Monitoring of sedimentary fluxes in the Amazon basin using satellite images

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• Satellite images are routinely used to monitor oceanic waters (primary production monitoring)

• New satellite sensors allow to monitor inland water quality:
  – Hyperspectral sensors at medium resolution
  – Very high spatial resolution sensors (SPOT 5)

• Which water quality parameters can be assessed by satellite?
  – The parameters that affect the optical properties of the surface water
  – We cannot directly measure water temperature, pH, dissolved oxygen or the presence of dissolved pollutants
  – Yet, we might infer those parameters from the optical properties of the water
Satellite images over the Amazon basin

- Rio Negro
- Floodplain lakes
- Amazon river

200 km
The satellite data that will be used

- **MERIS** (ENVISAT satellite) – ESA
  - 300-meter resolution, 1 image / 3 days, 15 bands

- **MODIS** (Terra & Aqua satellites) - NASA
  - 250 & 500-meter resolution, 2 images / day

Spectral bands:

![Graph showing spectral bands for SPOT, MODIS, and MERIS]
Monitoring of sedimentary fluxes with satellite

Example: ORE - HYBAM Manacapuru Station (2002-03)

- **Bleu**: Measured sediment load
- **Rouge**: Satellite Reflectance

MODIS images:
Red and NIR channels 500-meter mode

(Martinez et al. 2004)
Monitoring of sedimentary transfers at fine scale

Map of the sediment concentration in the surface water

Legend

TSS: 0 2.5 5 10 15 20 25 30 > 35 (mg/l)

Amazon river

Floodplain lakes
Perspectives : Integration in the ORE « HYBAM » observatory

• Definition of an automated data processing chain

  – Download of MERIS & MODIS images
    • SEAS-Guyane IRD antenna
  – Pretreatments
    • Atmospheric corrections, image synthesis
  – Inversion
    • From the satellite signal to the sediment load
  – Coupling with altimetry
    • Virtual station