Work Package 1

Production of global climate reanalyses

Review Meeting - P. Laloyaux - 15 December 2017

SEVENTH FRAMEWORK PROGRAMME

ECMWF
EUROPEAN CENTRE FOR MEDIUM RANGE WEATHER FORECASTS

Status of deliverables: key achievements in the past 12 months

January 2017

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D1.2	CERA-20C/Carbon	48
D1.3	CERA-SAT	48
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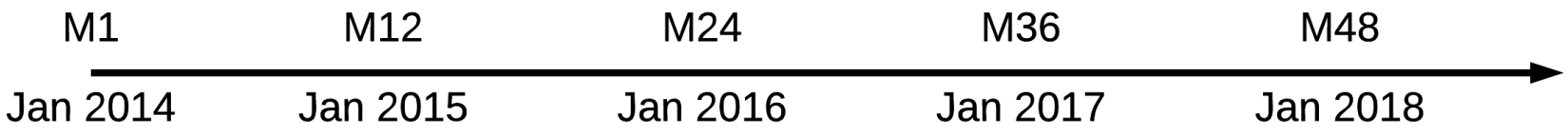
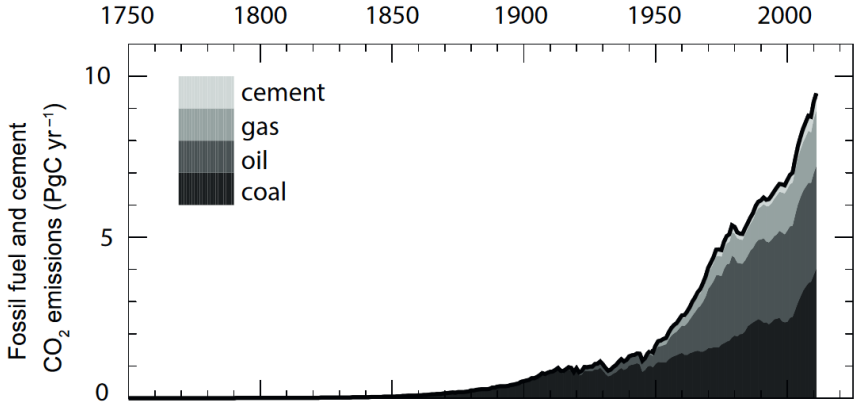
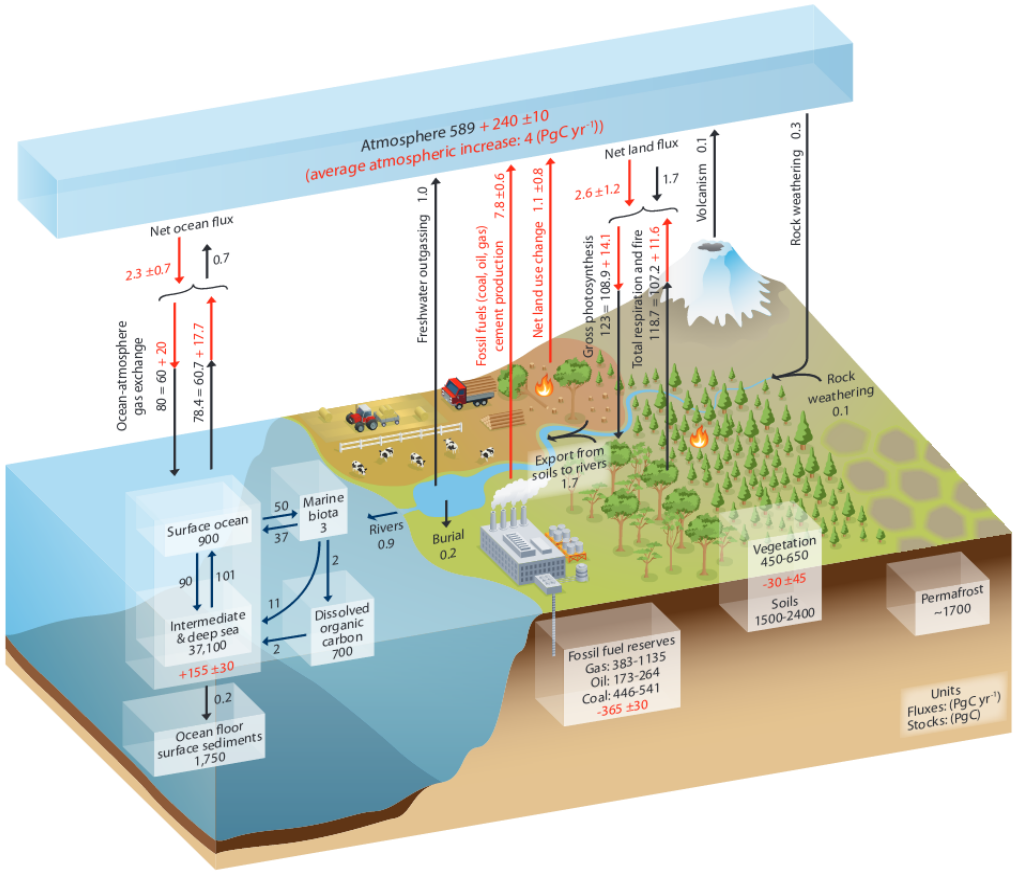


Context of CERA-20C/Carbon (D1.2)



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



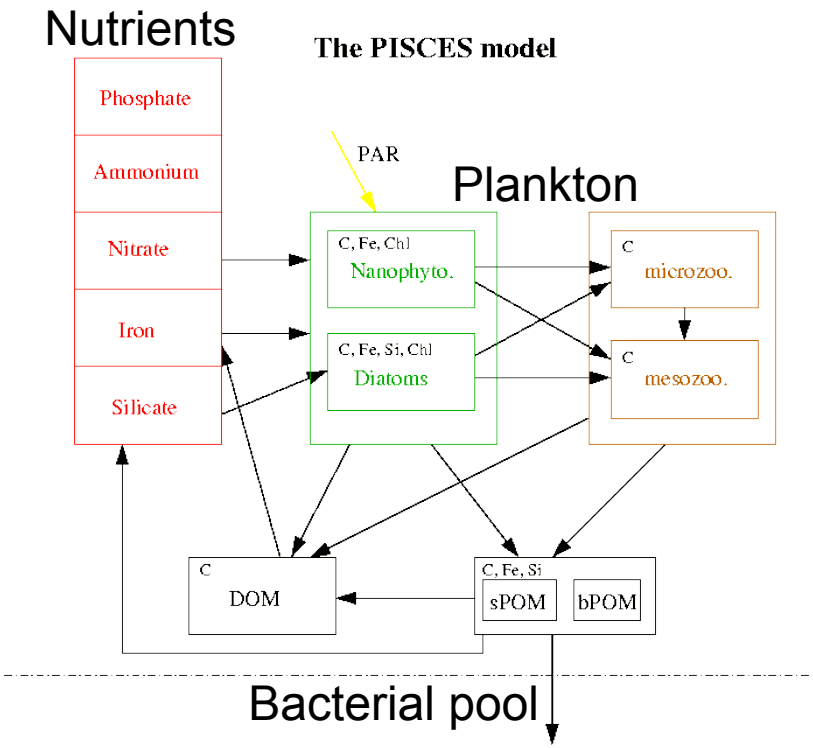
Intergovernmental Panel on Climate Change (IPCC) report shows that

- 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

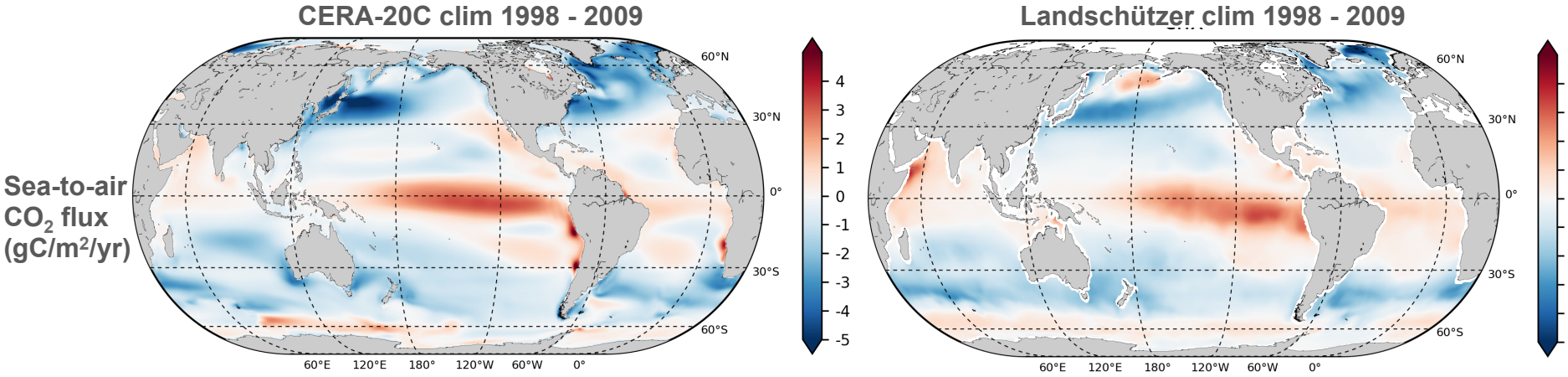


The PISCES model simulates 24 prognostic variables

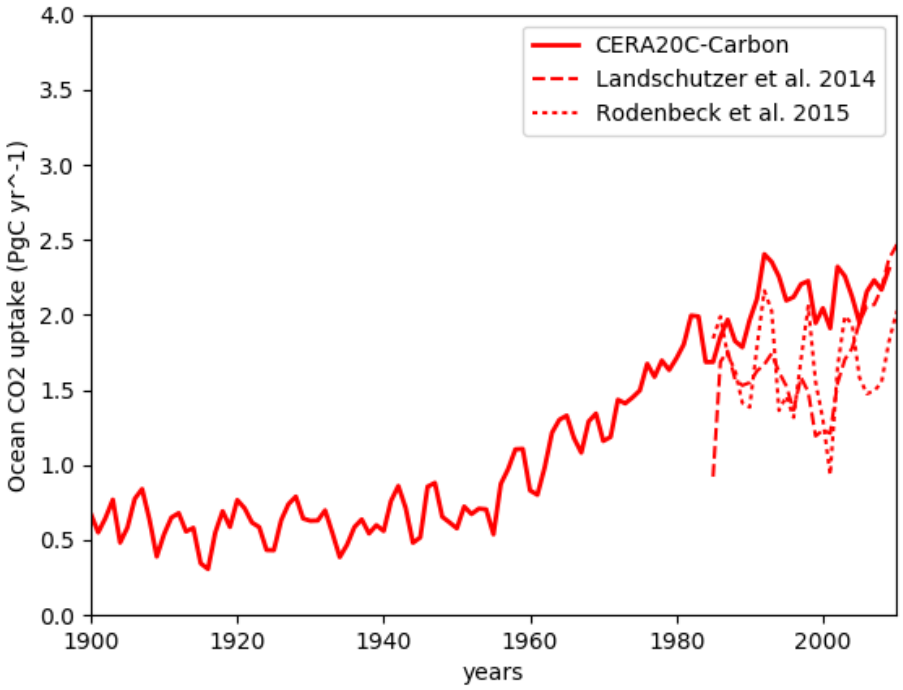
- cycle of oxygen
- cycle of carbon
- plankton growth

MERCATOR OCEAN
OCEAN FORECASTERS

Assessment of CERA-20C/Carbon Ocean



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

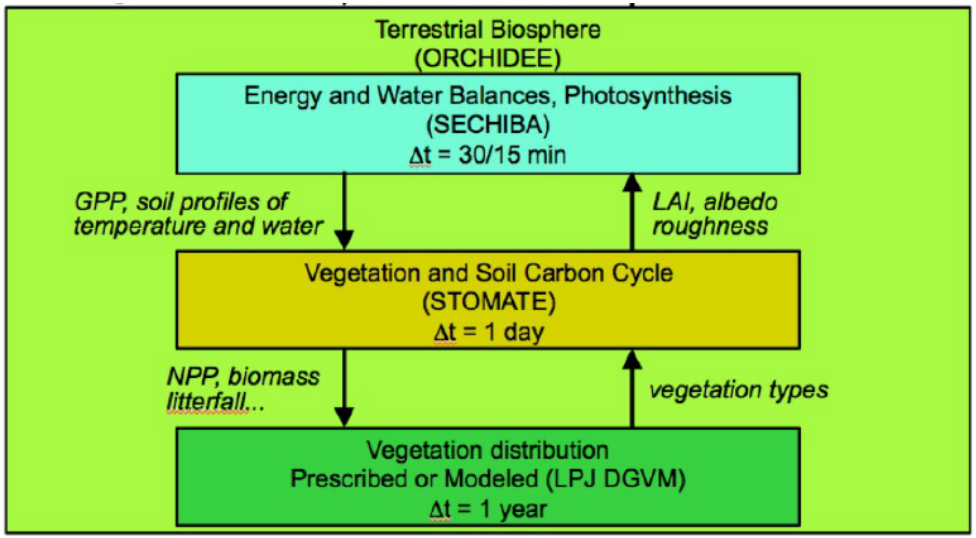
- Air-to-sea CO2 flux
- Chlorophyll (proxy for the amount of phytoplankton)
- Dissolved Inorganic Carbon
- Surface pCO2
- Iron
- Nitrate
- Phosphate
- Silicate
- Net primary production
- Photosynthetically Available Radiation (PAR)

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

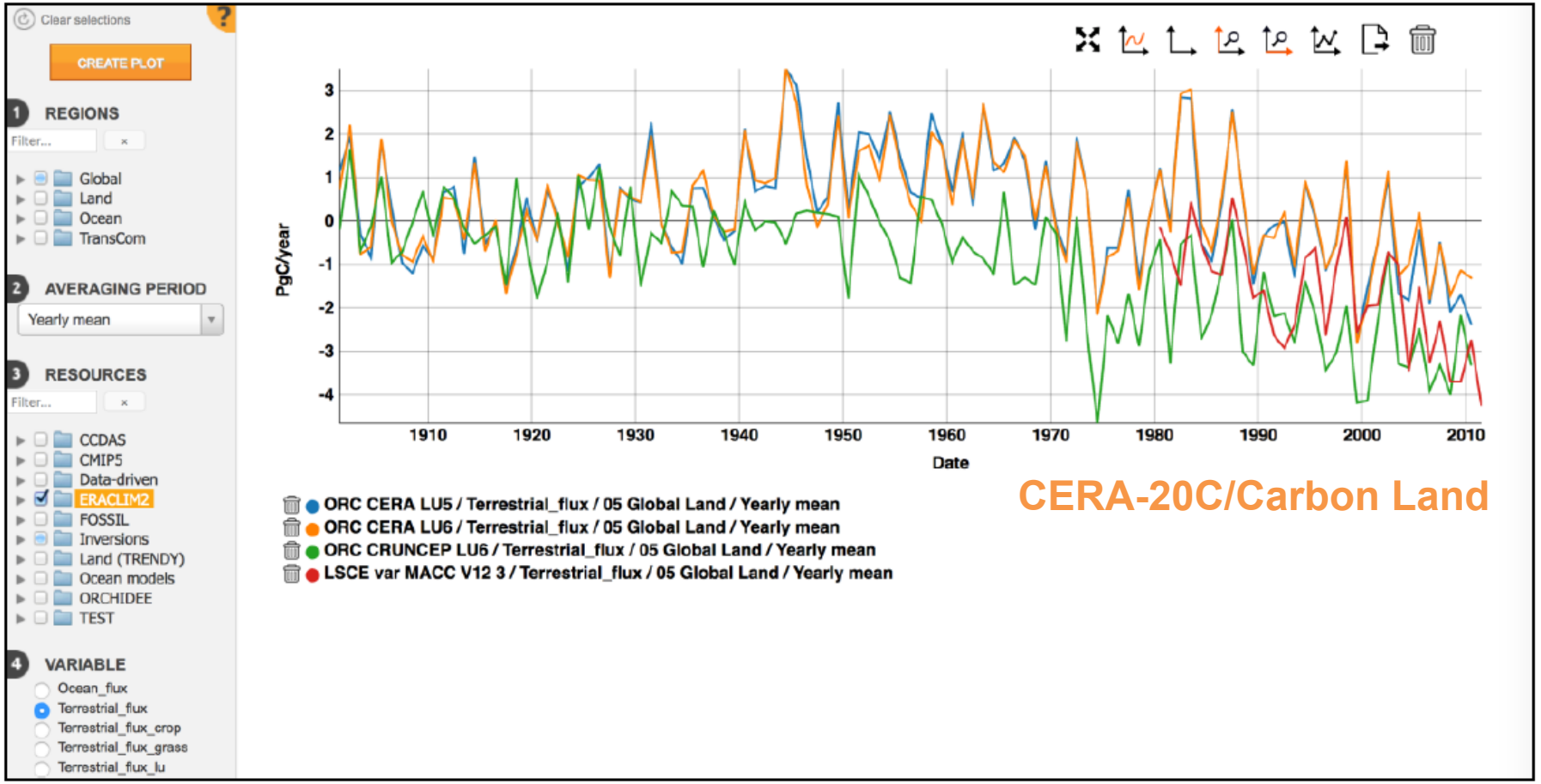
LSCE

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/

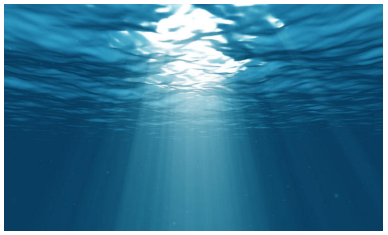
CERA-SAT (D1.3)

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

Atmosphere

Land

Wave



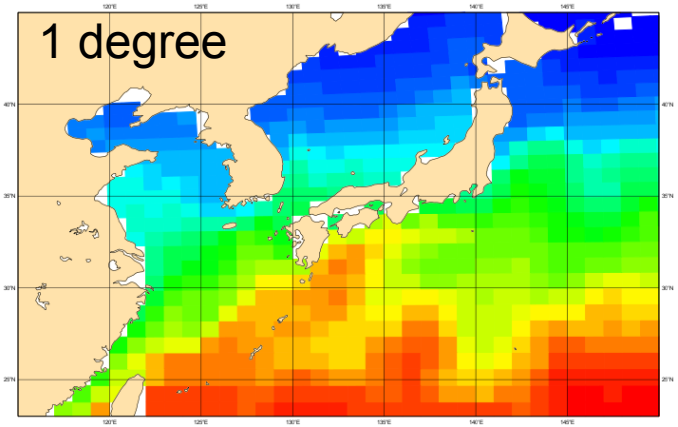
Ocean

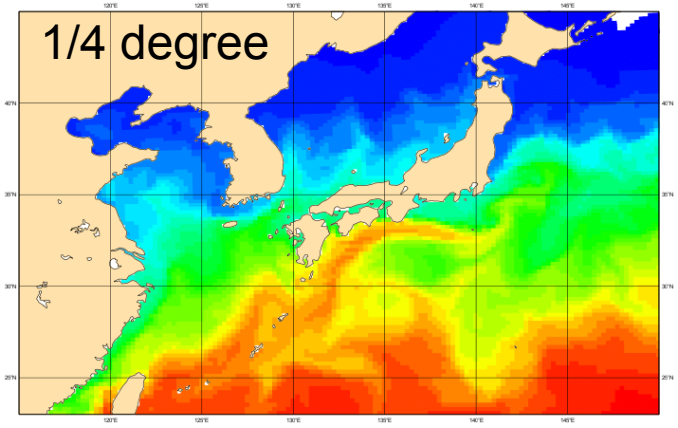
Sea ice

Resolution upgrade (more details):

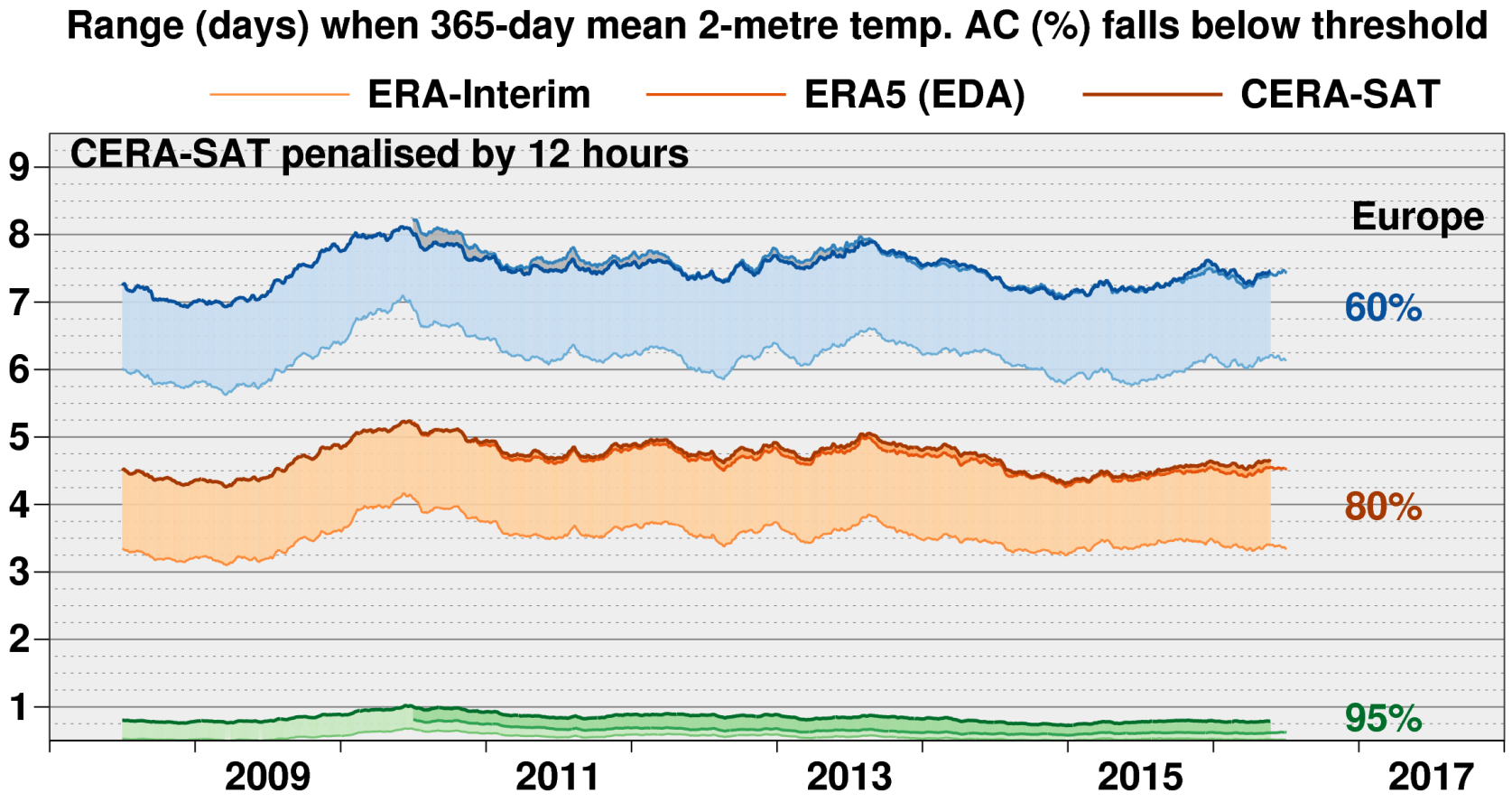
- atmosphere from 110km to 65km
- ocean from 1 degree (42 levels) to ¼ degree (75 levels)

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



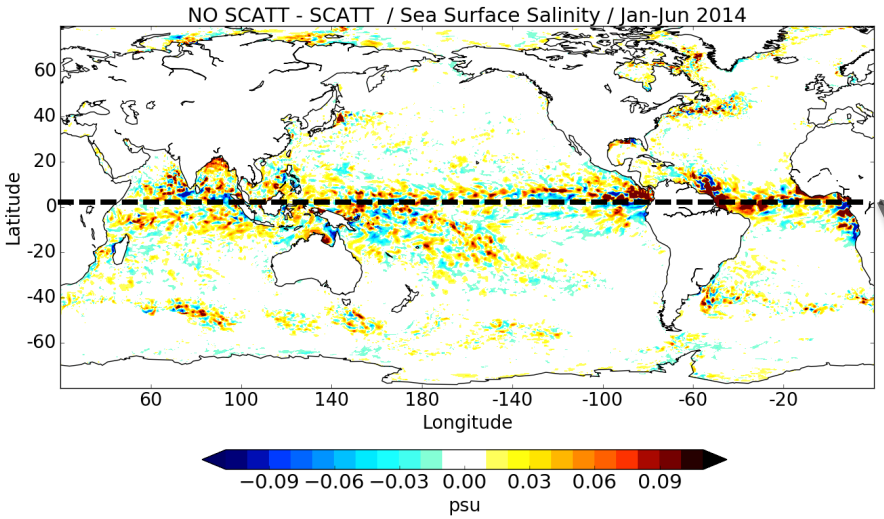


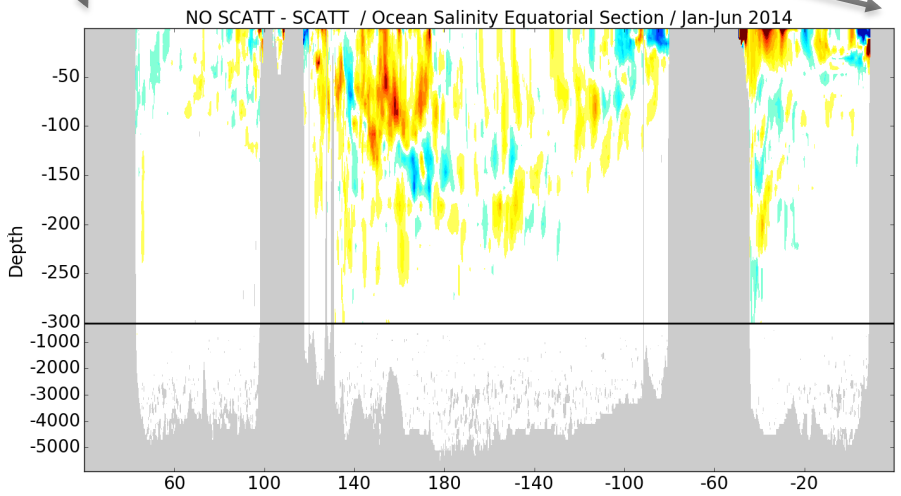
Assessment of CERA-SAT



Assessment of CERA-SAT

Impact of scatterometer winds on ocean salinity

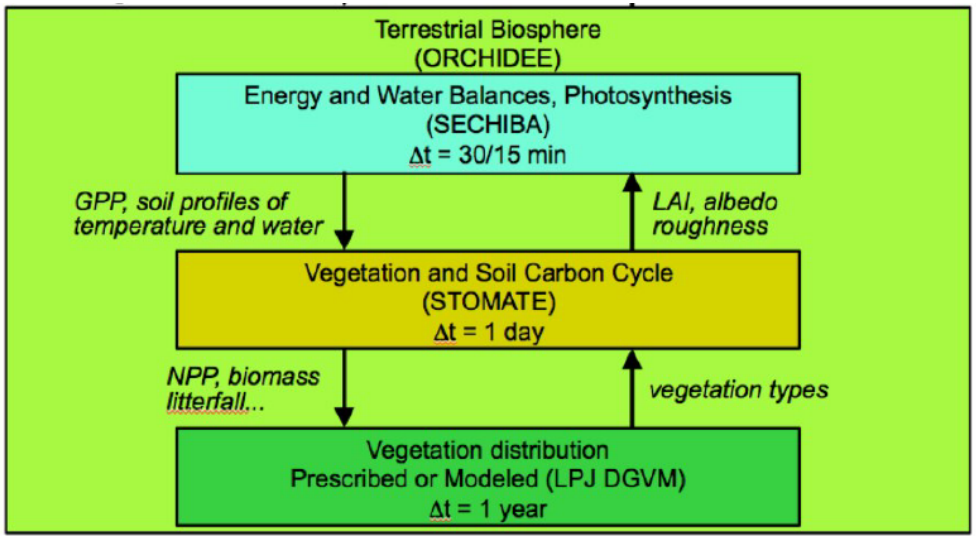




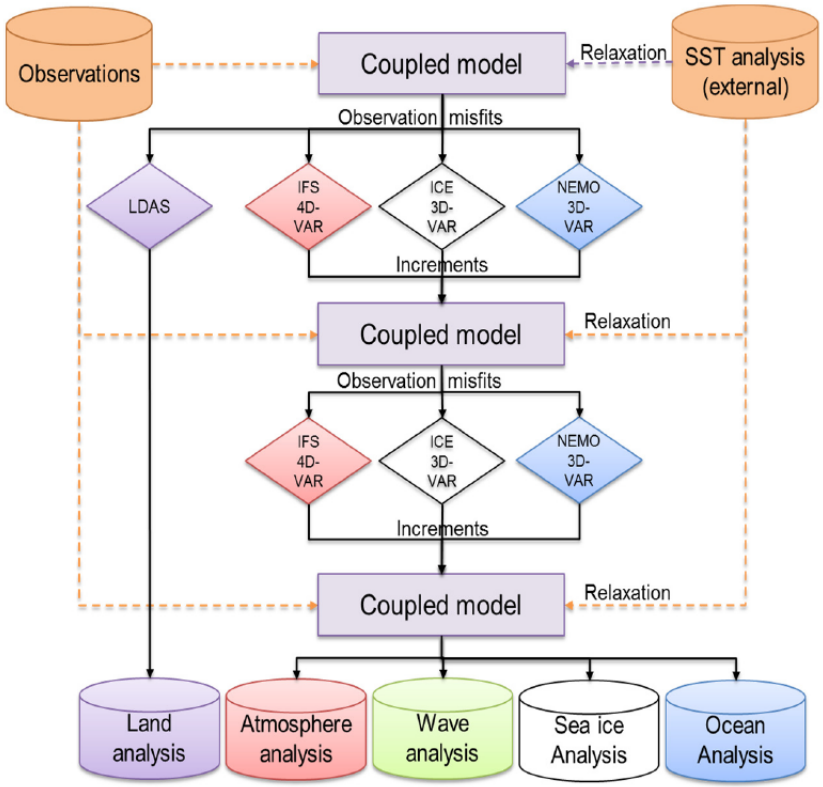
- Assimilation of satellite improves fit to ocean in-situ observations
- CERA-SAT should keep running to cover the YOPP period

CERA-SAT/Land Carbon (D1.4)

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



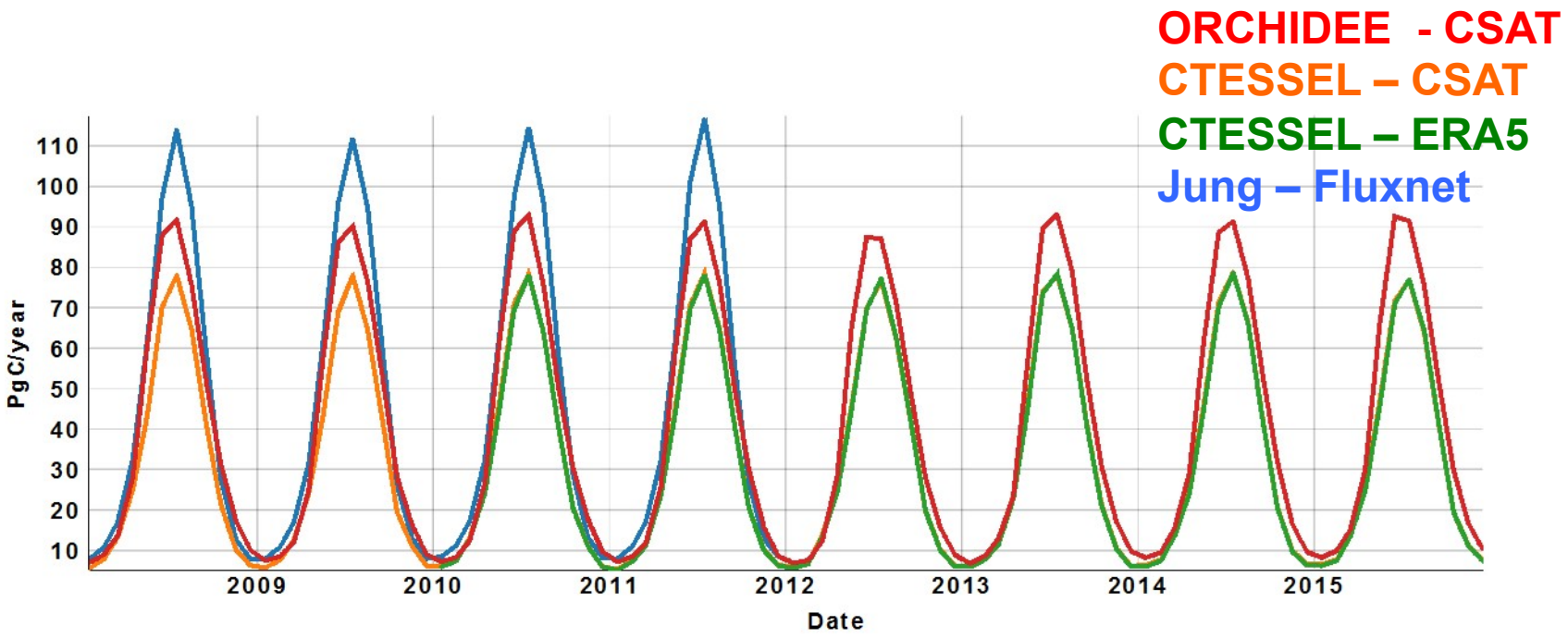
ORCHIDEE model



CTESSEL model is embedded in CERA

Assessment of CERA-SAT/Land

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



Similar seasonal cycle in the uptake of carbon by the vegetation

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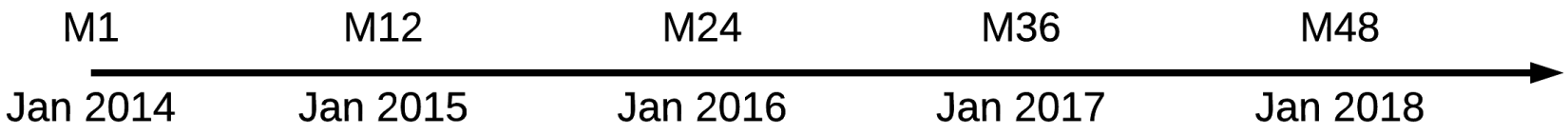
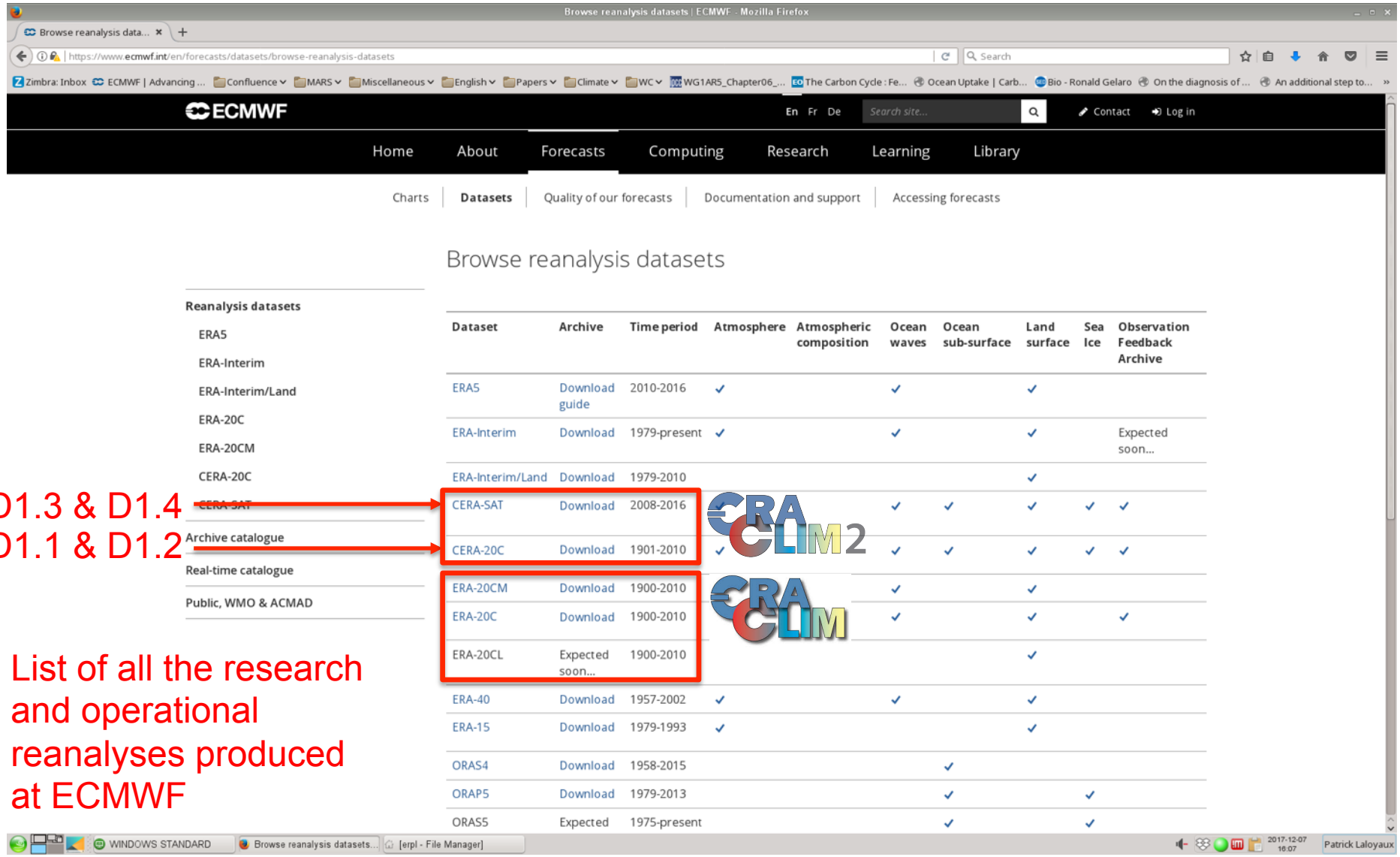


Access point to ERA-CLIM climate datasets



D1.3 & D1.4

D1.1 & D1.2

List of all the research and operational reanalyses produced at ECMWF