A proposal for a new IOCCG working group

Theme: ocean colour observations from the geostationary orbit

Proposed by David Antoine

IOCCG working group
"Ocean colour from the geostationary orbit"

Plan

- Motivations for a new WG

- Interests of the geostationary orbit for ocean colour remote sensing studies (science & operational), illustrated by a few examples

- Possible terms of reference for the working group

- Possible membership for the working group

IOCCG working group
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Motivations

Several projects have been submitted to agencies in the past decade (to ESA, NASA, CNES, ...)

A few examples (non-exhaustively):
-Special event imager (NASA / NOAA), W.E. Esaias & C. Brown PIs, not selected
-A proposal to NASA, J.W. Campbell PI, not selected
-NASA's "Hyperspectral Environmental Suite" (HES), eventually not selected
-BIOGEOSAT (ESA / CNES), D. Antoine PI, not selected
-COMS-1 / GOCI, to be launched soon
-"Advanced Baseline Imager" (ABI) on GOES-R or –S (only 2 large bands in the VIS)

Only one is now planned for launch (GOCI on COMS-1, from Korea)

The interest for such observations is growing, which means that other missions might be decided within the next 5 years

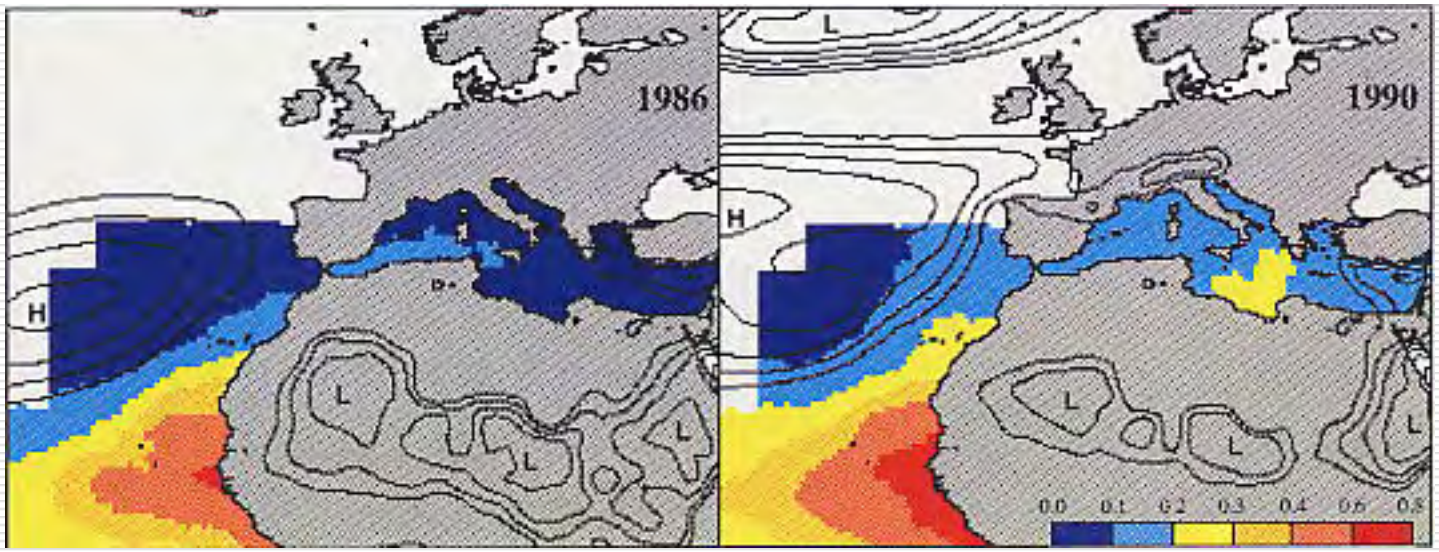
So, it's typically where IOCCG can enter into play, in order to set up requirements, to advocate for coordination, to foster collaborations etc...

Observations from the geostationary orbit : For what use up to now ?

⇩ Telecommunications

⇩ Meteorology

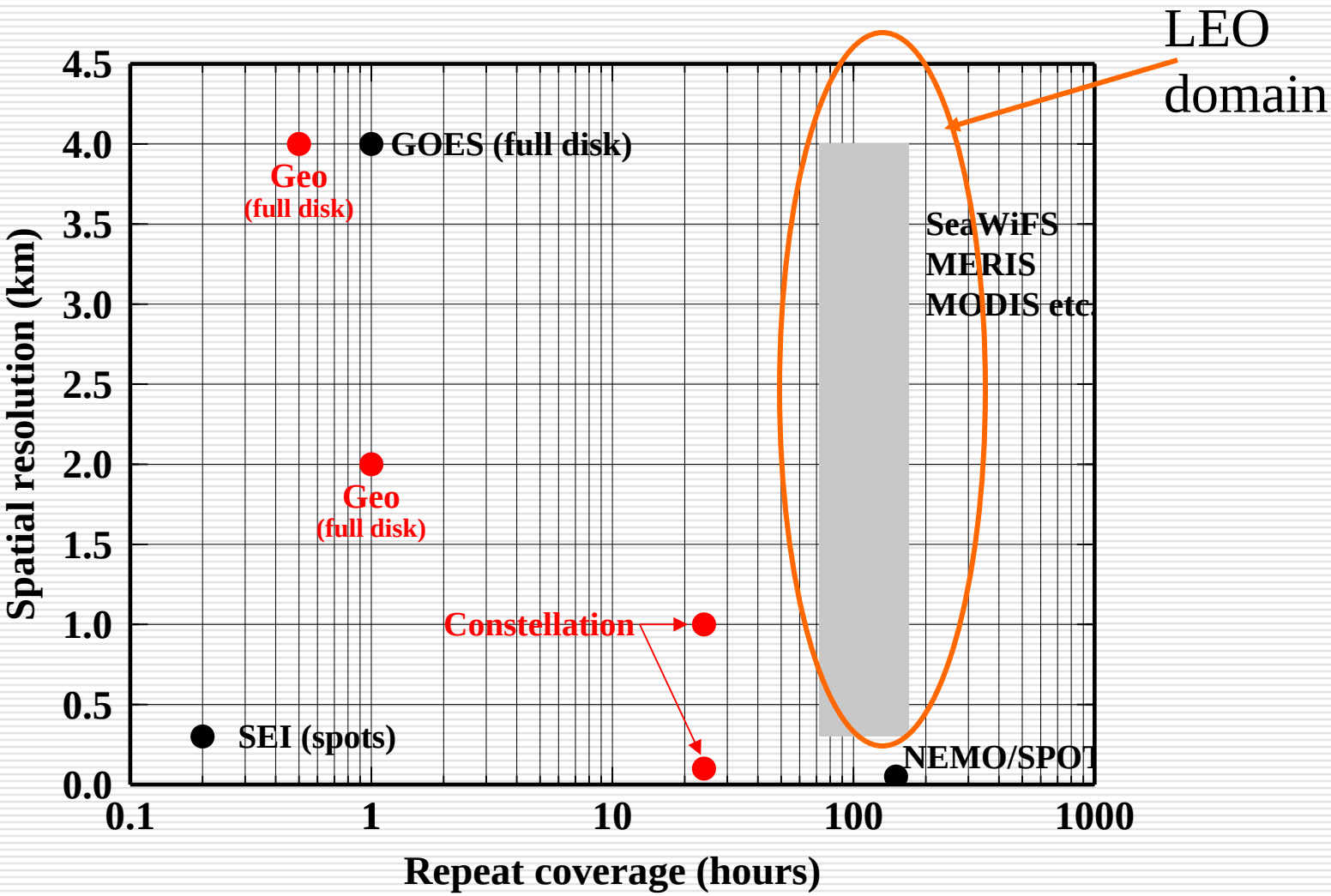
⇩ Scientific studies (aerosols, for instance from METEOSAT)



Moulin et al., Science, 1997

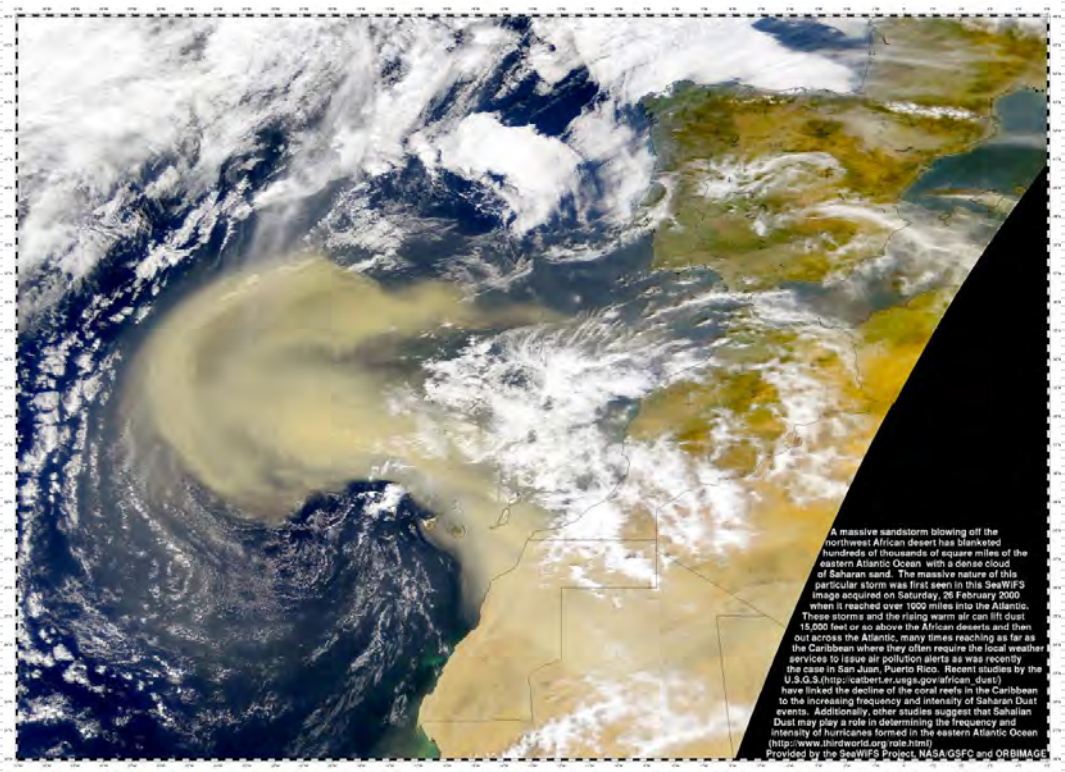
Observations from the geostationary orbit : Interest (advantages) for ocean colour remote sensing studies

Observations from the geostationary orbit : Spatial and temporal scales accessible



Interests of the geostationary orbit (1/8)

⇩ Possibility to follow episodic events, at the scale of hours : red tides, dissemination of sediments by rivers (floods), aerosol plumes (deserts, fires, pollution, volcanoes), response to storms…



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Interests of the geostationary orbit (2/8)

⇩ Tidal effects in the coastal environment

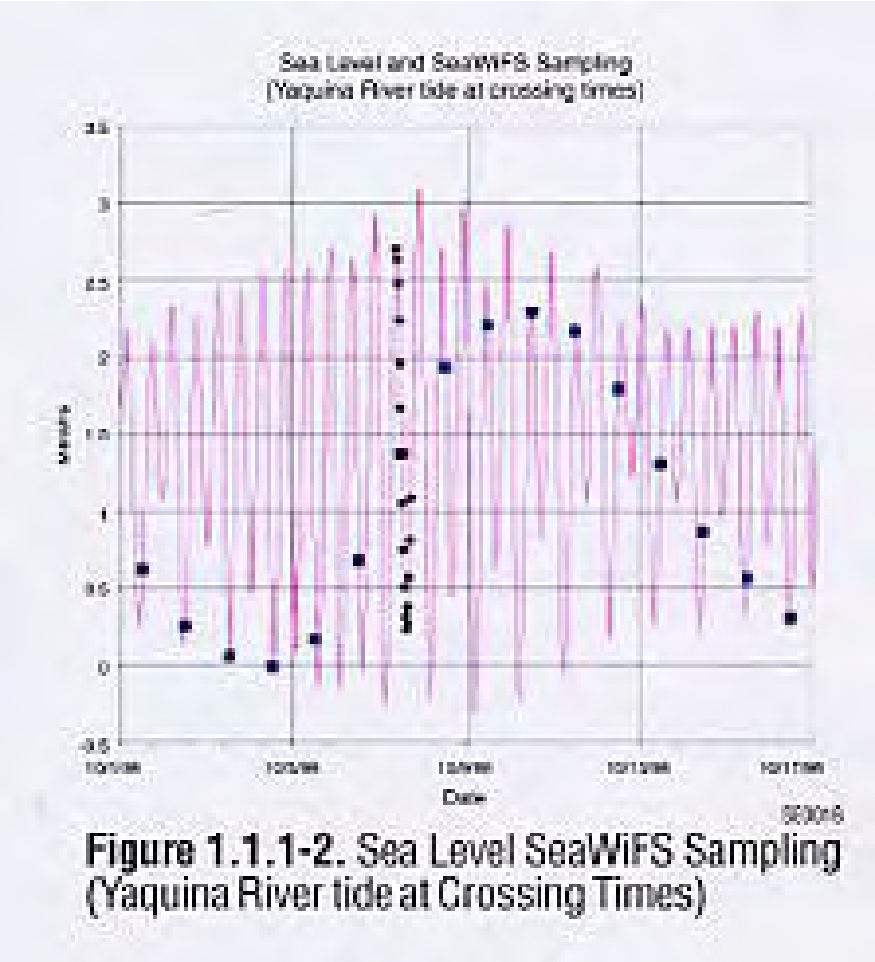


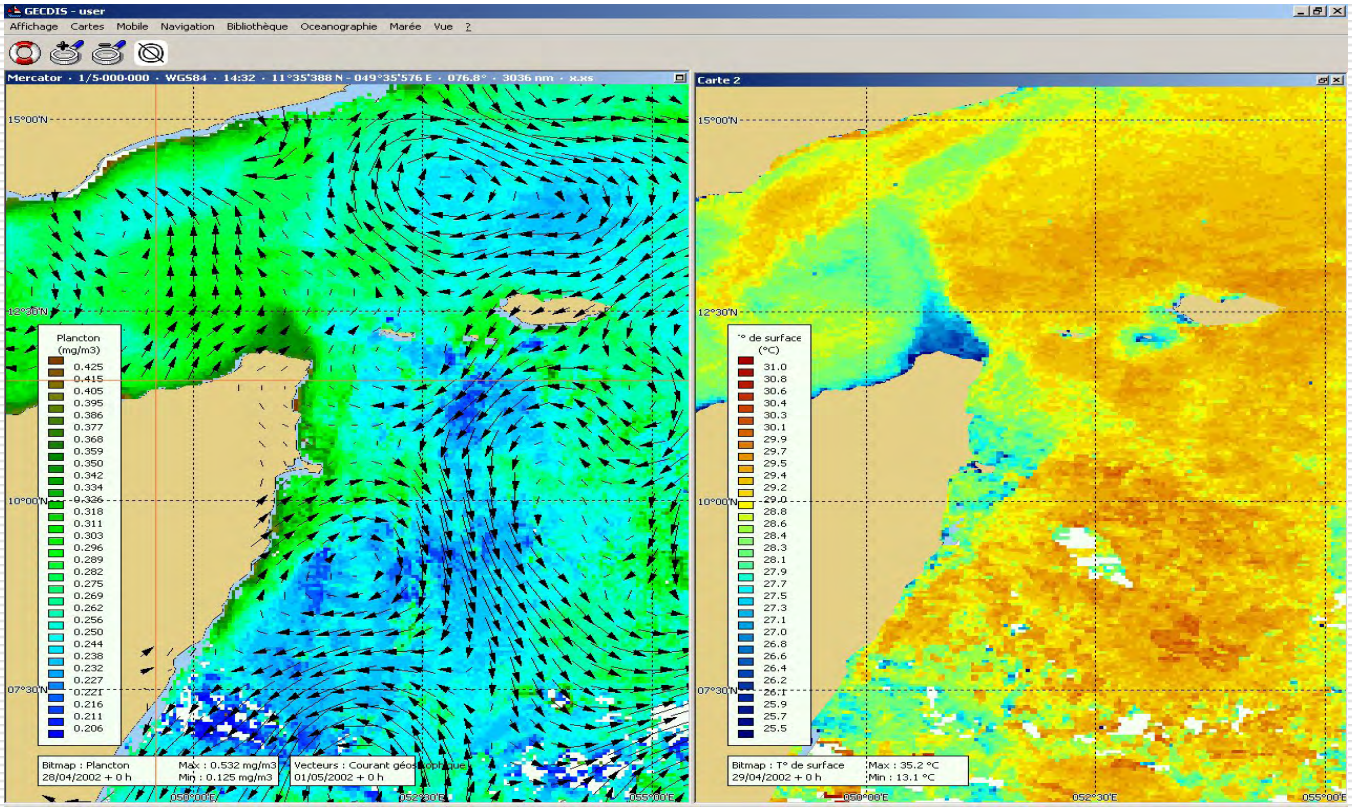
Figure 1.1.1-2. Sea Level SeaWiFS Sampling (Yaquina River tide at Crossing Times)

From Esaias W.E. and C.W. Brown, SEI fact sheet, NASA/NOAA

Interests of the geostationary orbit (3/8)

⇩ Improving the match between the temporal scale of satellite observations and those of models (data assimilation in particular, but also validation and initialization of models)

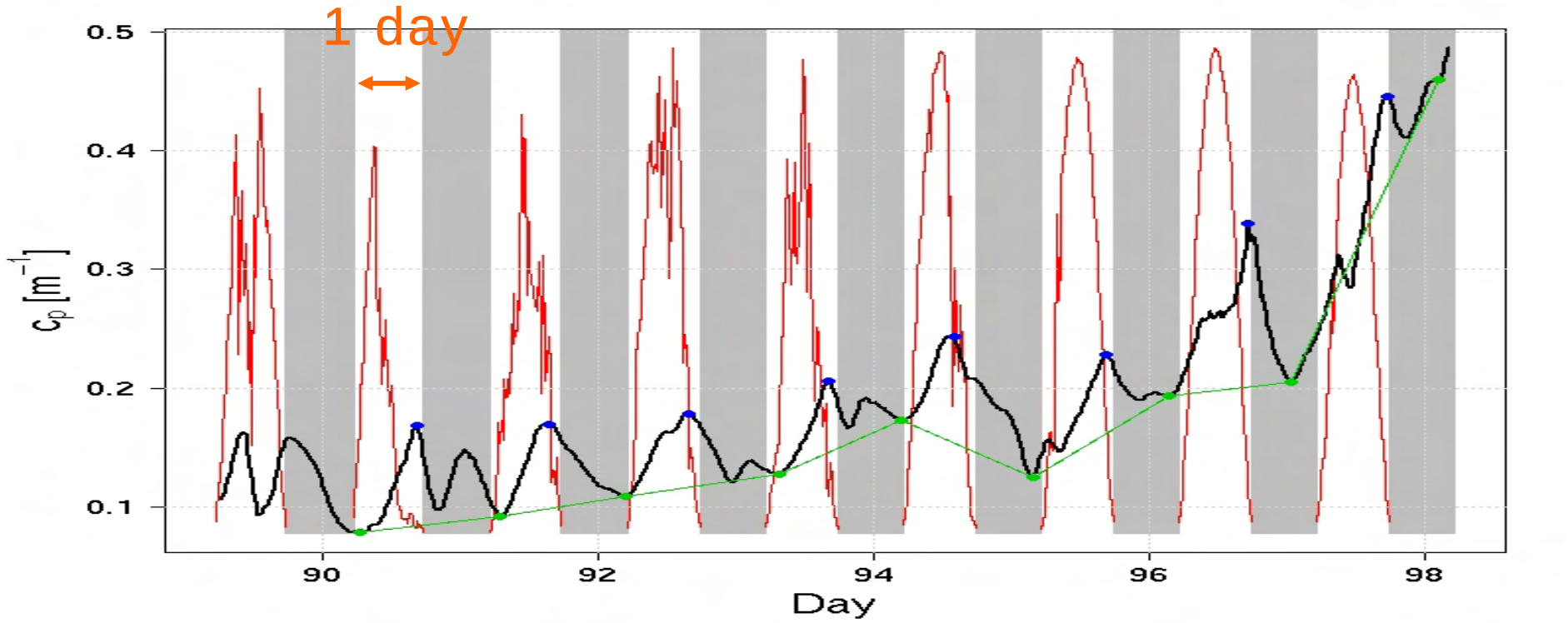
« CATSAT » System, developed by CLS



Interests of the geostationary orbit (4/8)

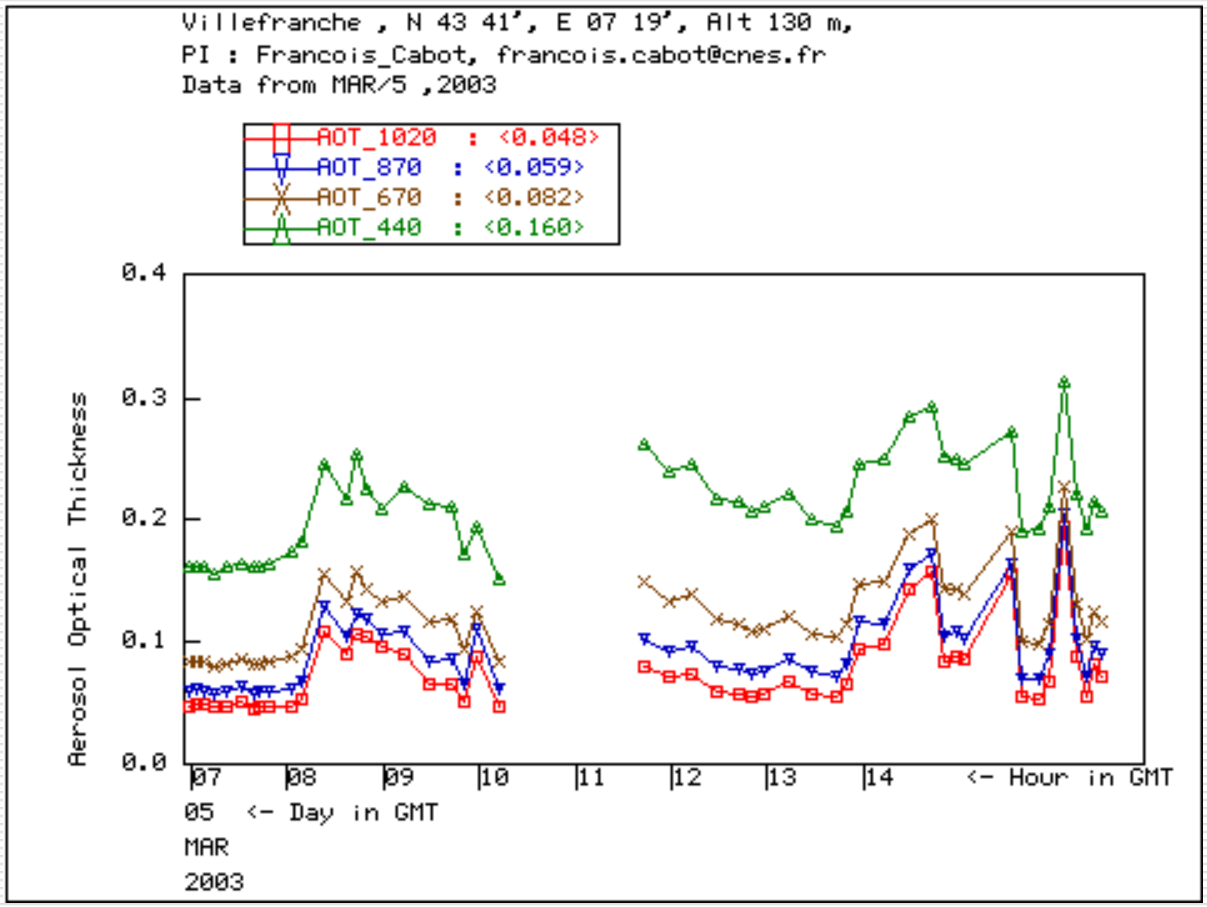
⇩ The daily cycle of some properties becomes accessible

Example: the beam attenuation coefficient of particles ($c_p(660)$), as measured at the BOUSSOLE site in the Mediterranean (a few days during the 2007 spring phytoplankton bloom)



Interests of the geostationary orbit (5/8)

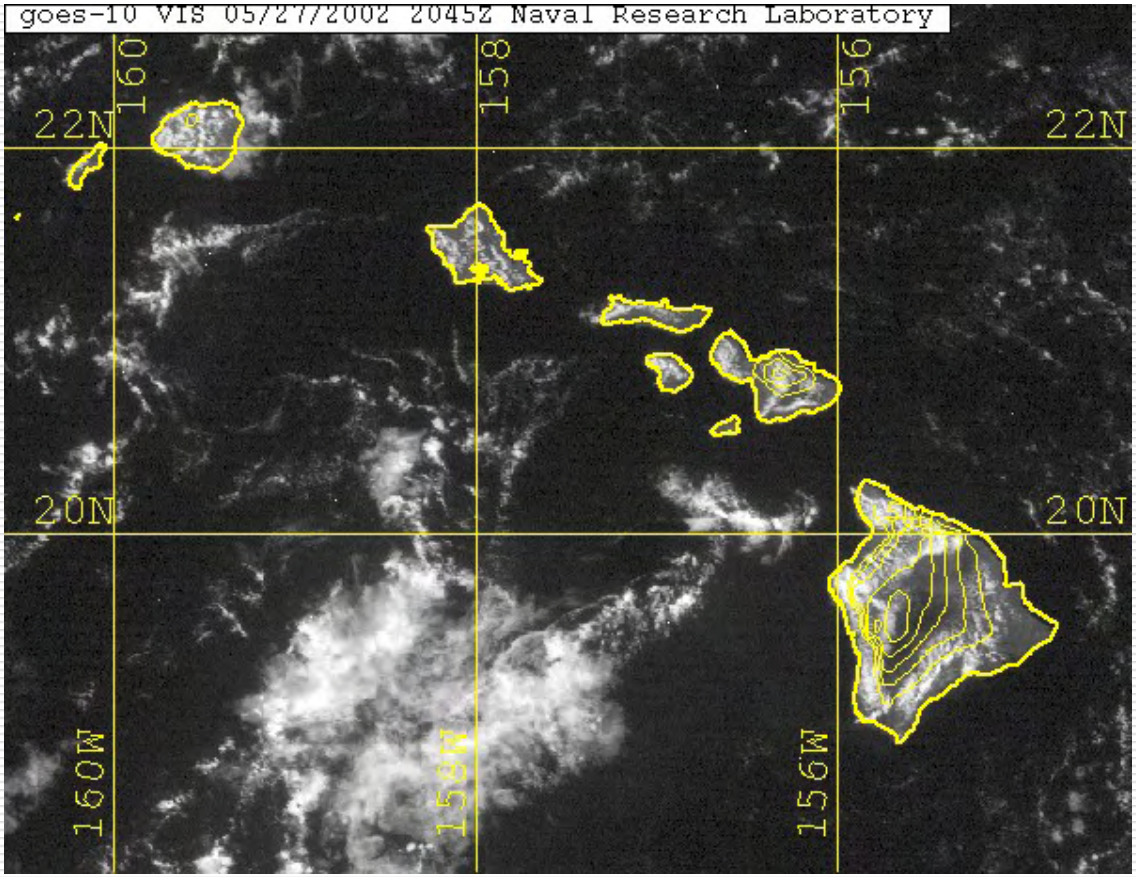
⇩ The daily cycle of some properties becomes accessible: aerosols



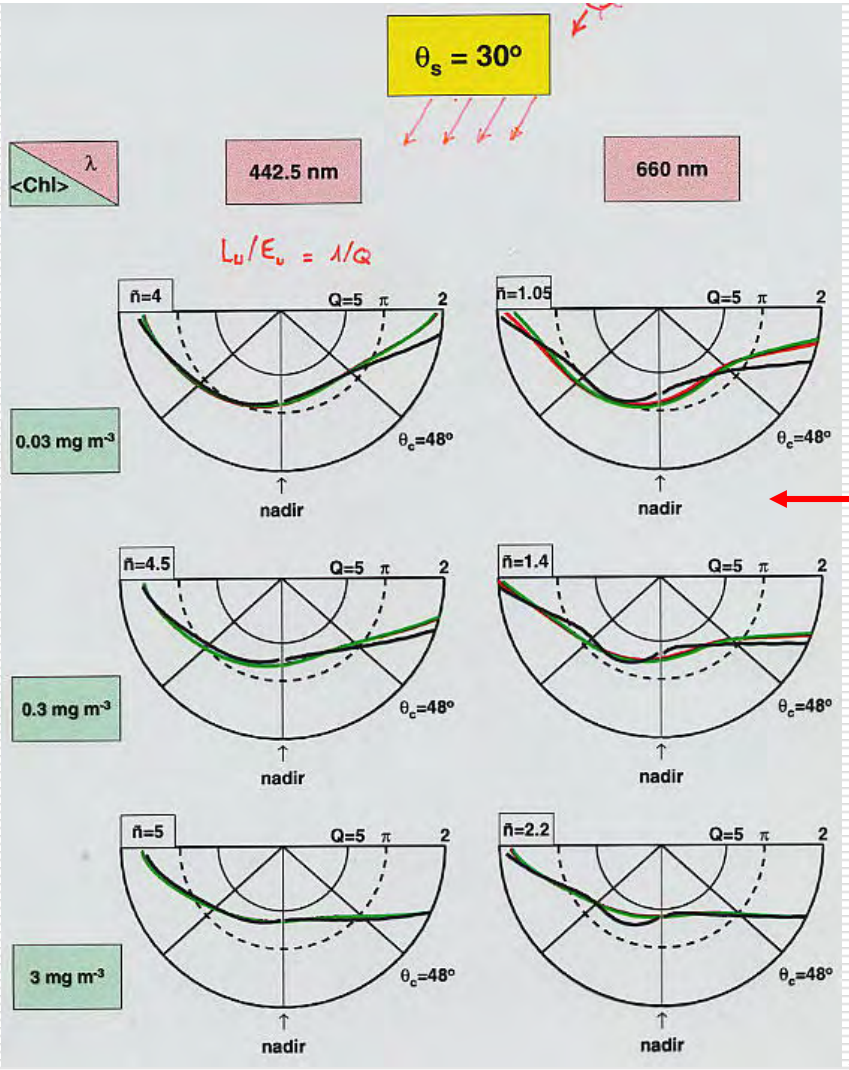
AERONET, Villefranche / mer

Interests of the geostationary orbit (6/8)

⇩ Elimination / study of clouds



Interests of the geostationary orbit (7/8)



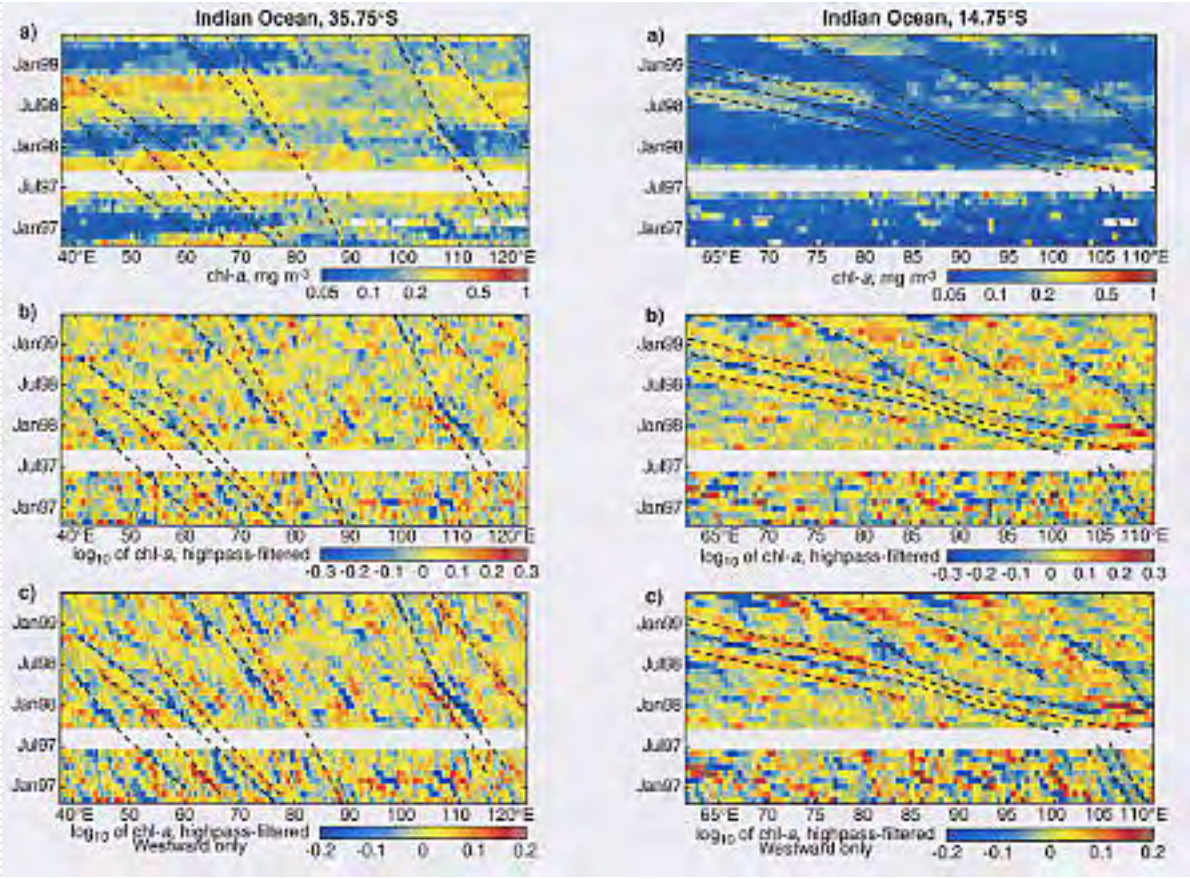
⇩ The bi-directionality of surfaces can be sampled (several observations with the same viewing angle and varying solar elevations)

← Directionality of the submarine light field

Adapted from Morel and Gentili, 1993

Interests of the geostationary orbit (8/8)

⇩ « Planetary waves »



Rossby waves & ocean color (Cippolini et al., *Geophysical Research Letters*, 28(2), 323-326, Jan 15, 2001)

Interests of the geostationary orbit: synthesis

"In many respects, the **polar-orbiting instruments study the effects of processes**, whereas the **geostationary instruments can study the process itself**" (Chesters *et al*., 1998).

"The Earth has many fast ("weather") and slow ("climate") modes.. If we hope to make reliable predictions of weather and climate, we have to monitor land, sea, and air on their natural scales. The main energy pumps are the annual and diurnal cycles, each with comparable driving power. The Earth's response to the cyclical solar drivers is episodic and irregular. **Therefore we must resolve not only the the seasonal cycle for many years, but also variations in the diurnal response cycle, … over the globe**" (Chesters, Adler and others, 1998).

"The **direct effect** of man-induced changes might be more accessible to **high-frequency observations**, while the **indirect effects** are more accessible to classical **low-Earth-orbiting satellites**"

Observations from the geostationary orbit: feasibility

Paramètre	maturité des algorithmes	Faisabilité à partir de l'orbite géostationnaire
Luminance normalisée	+++	+++
Chlorophylle	+++	+++
Propriétés optiques inhérentes	++	+++
Groupes phytoplanctoniques	-	+
Sédiments	+	+++
Substances jaunes	+	+
Fluorescence	-	+
Eaux rouges	-	+
Eclairement photosynthétique	++	+++
Epaisseur optique des aérosols	++	+++
types d'aérosols	++	++

⇩ Mature algorithms exist for LEO observations, which can be adapted to the GEO configuration

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Possible terms of references

- Demonstrating the value of the GEO orbit for ocean colour observations (research & operational uses)

- Inventory: some of the most significant past projects, and the existing missions

- Complementarity LEO / GEO

- What would be the "ideal" mission(s)

- Requirements

- Recommendations

End of presentation
Thank you