Dissolved organic and inorganic carbon from space

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1. The importance of the oceans
2. The importance of the oceans

Dissolved organic and inorganic carbon (DOC, DIC)
Need for carbon focused efforts – synergy approaches

CEOS recommendation – product focused (Carbon), rather than discipline focused. Need to exploit multiple parts of the electromagnetic spectrum. Synergy approaches
Dissolved organic carbon

DOC is made up of many components – one is CDOM. DOC correlates with $a_{\text{CDOM}}$ in coastal, estuarine and shelf seas. Regional DOC approaches, exploit DOC-$a_{\text{CDOM}}$-salinity linkages. Published methods use SeaWiFS and/or MODIS-Aqua.

**Stocks:**
Del Castillo and Miller, 2008; Mannino et al., 2008; Griffin et al., 2011; López et al., 2012; Liu et al., 2014; Mannino et al., 2016.

**Fluxes:**
Del Castillo and Miller, 2008; López et al., 2012; Mannino et al., 2016.
Dissolved inorganic carbon

No direct optical signature
Salinity from space now allows DIC to be observed
Exploit salinity-alkalinity relationships via regional algorithms

Capability identified by:
Land et al., 2015
Salisbury et al., 2015

A survey in 2015 found one suitable algorithm:
Lee et al., 2000
Uses salinity and nitrate

major DIC Component (~85%)
Dissolved inorganic carbon

river dominated DIC flux and mixing as seen by Aquarius (salinity) using Lee et al., 2000
Dissolved inorganic carbon

Ocean colour – salinity – alkalinity could be exploited.

Note: Error of 1-3 PSU, results in a small (<5%) error in DIC and $A_T$
Suggested community effort and opportunities

Community effort:

• Continue to highlight the importance of observing ocean carbon at an international level e.g. greater participation at Carbon from Space, routine carbon assessments.
• Carbon focused products (CEOS recommendation) in units of carbon.
• Land-ocean fluxes of carbon needs to be explicitly included in annual assessments (CEOS/ESA/GCP recommendation).

Opportunities for ocean colour community to lead:

• UV methods for DOC (via CDOM)? Low Earth orbit?
• Salinity from ocean colour in coastal zone?, even if RMSE is 1-3 PSU.
• More regional DIC algorithm development and evaluation and/or retraining of existing regional algorithms using new datasets? e.g. GLODAPv2 dataset.
• Routine monitoring of land-sea DOC and DIC fluxes for large rivers? A good start would be to quantify variability for major rivers e.g. Amazon, Mississippi, Ganges.
The importance of the oceans