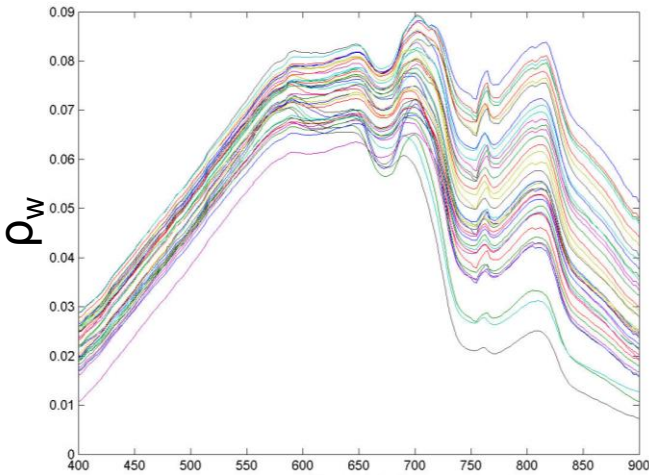
Scheldt (2-5 Jun 2012)

Gironde (11-16 Jun /2012)

La Plata (13-23 Nov 2012)



Reflectance (ρ_w): ASD & Trios

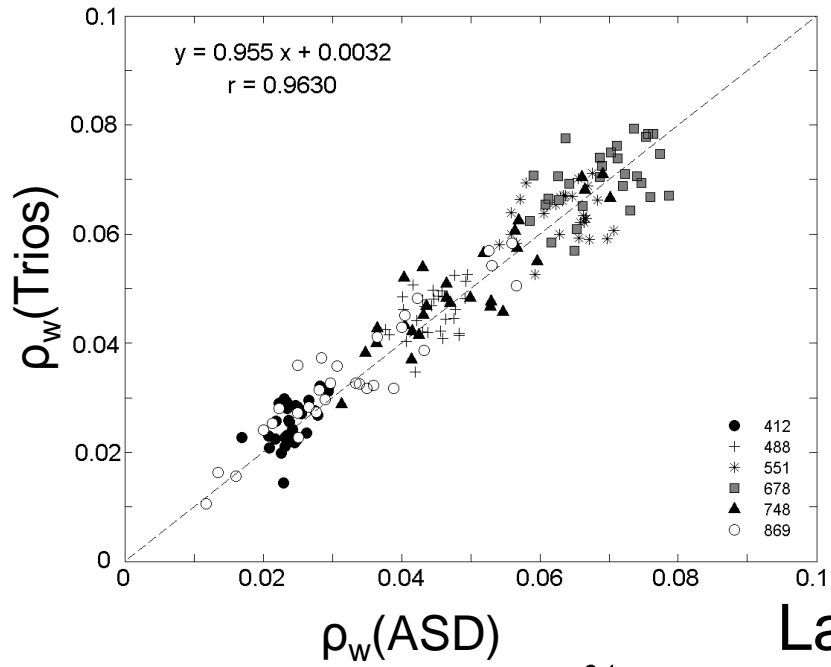


TSM 49 - 347
T 48 - 371 FNU

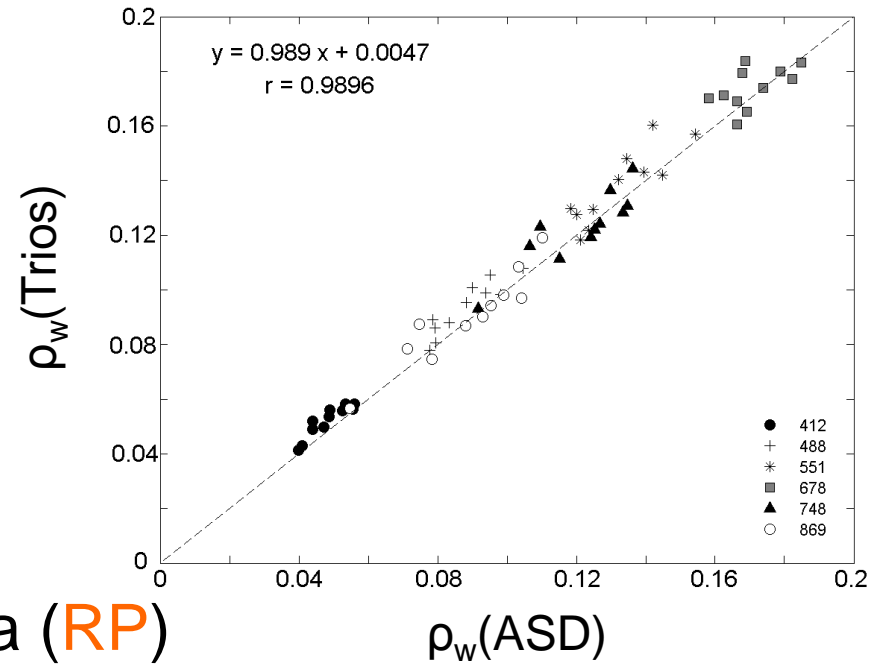
50 - 2800 mg L⁻¹
256 - 1900* FNU

30 - 160 mg L⁻¹
60 - 188 FNU

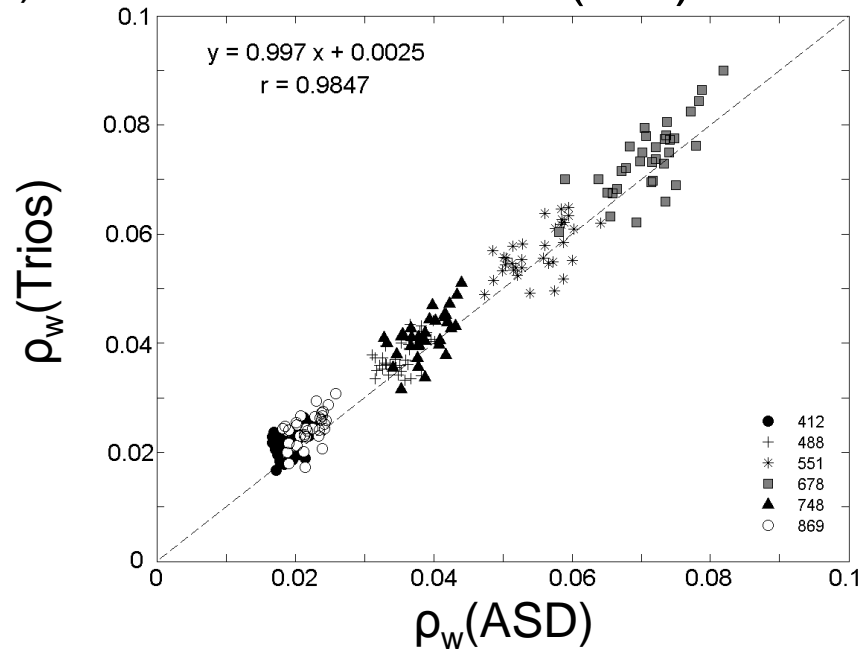
Scheldt (SA)



Gironde (GIR)



La Plata (RP)



TSM algorithms

VIS/NIR band ratio (empirical algo like in Doxaran et al. 2002)

$$TSM = A \exp\left(\frac{\rho_w^{xx}}{B}\right)$$

$$\rho_w^{86} = \rho_w^{859} / \rho_w^{645}$$

$$\rho_w^{85} = \rho_w^{859} / \rho_w^{555}$$

NIR single-band (Nechad et al. 2010 v.13)

$$TSM = A_{TSM}^{\lambda} \frac{\rho_w^{\lambda}}{\left(1 - \rho_w^{\lambda} / C_{TSM}^{\lambda}\right)}$$

$$\lambda = 859nm$$

$$A_{TSM} = 3510.5 FNU$$

$$C_{TSM} = 0.211$$

T algorithm

NIR single-band (Nechad et al. 2009 v.11)

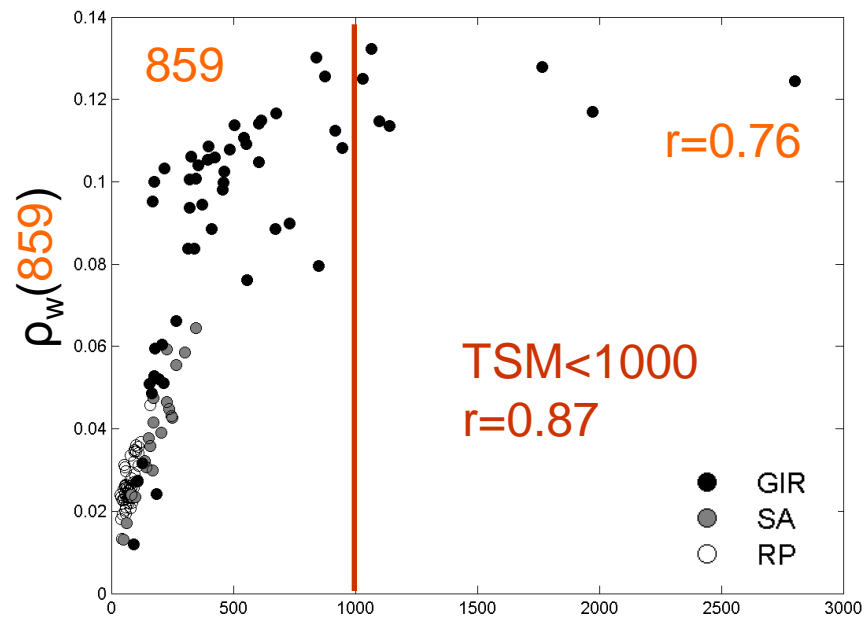
$$T = A_T^{\lambda} \frac{\rho_w^{\lambda}}{\left(1 - \rho_w^{\lambda} / C_T^{\lambda}\right)}$$

$$\lambda = 859nm$$

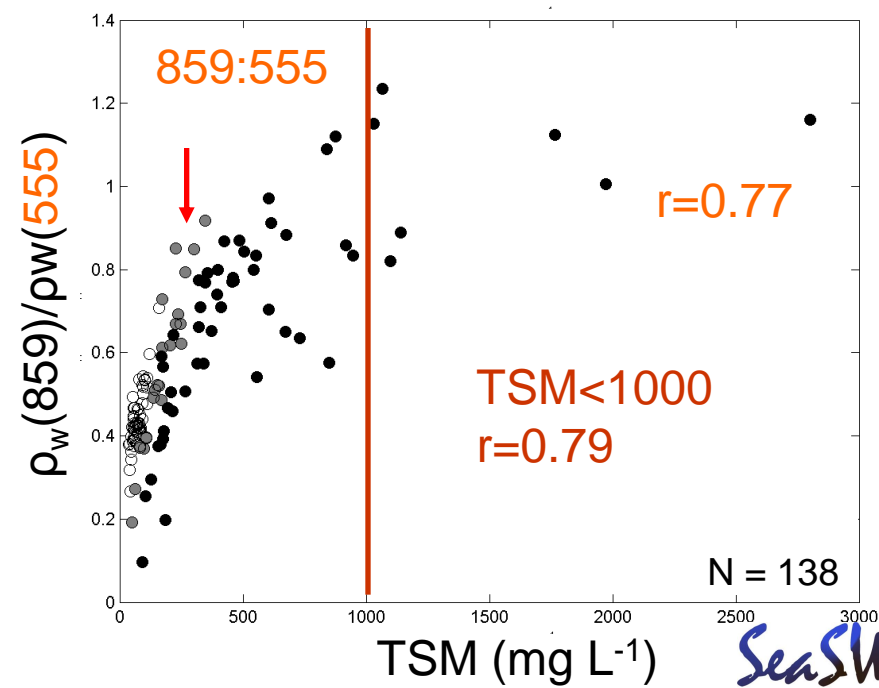
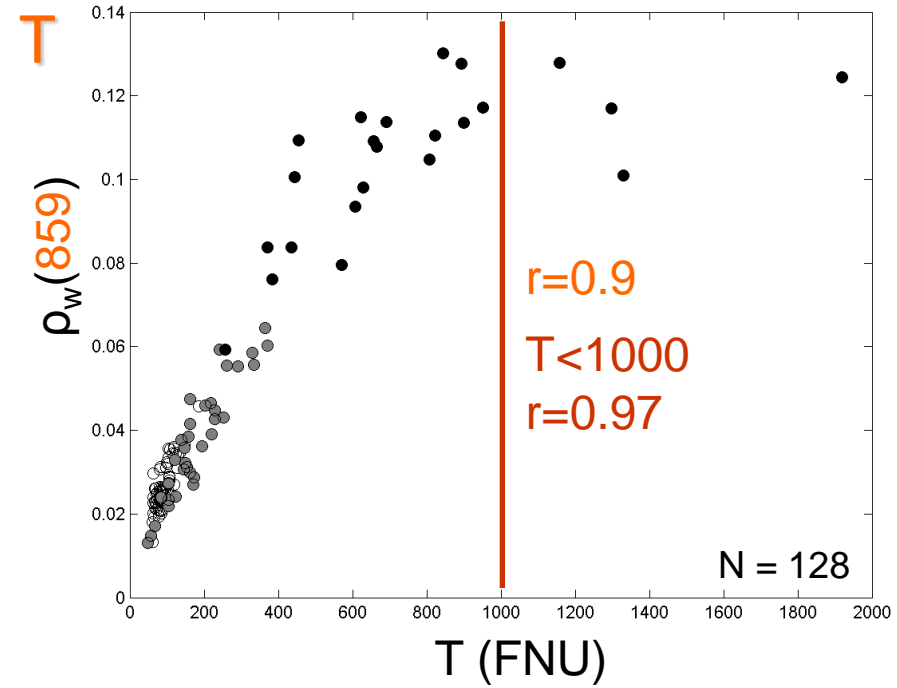
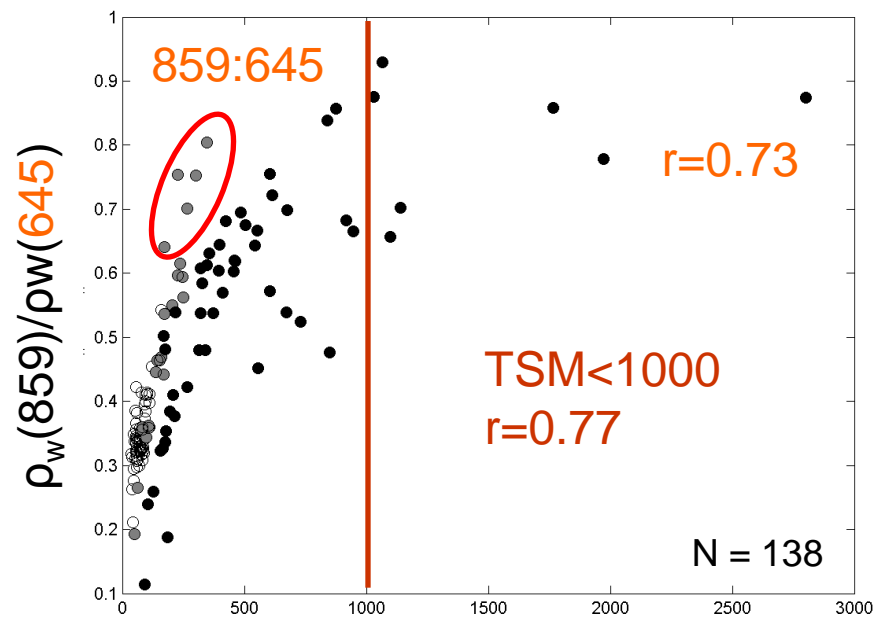
$$A_T = 3078.9 FNU$$

$$C_T = 0.211$$

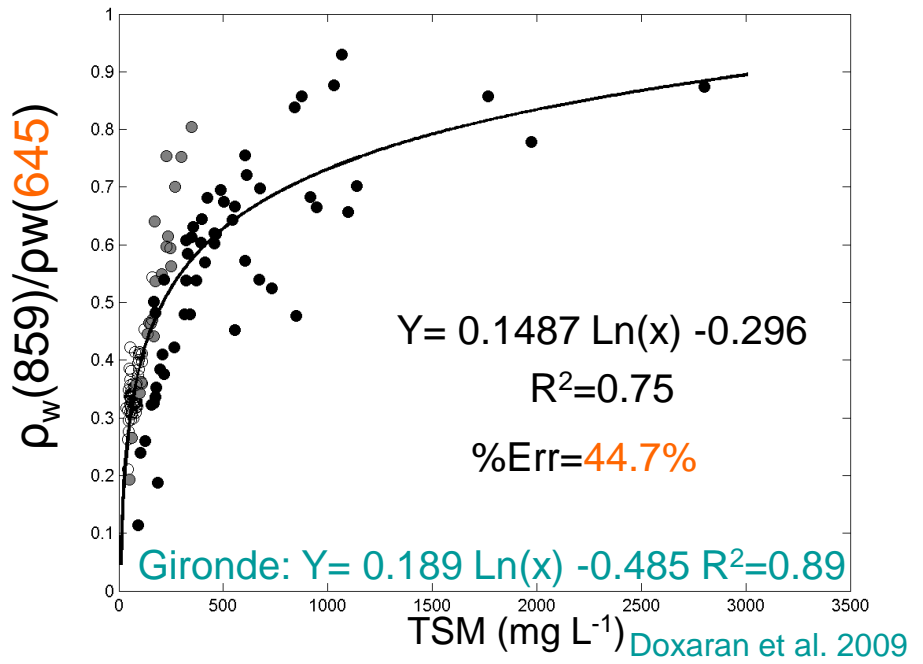
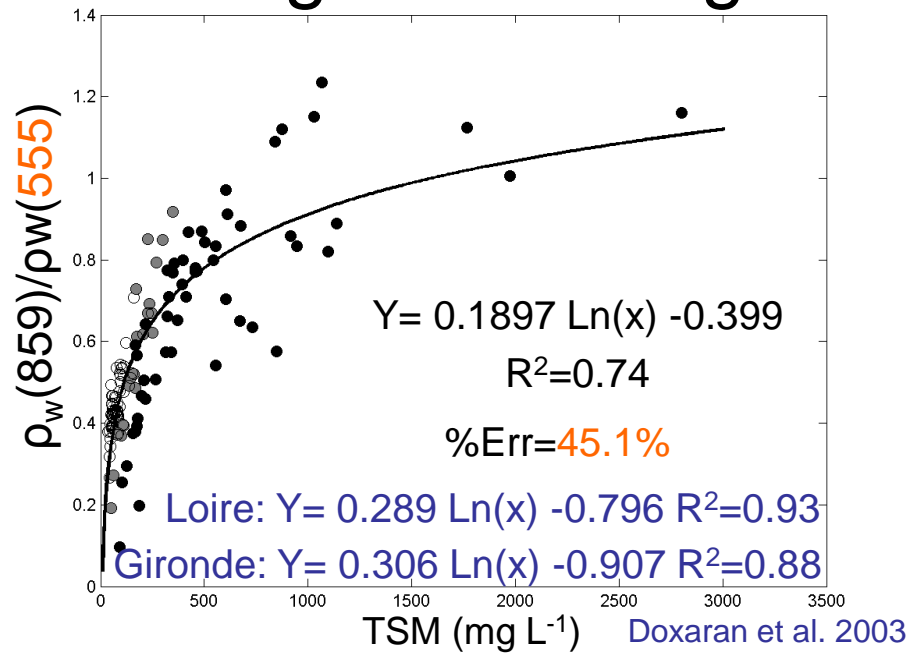
TSM Single-band



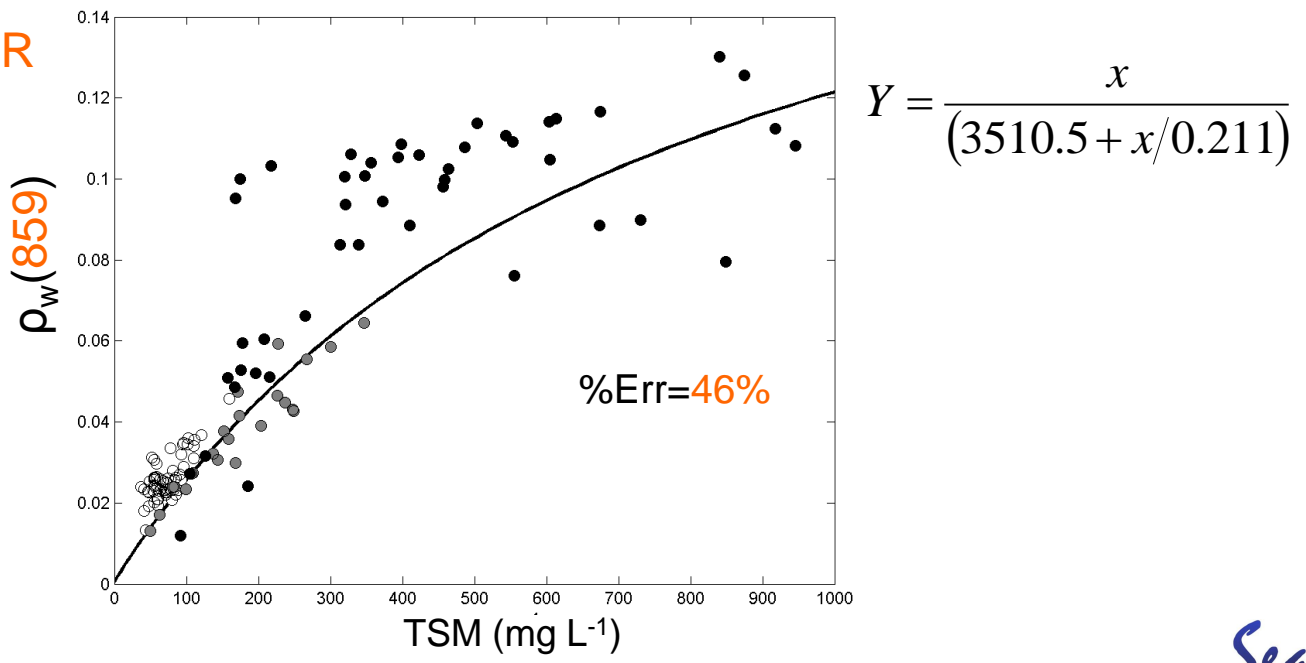
Band-ratio VIS/NIR



TSM Logarithmic regressions VIS/NIR

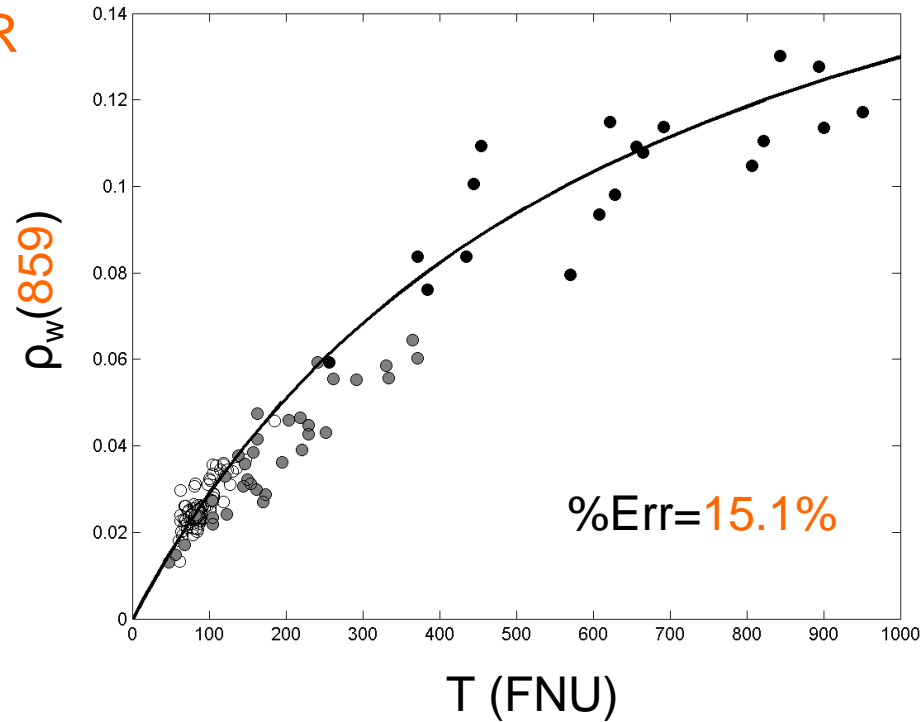


TSM Single band NIR



Single-band T algorithm

T Single band NIR



$$Y = \frac{x}{(3078.9 + x/0.211)}$$

MODIS images during campaigns

La Plata (14 Nov 2012) 17:55 GMT



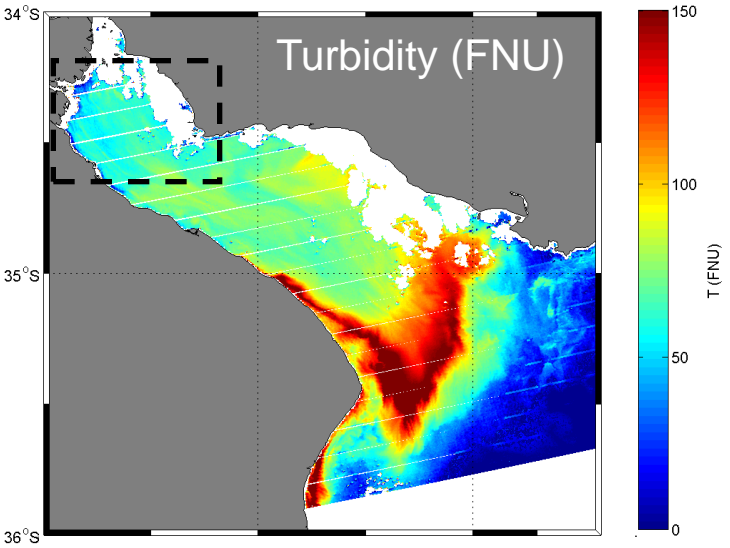
Gironde (15 June 2012) 12:35 GMT



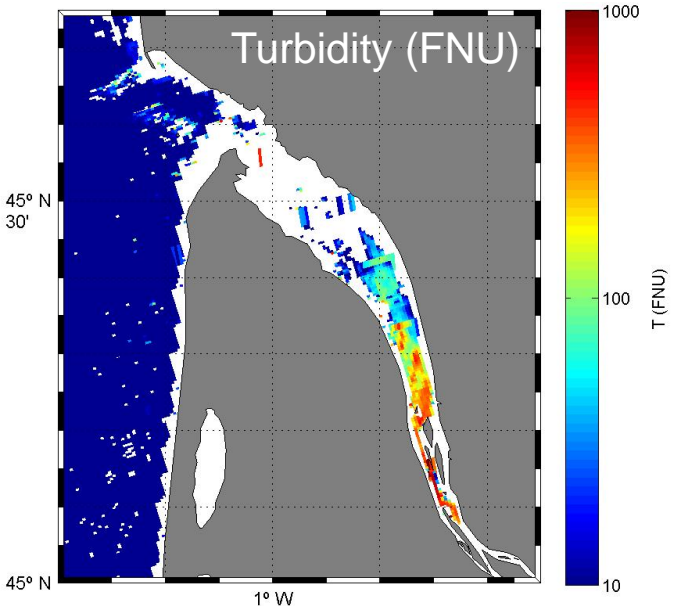
MODIS image processing

L0 -> L1A (HiRES) -> L2 (Rrs using NIR-SWIR AC) -> T map (859nm)

14 Nov 2012
17:55 GMT



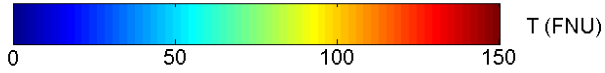
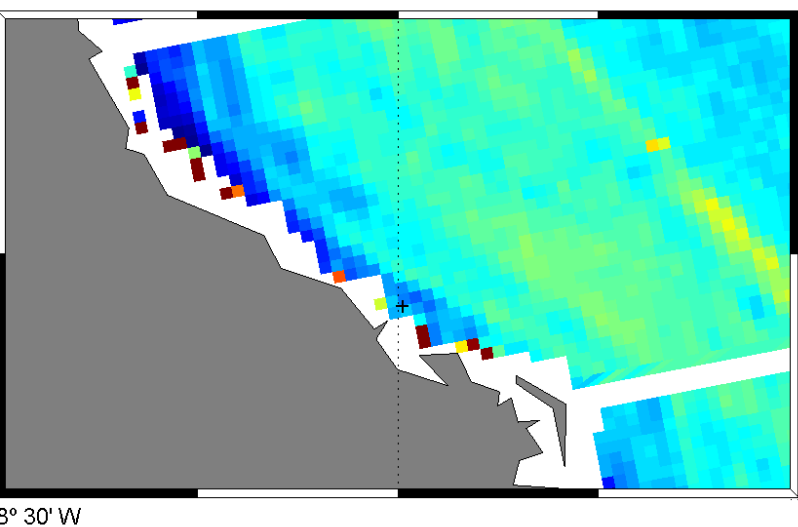
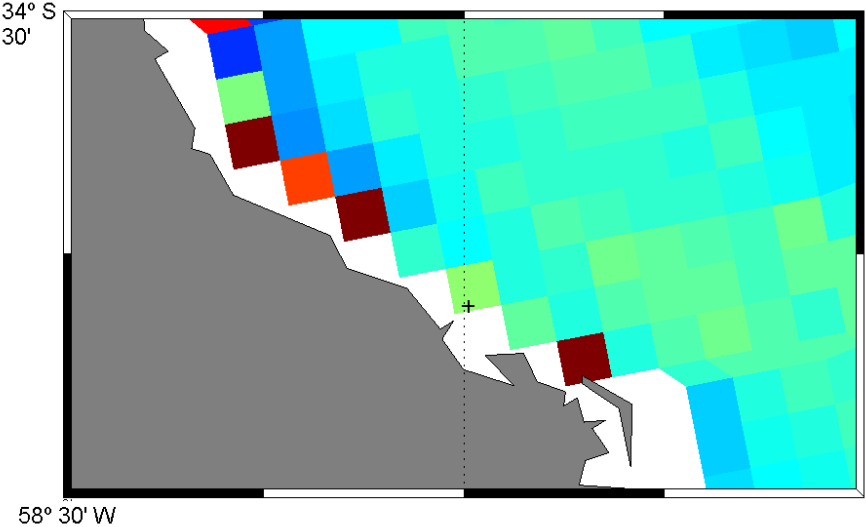
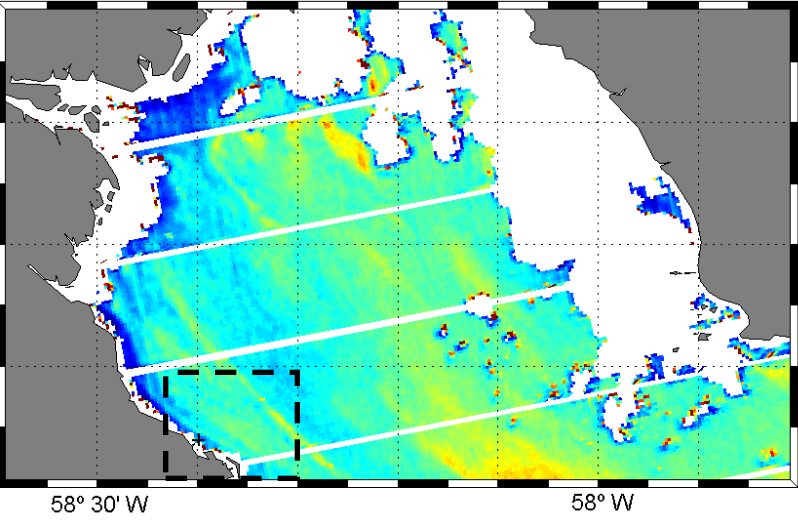
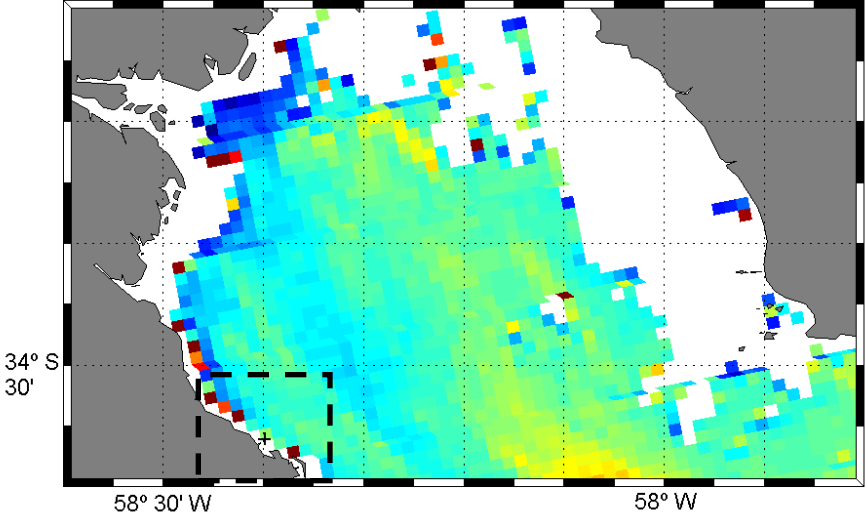
15 June 2012
12:35 GMT



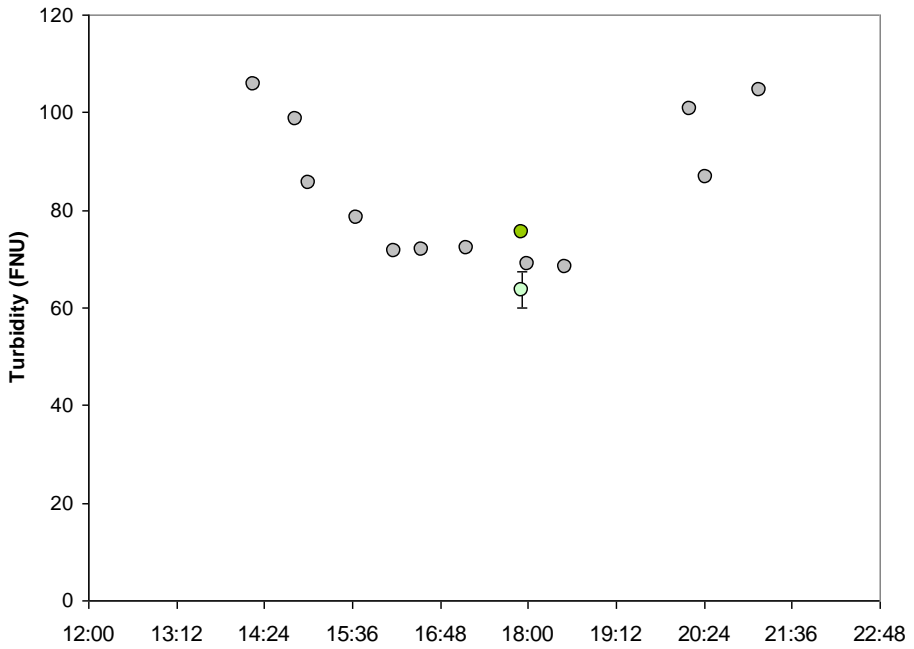
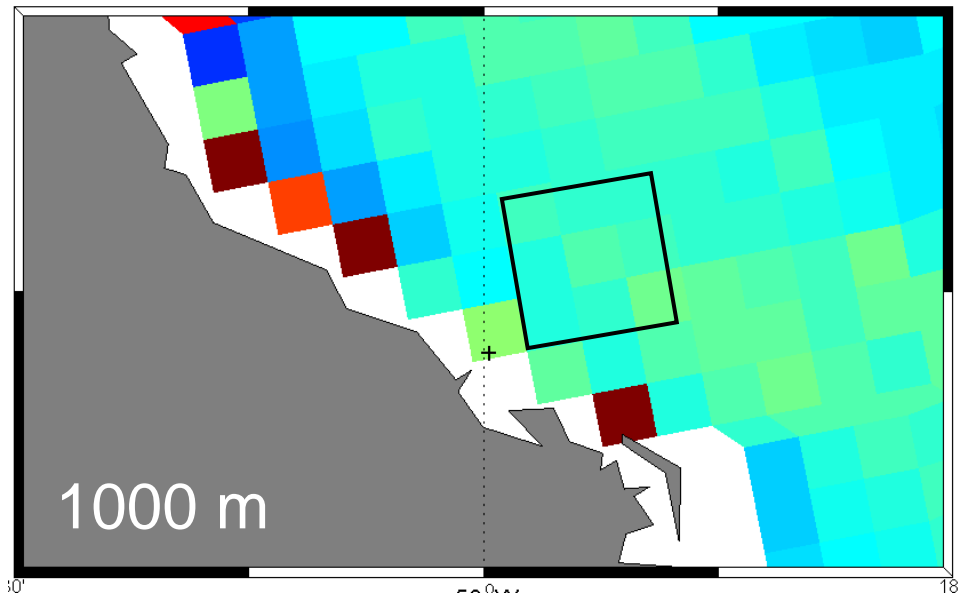
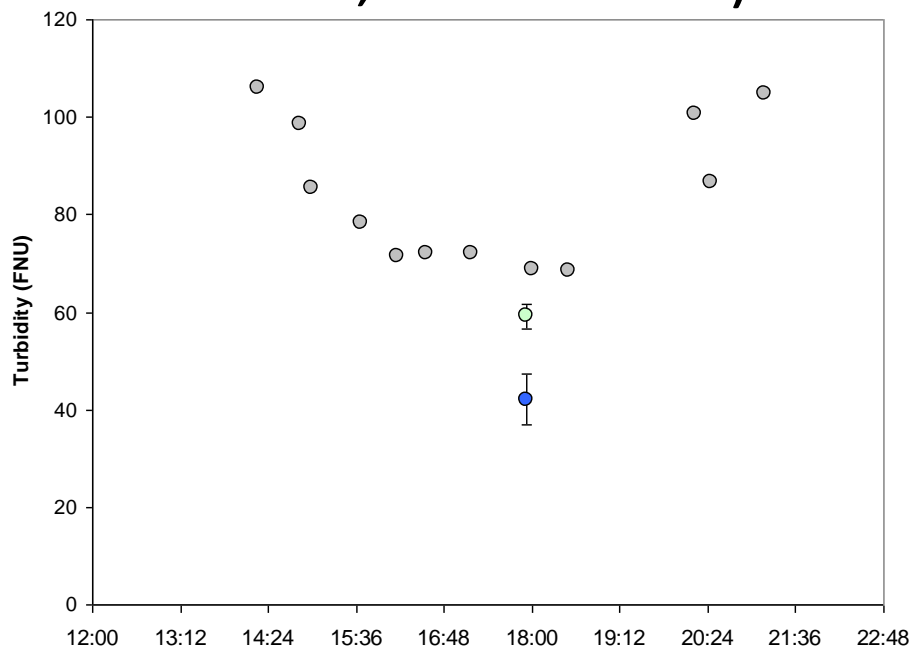
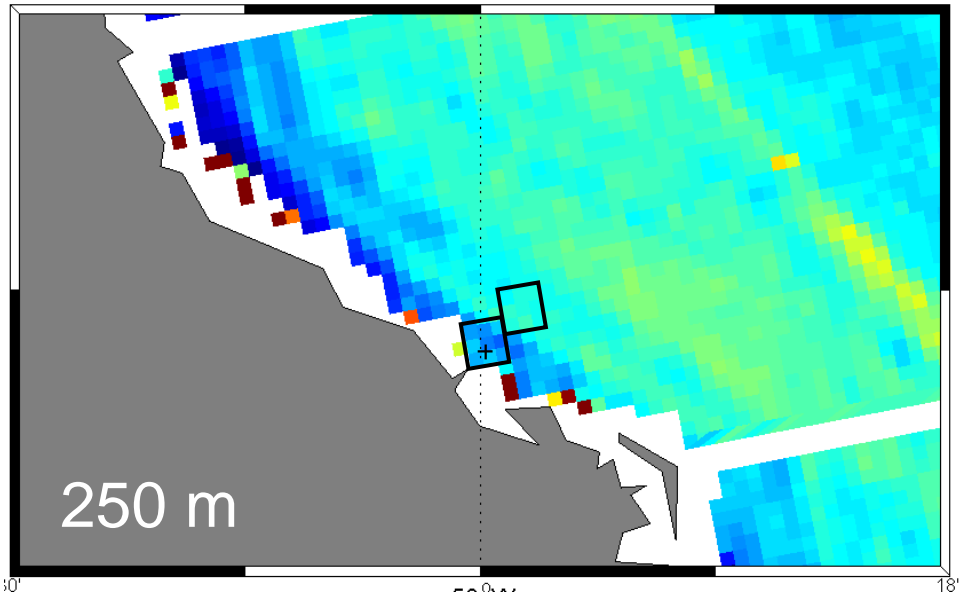
La Plata Turbidity Map MODIS (14 Nov 2012, 17:55 GMT)

MODIS 1 Km

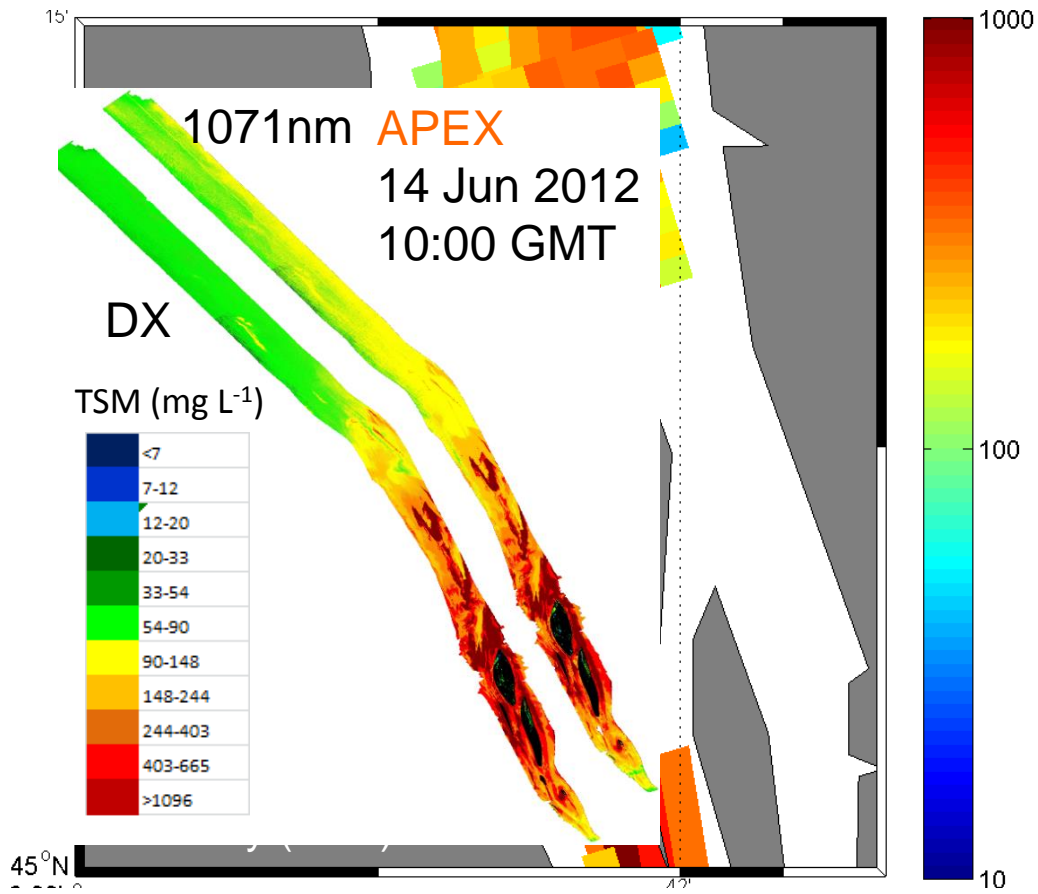
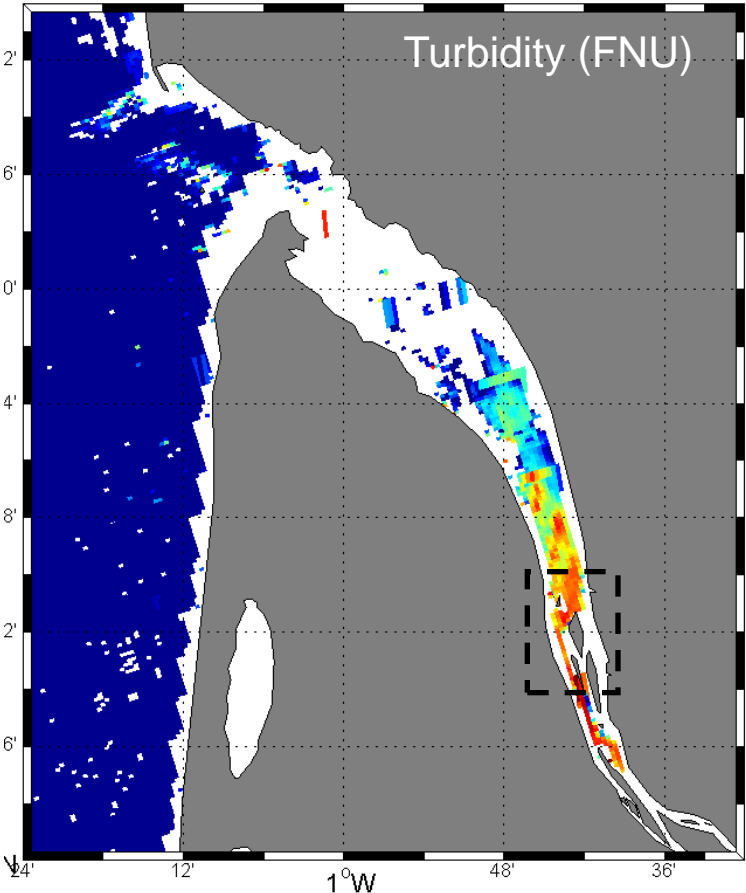
MODIS 250 m



La Plata Turbidity Map MODIS (14 Nov 2012, 17:55 GMT)



Gironde Turbidity Map MODIS (15 Jun 2012, 13:35 GMT)



- Gironde estuary was very close to the edge of the MODIS swath

Conclusions

- ✿ Using SeaSWIR database better correlations between **TSM** vs **NIR** (859nm) ($r=0.87$) than vs NIR/VIS band ratios for $TSM < 1000 \text{ mgL}^{-1}$ were obtained. Moreover, better correlations were found using the green (555nm, $r=0.79$) than the red (645nm, $r=0.77$) band.
- ✿ Better correlations between **T** vs **NIR** band ($r=0.97$ for $T < 1000 \text{ FNU}$)
- ✿ Uncertainties obtained using band ratios and single band algorithms to estimate **TSM** were $\sim 45\%$, while for **T** using a single band algorithm was $\sim 15\%$
- ✿ Simultaneous field and **MODIS-Aqua** derived **T** values for La Plata campaign were in **good agreement**. The high spatial resolution band didn't show better results due to high influence of land to pixels close to the coast.
- ✿ First results with existing high spatial resolution with SWIR bands remote sensors (HICO & APEX) promising

Thank you!