European prospects for a geostationary ocean color sensor: the "ocean color advanced permanent imager" (OCAPI)

David Antoine

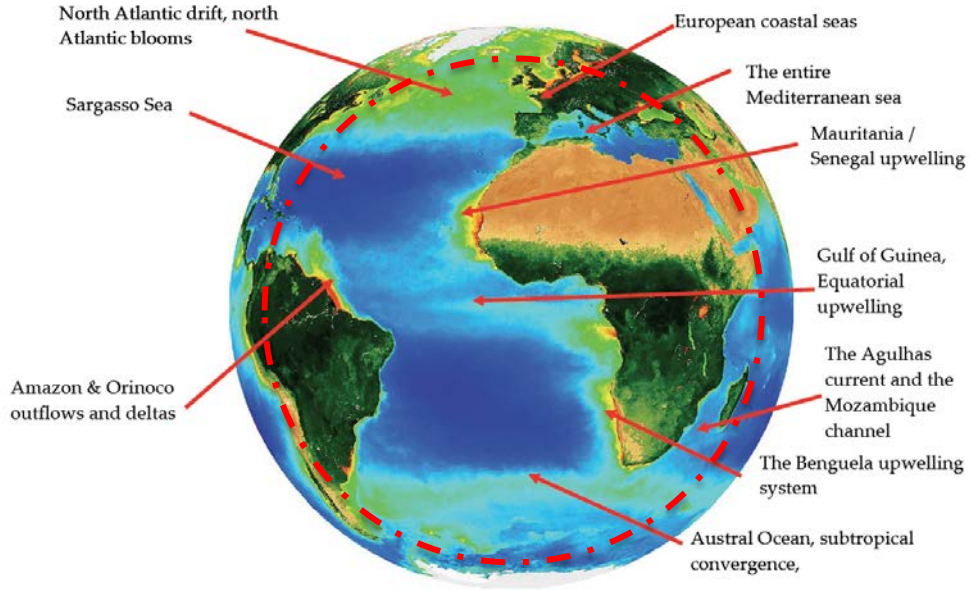
on behalf of the OCAPI science team

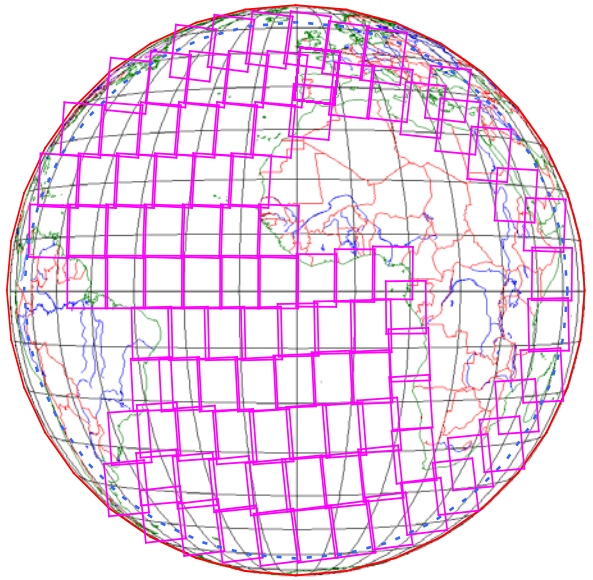
Curtin University, Remote Sensing & Satellite Research Group (RSSRG), Perth, Australia
CNRS-UPMC, Laboratoire d'Océanographie de Villefranche (LOV), France

2nd International Ocean Color Science Meeting, Geostationary Ocean Color splinter session, 16-18 June 2015, San Francisco, USA

The "ideal 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)





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

Science focus of the OCAPI mission

Encompasses open ocean and the coastal environment.

Includes:

- The diurnal cycle of ocean optical properties, and its relation to physics and biogeochemistry
- Biological-physical coupling at (sub)meso scale
- Data assimilation into coupled biological-physical models
- Improved marine biogeochemistry and ecosystem models
- Dynamics of coastal environments and ecosystems
- Sediment transport
- Aerosol transport
- Land – ocean interactions
- Operational services in the coastal zones

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 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.
- "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
- OCAPI was 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…)
- A "Phase A" study has formally started, with the aim of submitting a proposal to the ESA 9th Earth Explorer call (likely Q1 of 2016). Will be a simplified version of the "ideal OCAPI", for being proposed as a hosted payload on a commercial platform