

European prospects for a Geostationary ocean colour mission

The “Ocean Colour Advanced Permanent Imager” (OCAPI)

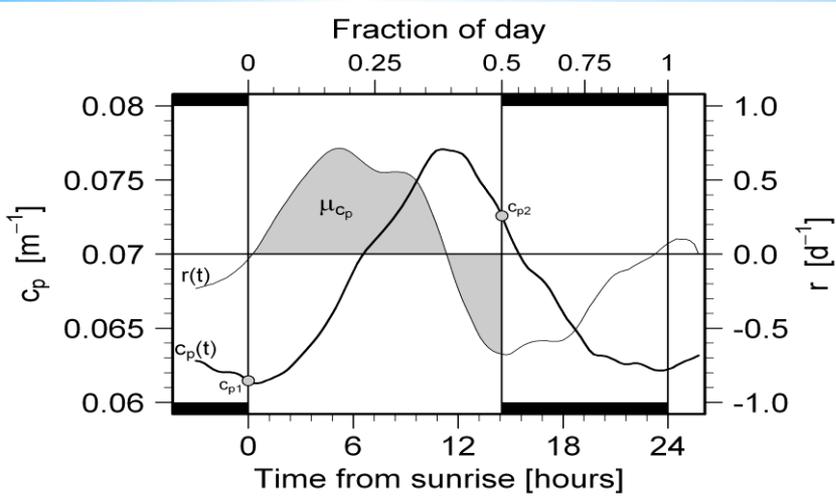
International context

- One mission has been launched in 2010: **COMS-1 / GOCI** from **KARI/KORDI**
- **NASA** includes GEO observations as one of its priorities, in the “Advanced plan for NASA’s Ocean Biology and Biogeochemistry Research, NASA, 2007”, and has the **GeoCAPE** mission proposal under investigation
- **ESA : Geo OCULUS** (R&D stage). Very high resolution for risk assessment.
- **ISRO** also considers the GEO orbit for future Earth observations missions (GEO-HR mission for risk monitoring / assessment)
- **CNES** is currently investigating the **OCAPI** mission proposal
- **IOCCG** has set up a working group on ocean color observations from the GEO orbit. This group has prepared an IOCCG monograph (report #12), to be published spring 2013.
- The EC Implementation Group of the Marine Core Service :
“**GMES** should allow for research and technological developments. In particular, the possibility of embarking new instruments with the potential to meet GMES needs should be considered. **Wide Swath altimetry and geostationary ocean color are the two most important new technology development that will benefit the GMES MCS in the long run.**”

OCAPI: overarching objectives

1. Within a range of conditions of observation (solar & view angles, clouds, ...), the **diel dynamics of the ocean will be accessible**. The 1st objective in this case is to study the ocean ecosystem functioning at the diurnal scale. The diurnal cycle of photosynthesis / respiration .. generates a diel cycle in the particulate pool, hence of the optical properties and of the recorded signal
2. In the above conditions and also when a little less observations will be available over a day, the 2nd group of objectives is related to observation & understanding of **rapidly evolving phenomena** (river outflows, aerosol plumes, phytoplankton blooms, (sub)meso-scale features ..). These phenomena are not necessarily linked to the biological functioning, and rather under the influence of physical forcings
3. When the conditions of observation do not allow the diel changes to be sampled, there is still the capability to **dramatically improve coverage**, with at least one observation of good quality per day in many areas. This is of tremendous importance for all **operational uses**, from data assimilation into coupled biological-physical 3D models to services in coastal zones

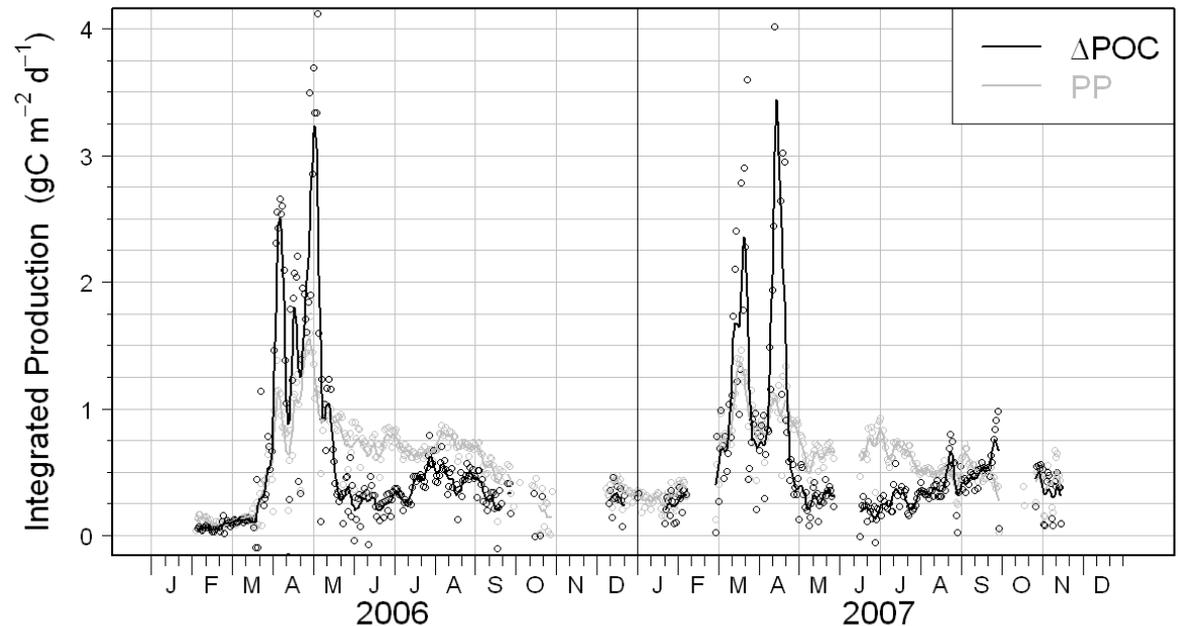
Diurnal cycle of optical properties and relation to NPP/NCP



Possible to go from Δc_p to DPOC.
 After integrating over the productive layer, one gets either NPP or NCP, depending on which Δc_p one considers

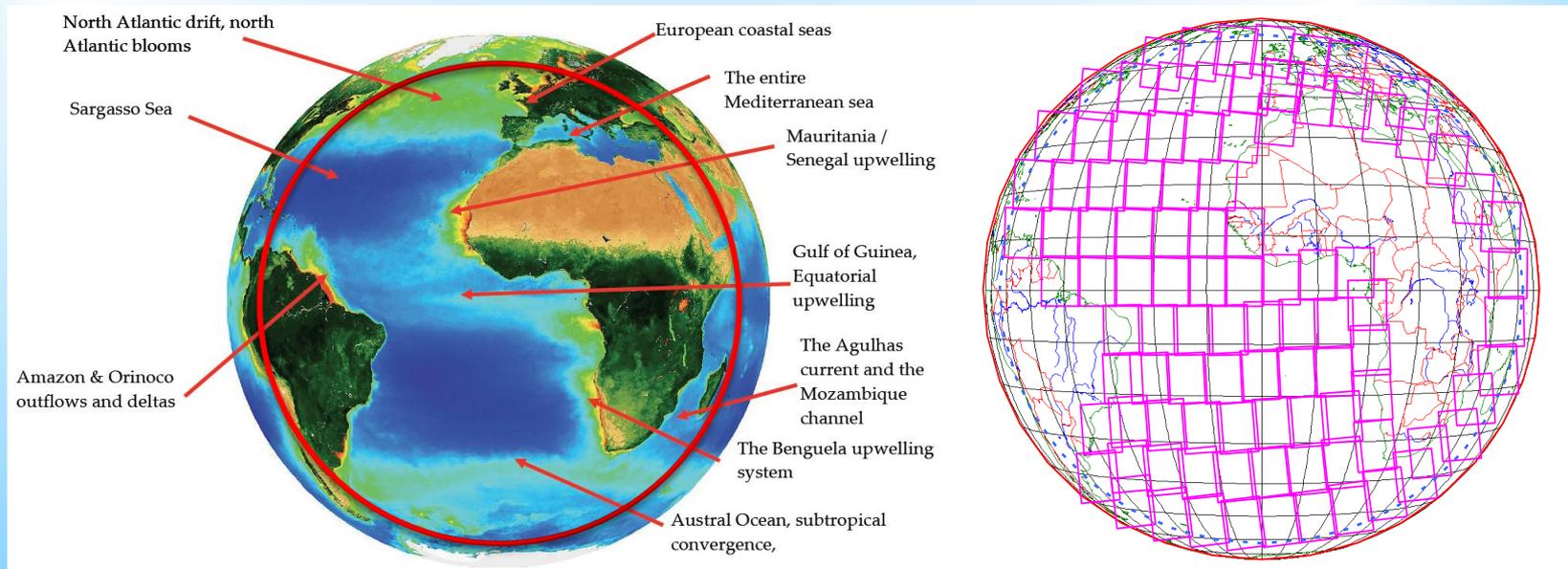
From Gernez, Antoine and Huot, 2011, L&O, 56, 17-36

Therefore: potential for a direct estimation of major carbon fluxes



OCAPI: preliminary mission elements

- Observation of all ocean areas (open + coastal) on the Earth disk at a ~1h temporal resolution from a geostationary orbit (slightly inclined geosynchronous have been evaluated also)
- Step & stare concept
- 250m GSD @ SSP
- 18 bands from 395 to 1020 nm (OLCI compatibility)
- High SNR required for ocean colour (>1000 @ 1-km resolution)
- On-board calibration devices (solar diffusers)
- Other characteristics typical of what's required for ocean colour (see IOCCG#13)



Where do we stand?

- First proposal to CNES in spring 2008 (built from past experience and other proposals for GEO or LEO missions led by our group)
- Presented at the CNES quadrennial prospective seminar in March 2009 → identified among the priorities
- Submitted in June 2010 to the “Earth Explorer 8” call from ESA → Excellent reviews but not selected because of cost and some uncertainties on launcher options
- An adapted version (much simpler) was proposed as a hosted payload aboard a telecomm satellite (hosted payload call from ESA in fall of 2011). Not selected at the end
- “Phase 0.2” studies have been conducted under CNES responsibility, as 2 parallel studies by Astrium and Thales-Alenia-Space (TAS). Concluded in March 2013. Led to select the 250-m option for possible continuation
- A mission review meeting will be held this fall (2013) at CNES. This will give the elements for CNES management to decide of a phase A in 2104.
- OCAPI will be again presented at the 2014 CNES quadrennial prospective seminar
- We are seeking for international collaboration/support (Brazil, South Africa, Belgium...)
- Science studies progress in parallel (diurnal cycles, assimilation...)