**Pushing the limits of atmospheric correction over very turbid waters**

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Capability of ocean colour sensor to provide sea surface reflectance over sediment-dominated waters relies on the so-called Bright Pixel Atmospheric Correction (BPAC). The challenge is to decouple marine and atmospheric signal in the near-infrared (NIR), so that the classical atmospheric correction can properly operate as if over clear waters. Inspection of recent satellite data over the Amazon plume, Rio de la Plata river and smaller estuaries shows evidence that growing turbidity is still a limiting factor and generally yields to complete failure of the atmospheric correction.

The present work is a successive attempt to push the limits of the BPAC. The core element is a coupled atmosphere-hydrological model defined by a set of free variables (sediment concentration and aerosol) and fixed constants (spectral shape of inherent optical properties). Information is restricted to NIR bands in order to avoid too large uncertainties in the model, due to lower absorption of pure seawater near the visible and larger absorption of non-modelled components; also we discard SWIR bands, not present on most of past and future sensors.

We first demonstrate that inversion is mathematically ambiguous at high turbidity for some band combinations, what explains the classical confusion between aerosol and sediment. We then show that the problem can be solved unambiguously through a χ2 minimization method on three NIR bands, taking into account input uncertainties. Finally particulate absorption is identified as a key modelling parameter. MERIS maps and validation results demonstrate the significance of these findings for future data processing.

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