Advantages and Challenges for geostationary ocean colour remote sensing

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Breakout Session 2
SEVIRI daily composite of 34 images
Quasi cloudfree

MODIS: 1 image
60% clouded

SEVIRI high temporal resolution
=> better for tidal and cloudy regions

Turbidity (FNU)

[Neukermans et al, 2012; Neukermans, 2012]
The advantages of GEO observations (North Sea)

a) scattered clouds, b) tidal variability

#days with 12:30 image OK
#days with ≥1 image
#days with ≥4/6 images (10-15:00)

[Ruddick et al, 2014]

- Fresnel reflectance, \( R_f \), of the sea surface!
- \( R_f = \frac{\text{reflected}}{\text{incident}} \) (air)

\[ \text{incident} \rightarrow \text{reflected} \rightarrow \text{transmitted} \]

\[ \text{Air} \rightarrow \text{Sea} \]

[Mobley, 1994]

Strong sky/sun reflection at high VZA/SZA

Weaker water-leaving radiance for high VZA (marine BRDF)
Some “new” problems

- E.g. Wave shadowing

SeaSWIR campaign
Rio de la Plata, Nov 2012
SZA=75°, wave height=10-20cm

[Ruddick et al, 2014]
Viewing Zenith Angle (VZA) and Geographic coverage

5 GEO coverage for VZA=60° (black), 70° (grey), 80° (white)

This is the challenge!

[Ruddick et al, 2014]
Challenges and Questions

- **Multitemporal** data processing?
- LEO-GEO synergy? Combined products?
- High sun and viewing zenith angle challenges:
  - What is the **maximum air mass** for atmospheric correction? 5? 8?
  - Is high air mass atmospheric correction best by direct (“Gordon-Wang”) or indirect (e.g. neural network, POLYMER) methods?
  - Can we correct for air-sea interface at high sun/viewing zenith?
  - Can we correct for atmospheric “spherical shell” (earth curvature)? (YES)
- ... Degradation of spatial resolution with viewing zenith angle

Some references for SEVIRI work:

- Neukermans G. Optical in situ and geostationary satellite-borne observations of suspended particles in coastal waters. Ph.D. dissertation, Université du Littoral
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  - BELSPO-funded GEOCOLOUR project
  - ... EUMETSAT SEVIRI-WT project

- Data from:
  - EUMETSAT (SEVIRI)