

Work Package 1

Production of global climate reanalyses

The logo for CRACIM2 is displayed in a large, stylized font. The letters are arranged in two rows: 'CRA' on top and 'CIM2' on the bottom. The 'C' in the top row is blue, 'R' is blue, and 'A' is blue. The 'C' in the bottom row is red, 'I' is blue, 'M' is green, and '2' is grey. The letters have a 3D effect with shadows.

Review Meeting - P. Laloyaux - 15 December 2017

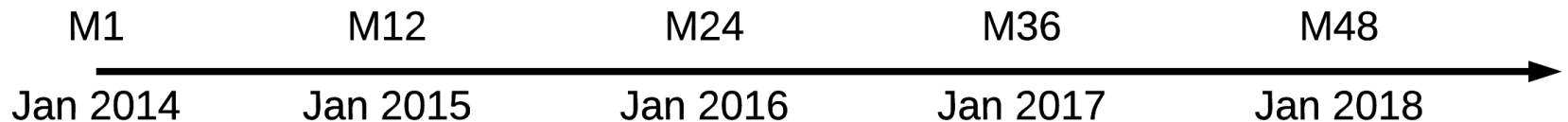
Status of deliverables: key achievements in the past 12 months

January 2017

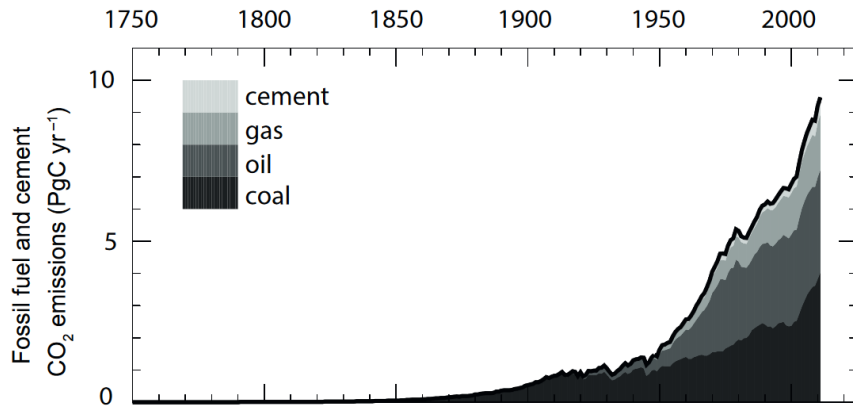
Deliverable	Description	Delivery date
D1.1	CERA-20C	36
D1.2	CERA-20C/Carbon	48
D1.3	CERA-SAT	48
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D1.5	Status report WP1	8

December 2017

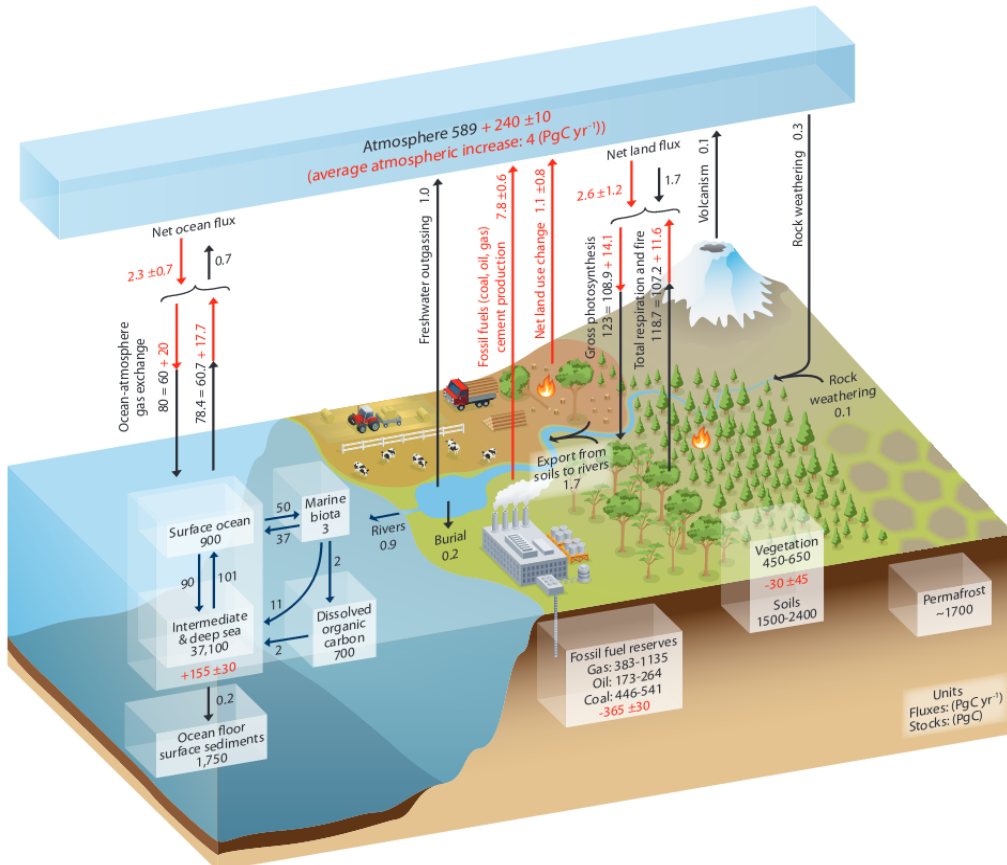
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Context of CERA-20C/Carbon (D1.2)



Anthropogenic CO₂ emissions increased over the 20th century (9 PgC/yr over 2000-2010)



Intergovernmental Panel on Climate Change (IPCC) report shows that

- 2.3 PgC/yr stocked in the ocean
- 2.6 PgC/yr stocked in the land
- 4 PgC/yr stays in the atmosphere

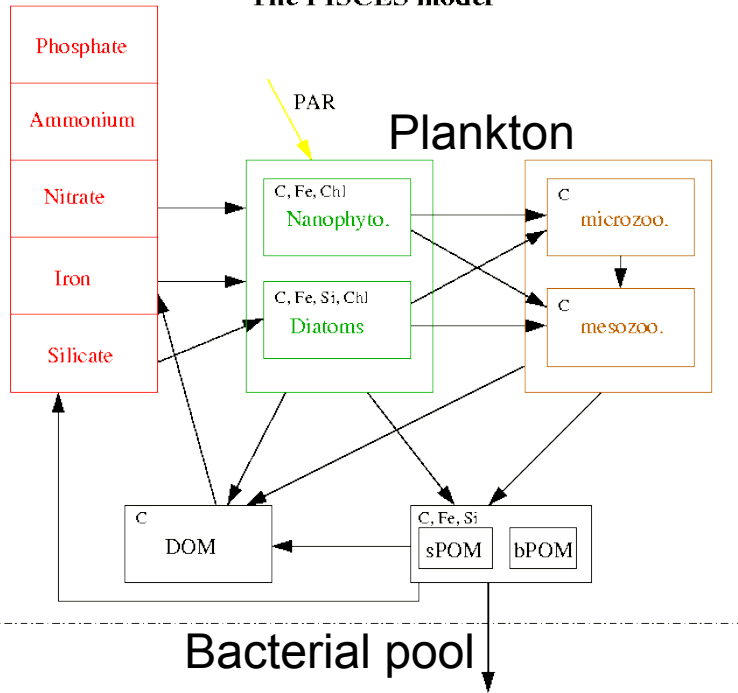
How did carbon exchange fluxes evolve over the 20th century?

CERA-20C/Ocean Carbon

Fluxes from CERA-20C:
temperature, wind,
precipitation, radiation

Nutrients

The PISCES model

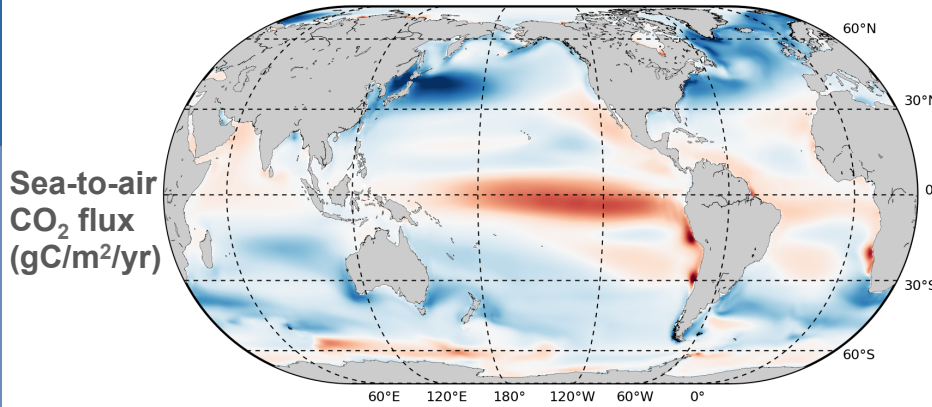


The PISCES model simulates 24 prognostic variables

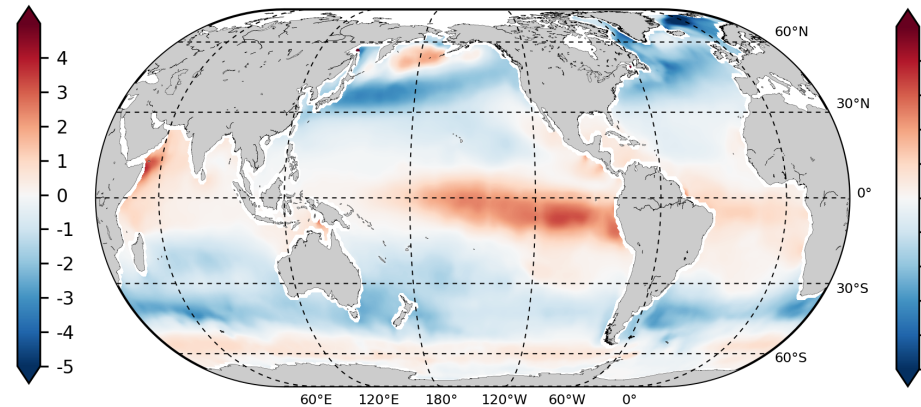
- cycle of oxygen
- cycle of carbon
- plankton growth

Assessment of CERA-20C/Carbon Ocean

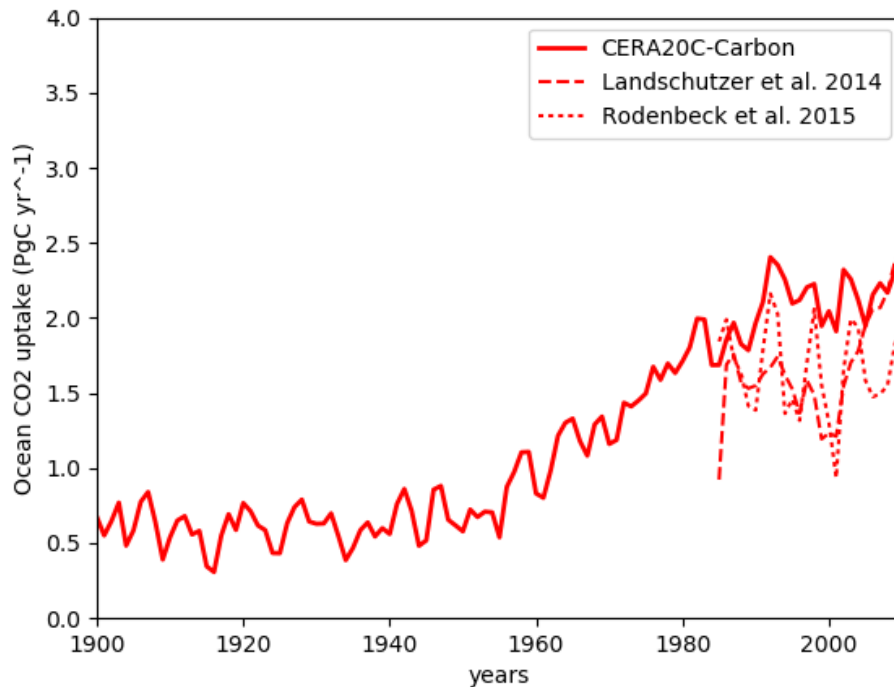
CERA-20C clim 1998 - 2009



Landschützer clim 1998 - 2009



CO₂ flux comparison over a recent period, positive sign indicates an outgassing and negative sign an ocean sink.



Ocean CO₂ uptake over 2000-2010 is consistent with IPCC conclusions (2.3 PgC/yr)

CERA-20C/Carbon Ocean shows how this evolved over the 20th century

CERA-20C/Ocean Carbon

Monthly means over 1900 – 2009 of

- Air-to-sea CO₂ flux
- Chlorophyll (proxy for the amount of phytoplankton)
- Dissolved Inorganic Carbon
- Surface pCO₂
- Iron
- Nitrate
- Phosphate
- Silicate
- Net primary production
- Photosynthetically Available Radiation (PAR)

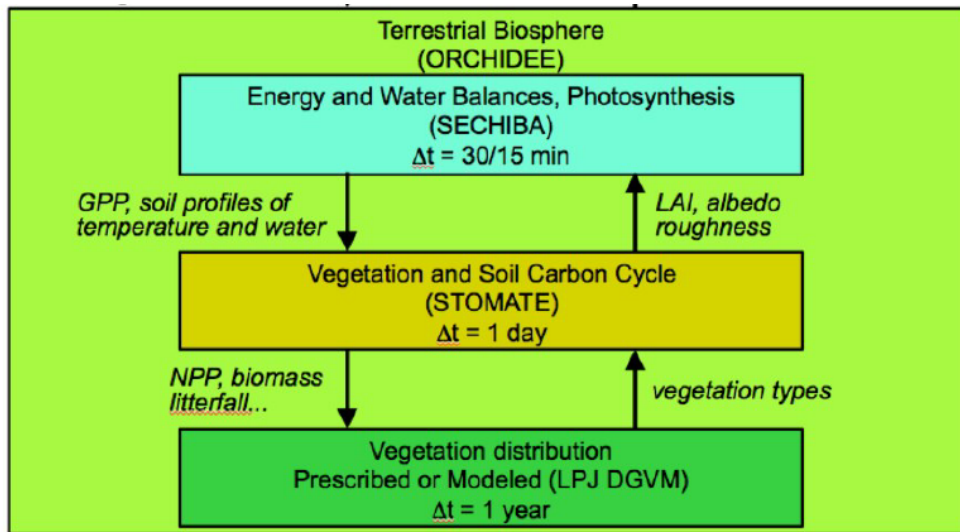
And more variables in annual means

Available on the Mercator FTP:

<ftp://ftp.mercator-ocean.fr/download/eraclim2/>

CERA-20C/Land Carbon

Fluxes from CERA-20C:
temperature, wind,
precipitation, radiation



The ORCHIDEE model calculates

- carbon
- water
- energy fluxes



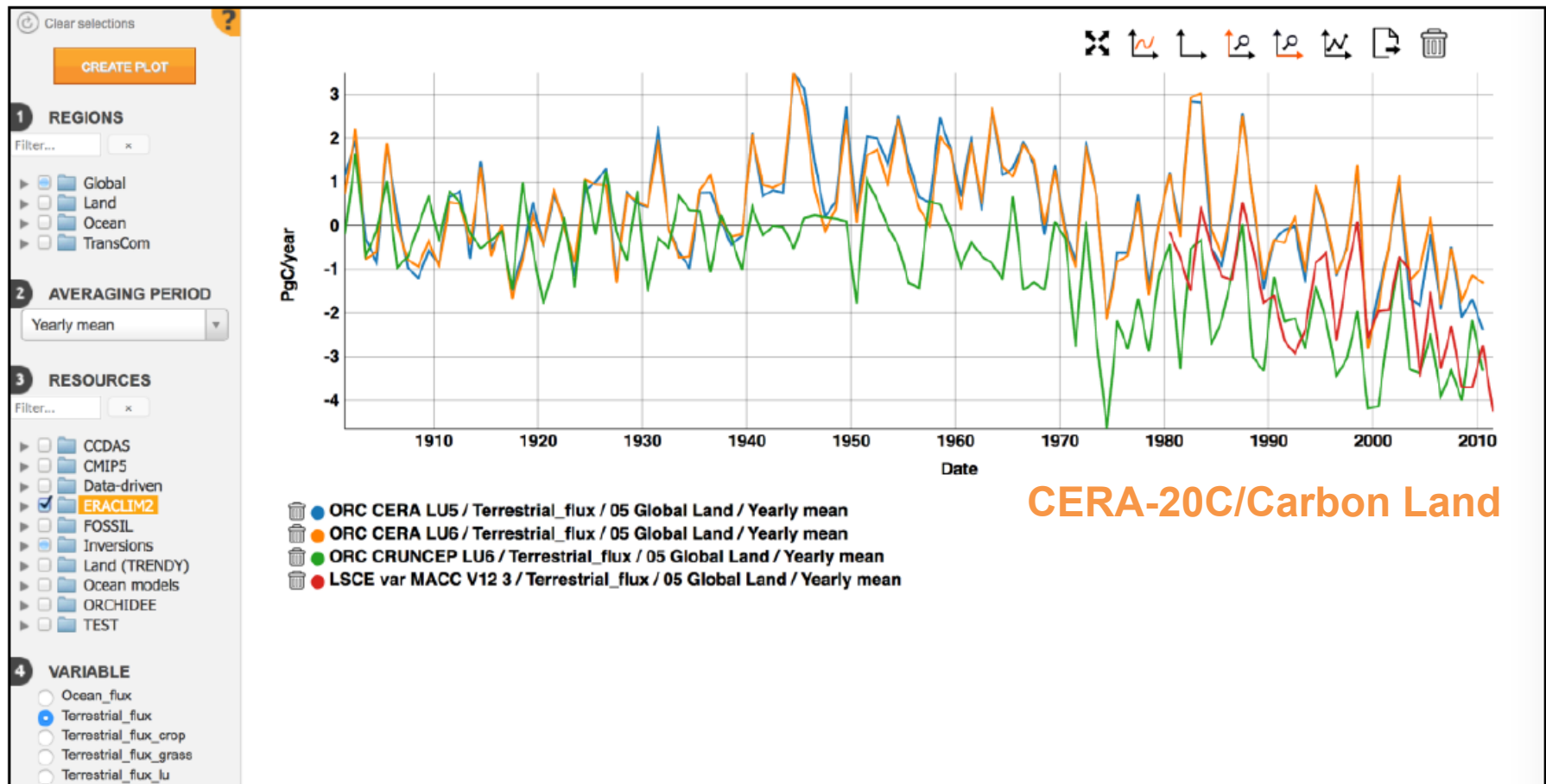
LSCE

Assessment of CERA-20C/Carbon Land

A dedicated web site to view carbon results

<http://eraclim.globalcarbonatlas.org/>

User/Passwd: eraclim / eraclim2017



CERA-20C/Land Carbon

Monthly means over 1900 - 2010 of main carbon fluxes and stocks

- Gross Primary Production (GPP): the uptake of carbon by the vegetation
- Growth Respiration (Growth_resp): the emission of carbon from the growth of vegetation
- Maintenance Respiration (Maint_resp): the emission of carbon due to maintenance of plant.
- Heterotrophic Respiration (Het_resp): the emissions of carbon due to decomposition of organic matter in the soil
- Emission from vegetation conversion (CONVFLUX): emission due to land cover change effect such as deforestation
- Total biomass: Carbon stored in the vegetation (above and below ground).

Available on the LSCE server:

<http://dods.lsce.ipsl.fr//invsat/PEYLIN/ERACLIM2/>

CERA-SAT (D1.3)

Production of coupled reanalysis at higher resolution (2008-2016)



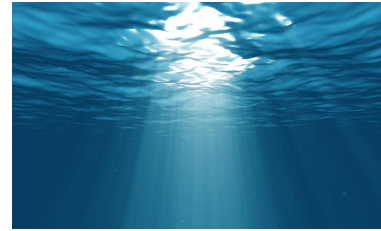
Atmosphere



Land



Wave



Ocean

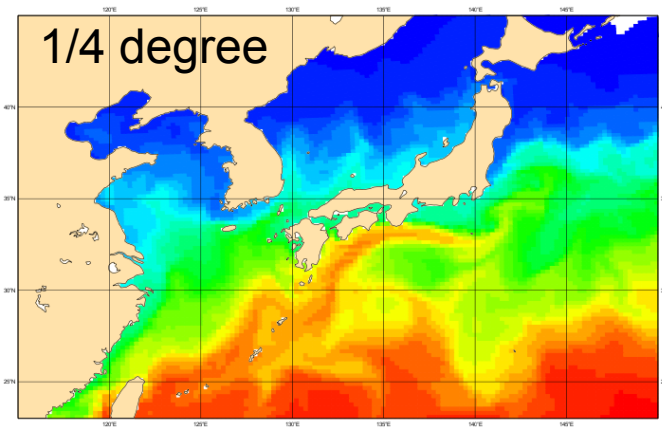
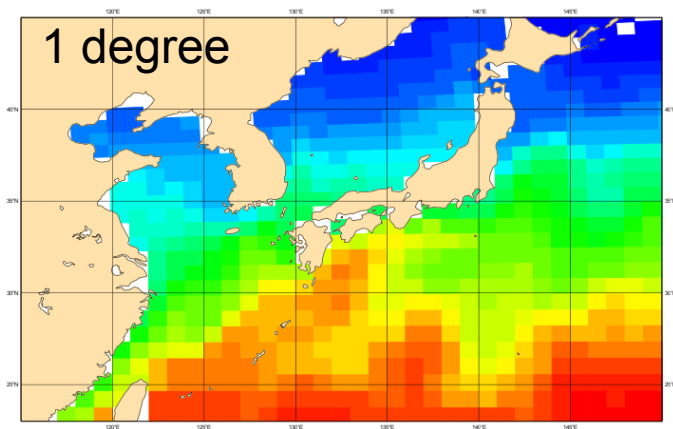


Sea ice

Resolution upgrade (more details):

- atmosphere from 110km to 65km
- ocean from 1 degree (42 levels) to $\frac{1}{4}$ degree (75 levels)

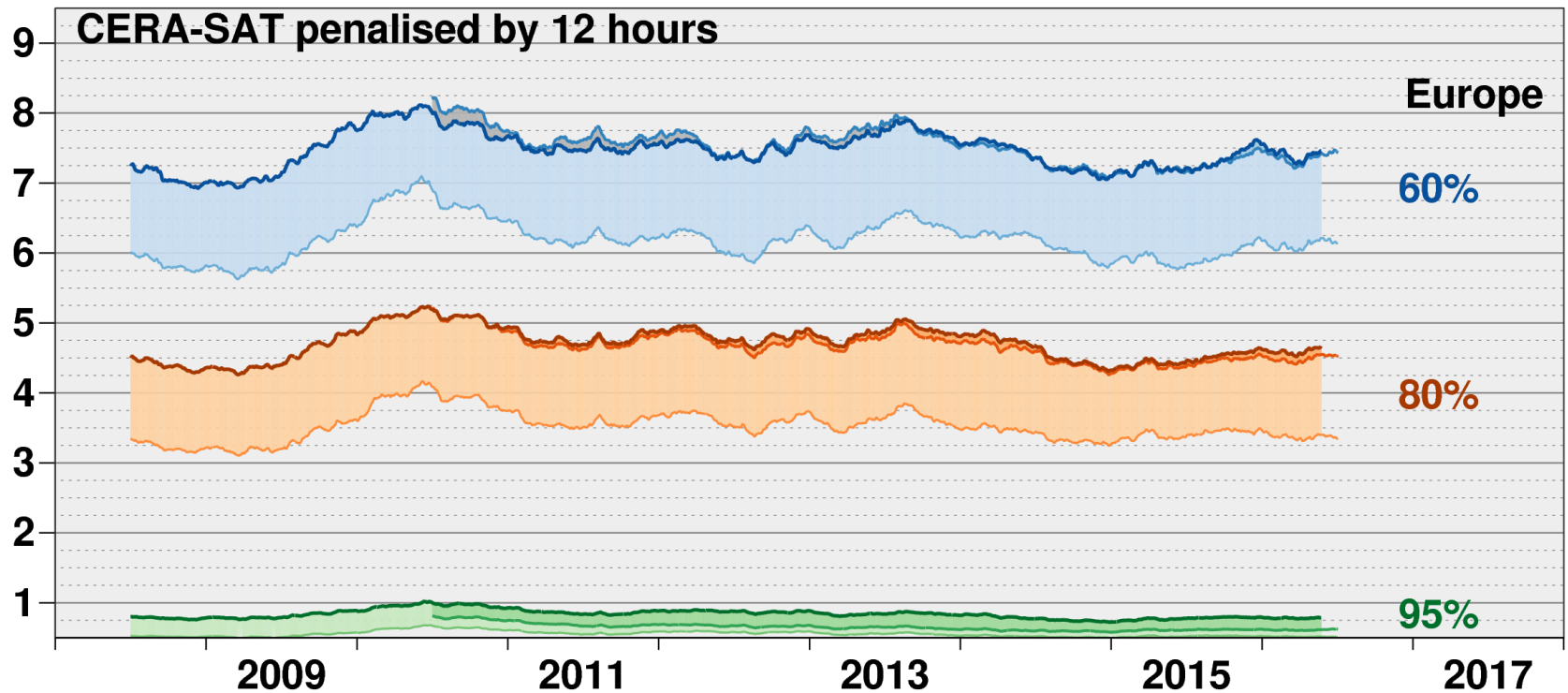
Assimilation of upper-air and satellite measurements (more details)



Assessment of CERA-SAT

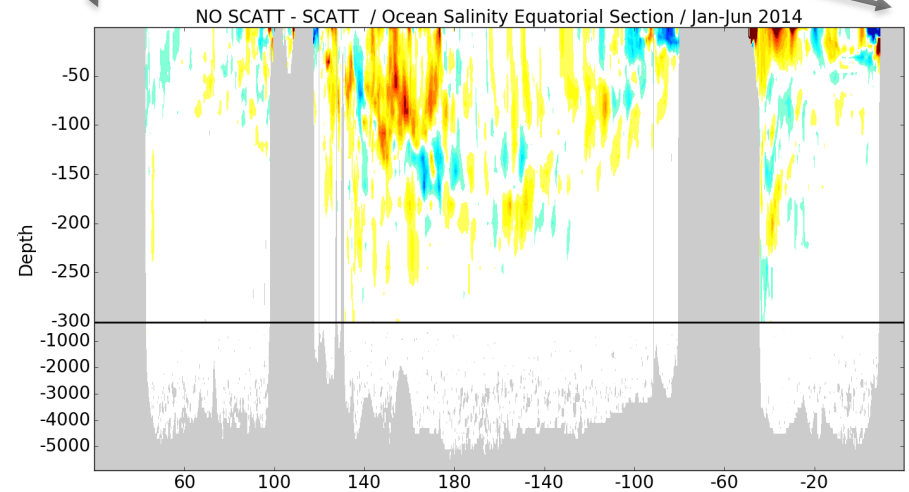
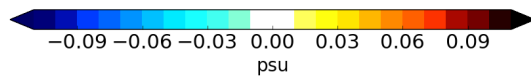
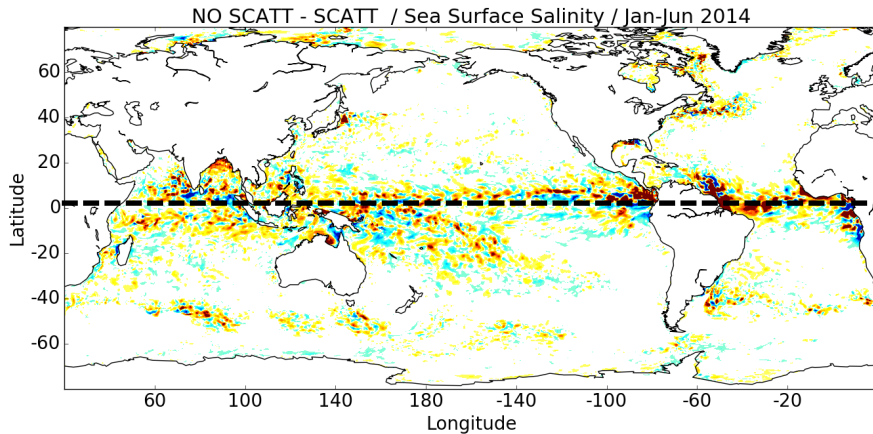
Range (days) when 365-day mean 2-metre temp. AC (%) falls below threshold

— ERA-Interim — ERA5 (EDA) — CERA-SAT



Assessment of CERA-SAT

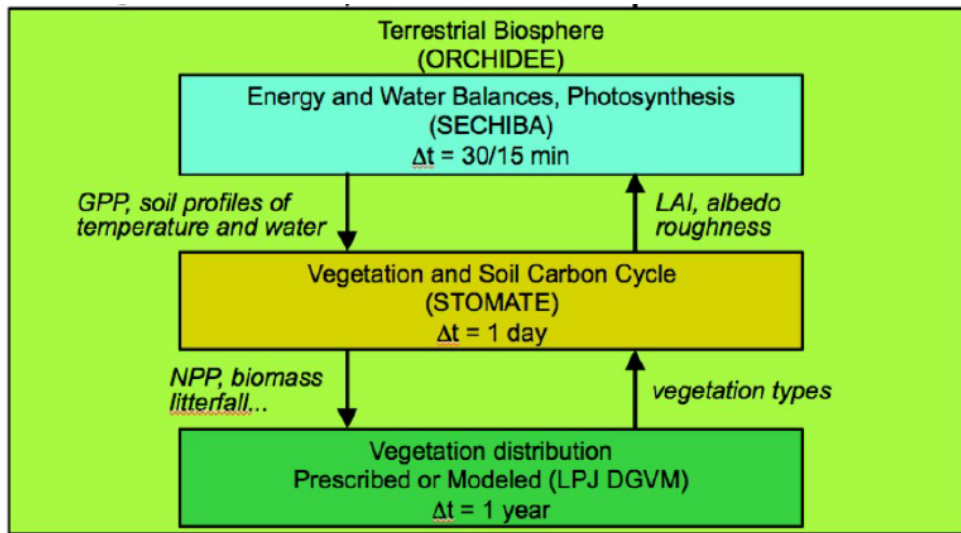
Impact of scatterometer winds on ocean salinity



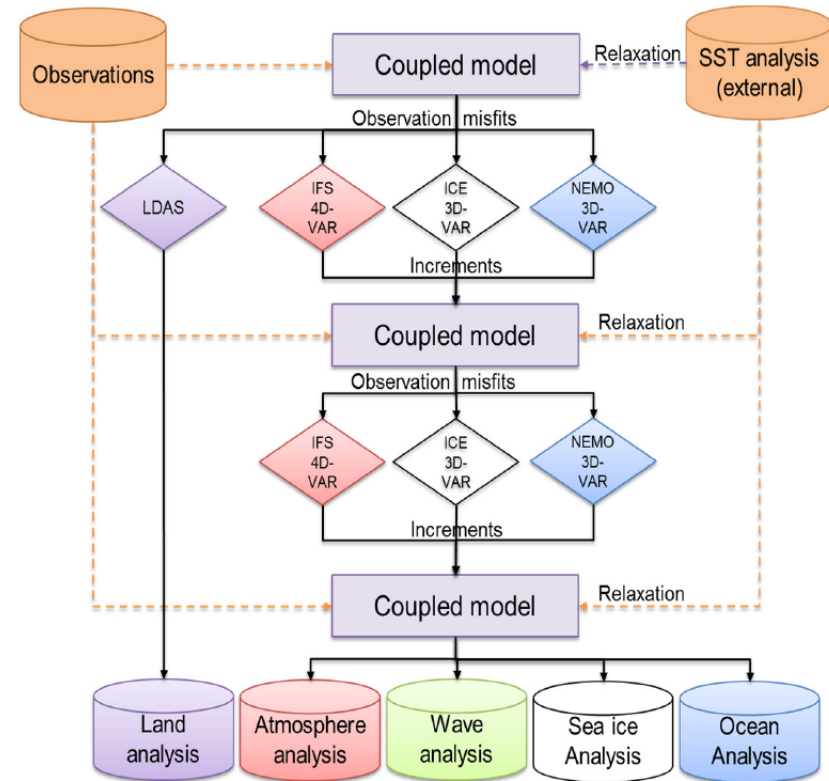
- Assimilation of satellite improves fit to ocean in-situ observations
- CERA-SAT should keep running to cover the YOPP period

CERA-SAT/Land Carbon (D1.4)

Fluxes from CERA-SAT:
temperature, wind,
precipitation, radiation



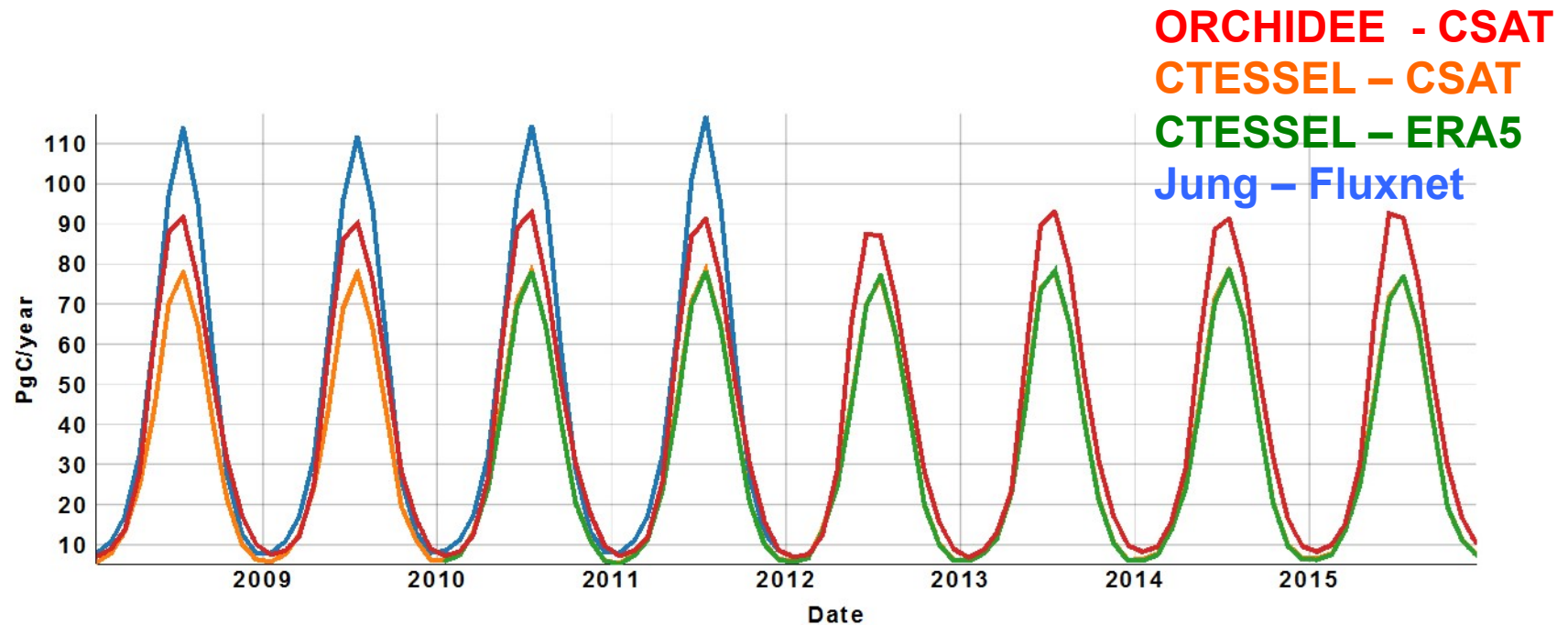
ORCHIDEE model



CTESSEL model is embedded in CERA

Assessment of CERA-SAT/Land

Gross Primary Production (uptake of carbon by the vegetation) in the Northern hemisphere



Similar seasonal cycle in the uptake of carbon by the vegetation

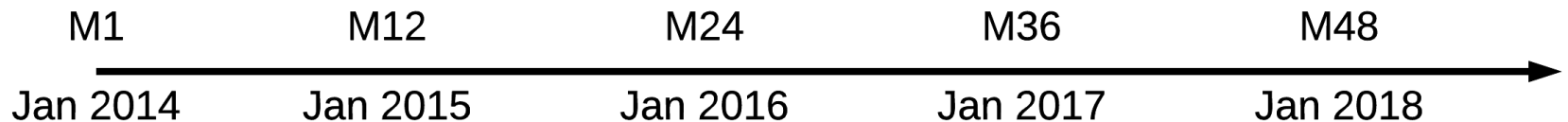
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Access point to ERA-CLIM climate datasets

Browse reanalysis datasets

Dataset	Archive	Time period	Atmosphere	Atmospheric composition	Ocean waves	Ocean sub-surface	Land surface	Sea Ice	Observation Feedback Archive
ERA5	Download guide	2010-2016	✓		✓		✓		
ERA-Interim	Download	1979-present	✓		✓		✓		Expected soon...
ERA-Interim/Land	Download	1979-2010					✓		
ERA-20C	Download	1900-2010	✓		✓	✓	✓	✓	✓
ERA-20CM	Download	1900-2010			✓		✓		
ERA-20C	Download	1900-2010			✓		✓		✓
ERA-20CL	Expected soon...	1900-2010					✓		
ERA-40	Download	1957-2002	✓		✓		✓		
ERA-15	Download	1979-1993	✓				✓		
ORAS4	Download	1958-2015				✓			
ORAP5	Download	1979-2013				✓		✓	
ORASS	Expected	1975-present				✓		✓	

D1.3 & D1.4 → CERA-SAT

D1.1 & D1.2 → CERA-20C

List of all the research and operational reanalyses produced at ECMWF