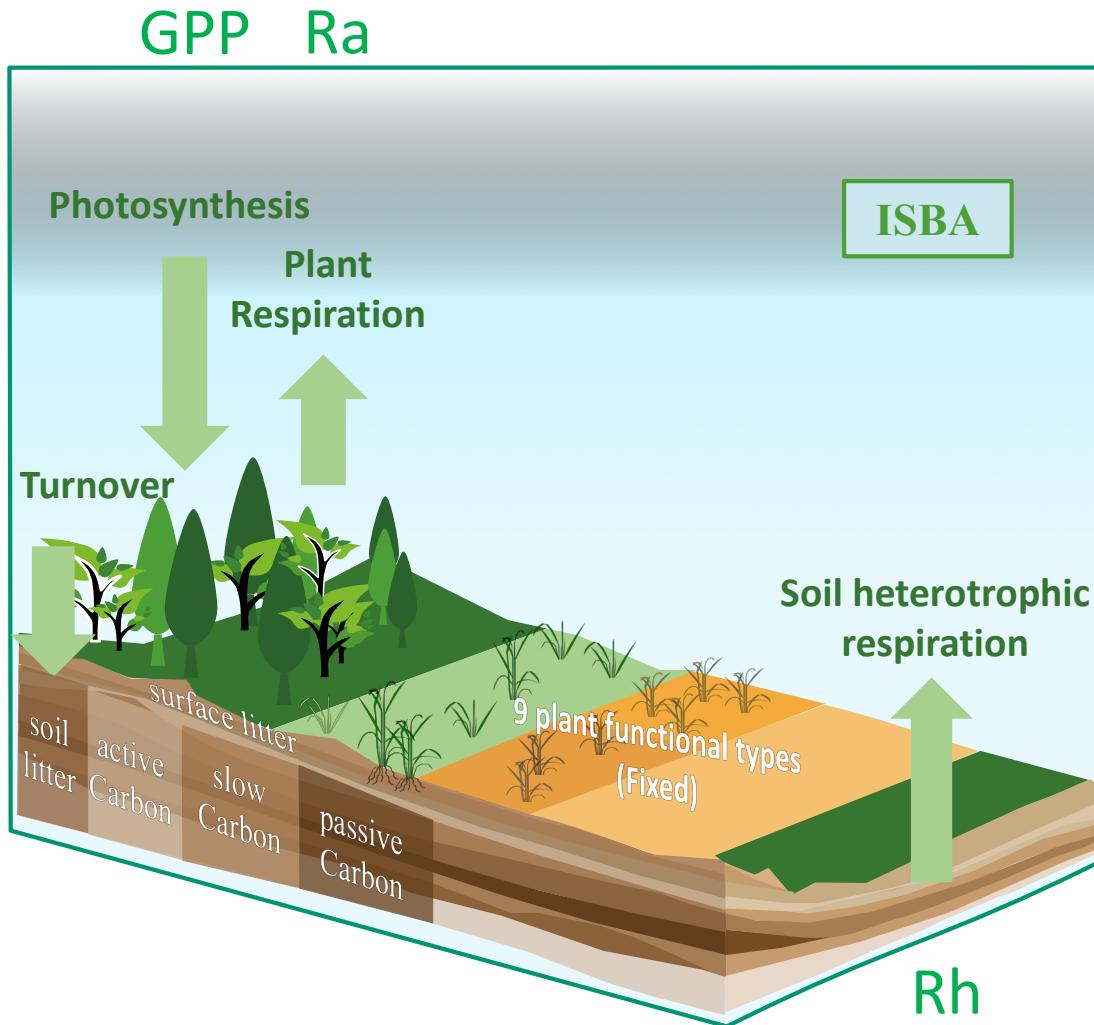




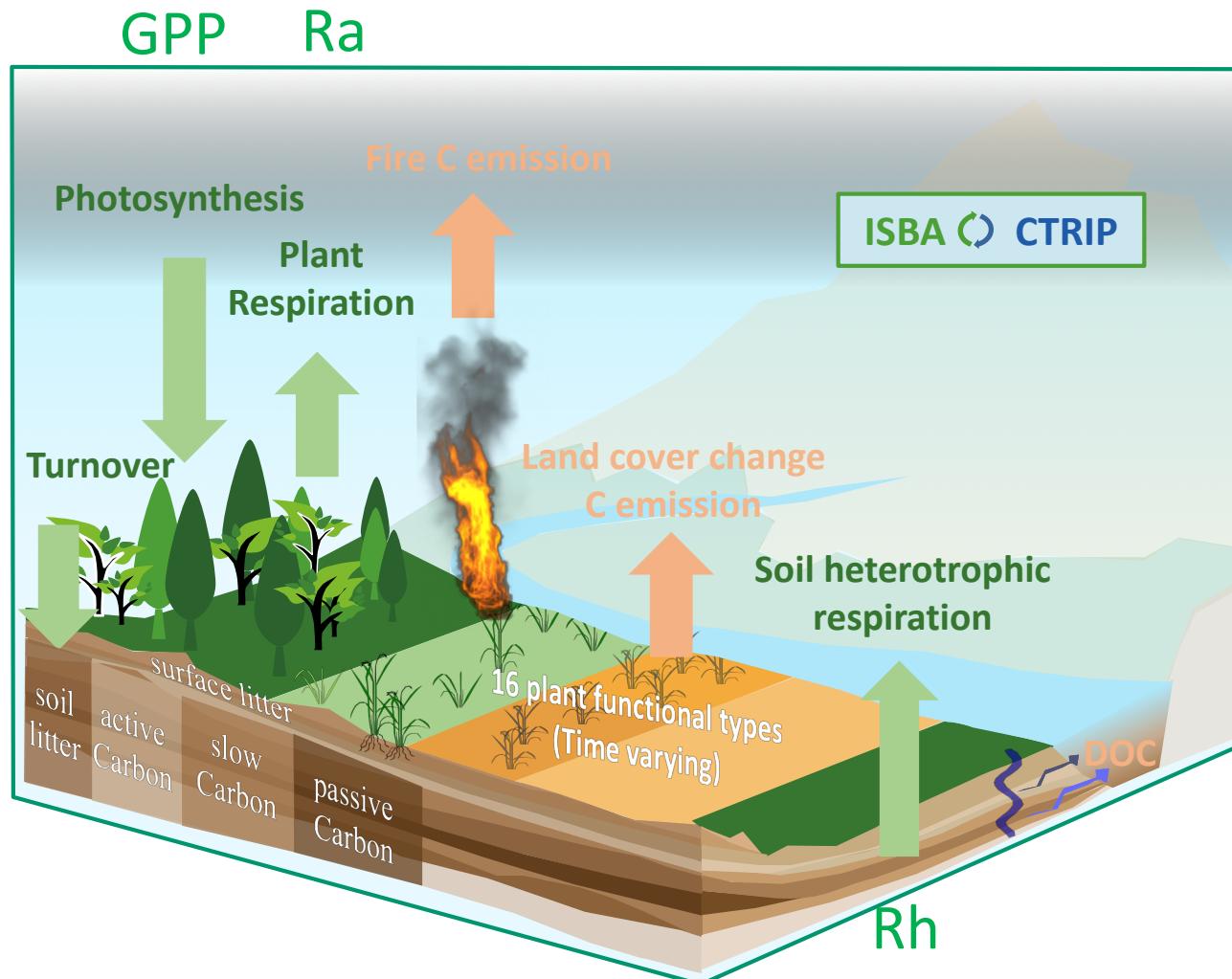
la représentation du cycle du C continental par ISBA et CNRM-ESM2

Christine Delire, Roland Séférian, Bertrand Decharme, Emilie Joetzjer,
Ramdane Alkama (JRC, Ispra)

Carbon cycle in ISBA around 2010



Carbon cycle in ISBA : 2019



Summary of changes

Vegetation distribution

- 16 plant functional types instead of 9 (+ bare soil, rock, permanent snow/ice)
- land-use / land cover changes : yearly input maps, net changes

Updated Processes on major biomes of the world

- ecophysiological observations for rainforest (E. Joetzjer PhD, 2014, *Joetzjer et al, GMD, 2014-15*)
- ecophysiological database, TRY, to update parameters for other PFTs

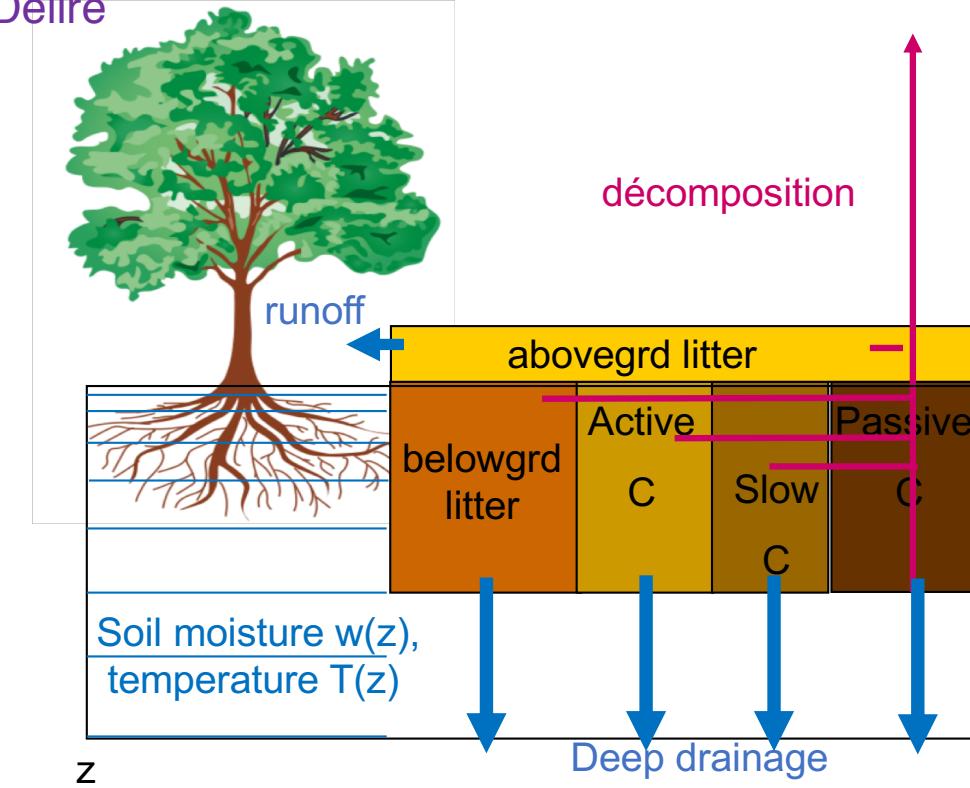
New processes

- Natural fires : Burned area (Thonicke et al, 2001, Krinner et al, 2005), C emissions
- C leaching from soil to river → ocean

New processes : Dissolved Organic Carbon

R. Séférian, F. Guérin, B. Decharme, C. Delire

Motivation : C input to ocean



Hyp: 1. fraction of organic matter dissolved in water during decomposition

-> DOC controlled by same factors as decomposition : T, wg (CENTURY)

2. DOC is transported by rivers (no transformation)

Simulated carbon cycle

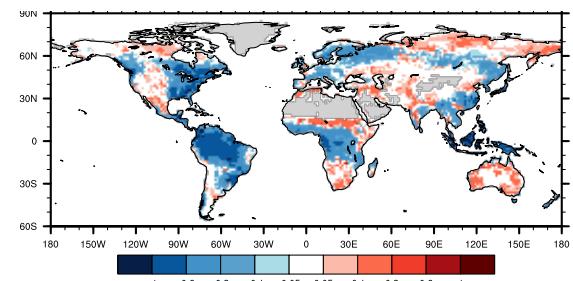
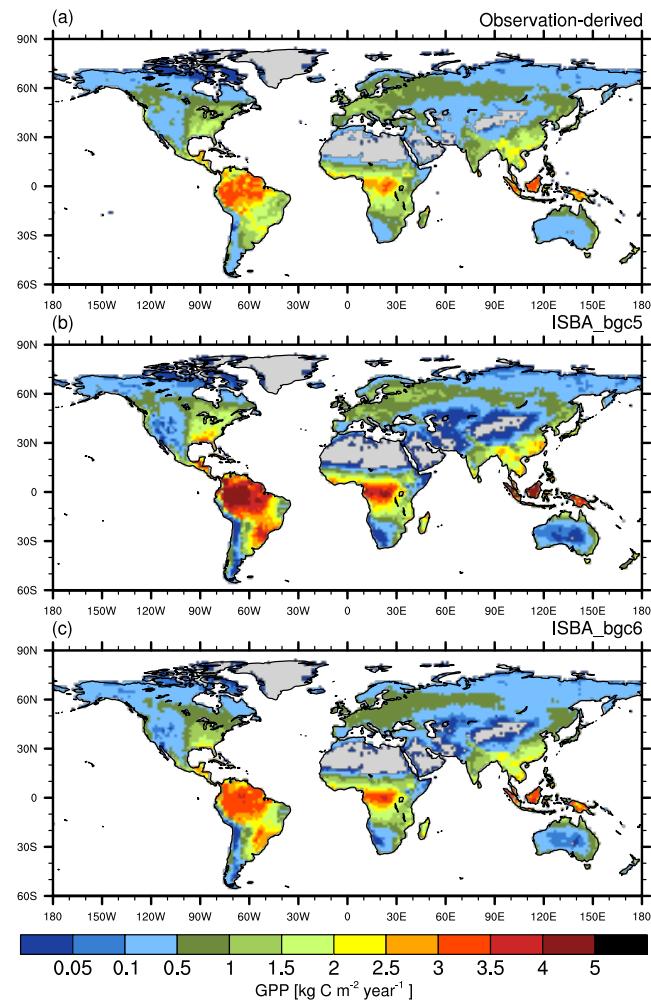
	ISBA_bgc5	ISBA_bgc6	CNRM-ESM2
climate :	Forced CRU-NCEP 1901-2016 (<i>Viovy et al, 2018</i>)		calculated
CO2 :	observed		observed
Land use change :	ECOCLIMAP	LUHv2.0	
Physics		Soil : DIF (14 layers) Snow : ES (12 layers) Hydrology : aquifers	
Spin up	550 years, 400 with numerical acceleration of soil carbon module forcing = 1901-1920 recycled CO2 : 286.4 ppmv		1100 years fully coupled after equilibration of components
Resolution	1° x 1°		
Results	mean values for 1980-2010 (depending on observed data)		

FluxComV1

(*Jung et al., 2017;*
Tramontana et al., 2016)

ISBA_bgc5

ISBA_bgc6

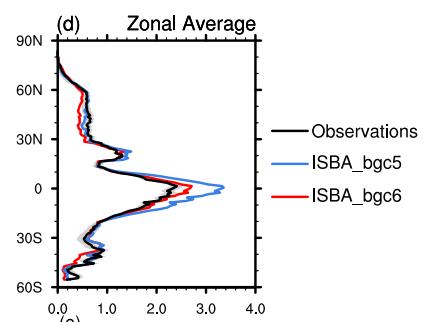


Photosynthesis

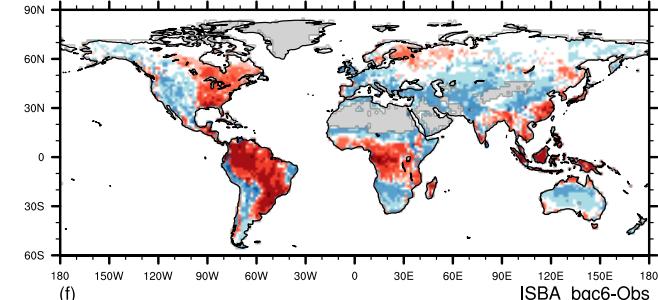
GPP
↓



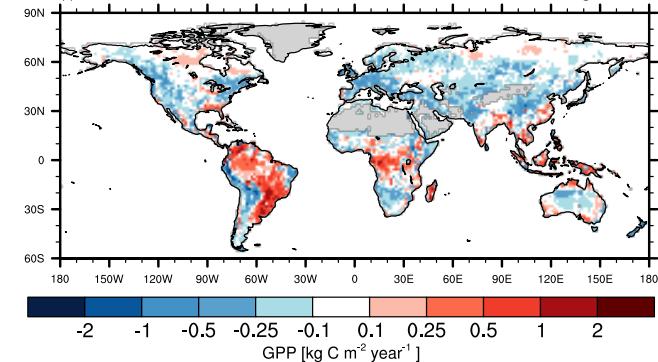
Zonal Average



ISBA_bgc5-Obs



ISBA_bgc6-Obs

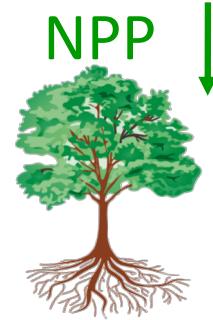


ISBA_bgc6 - ISBA_bgc5

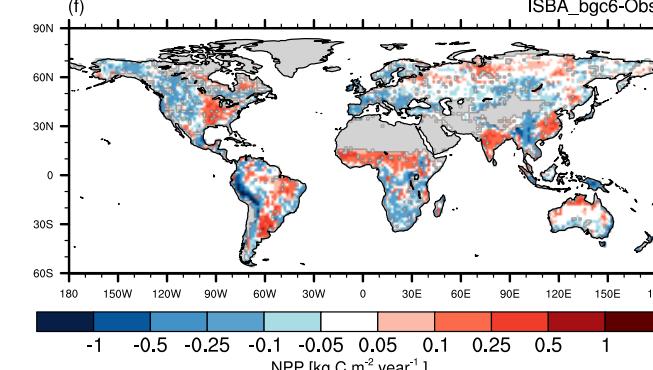
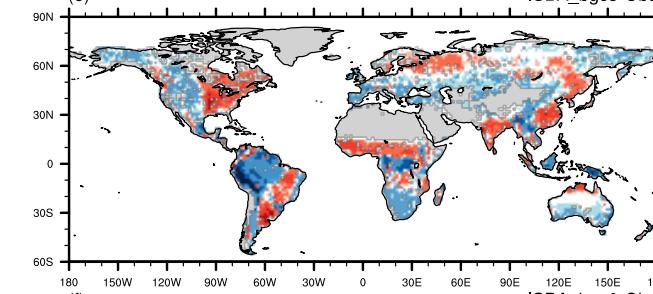
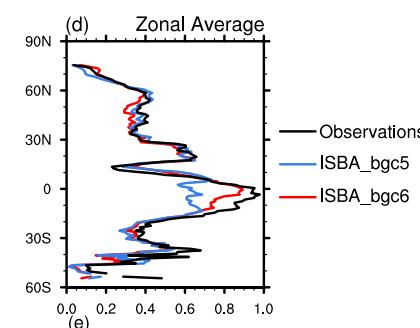
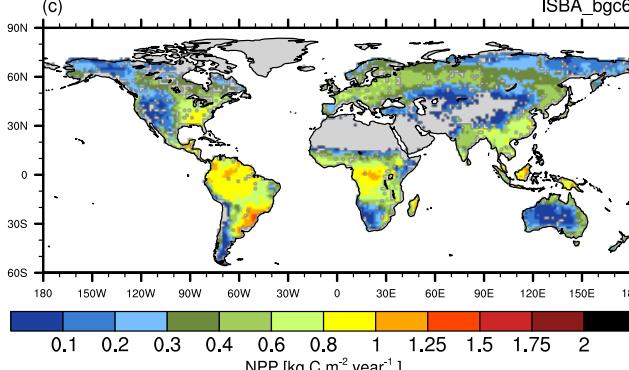
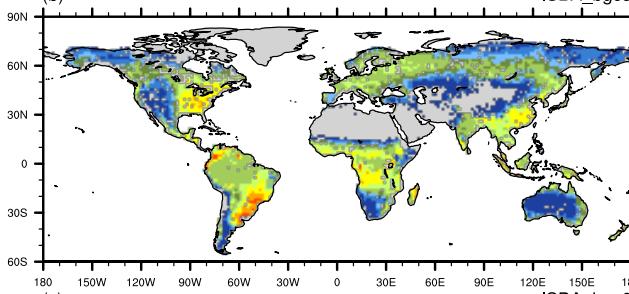
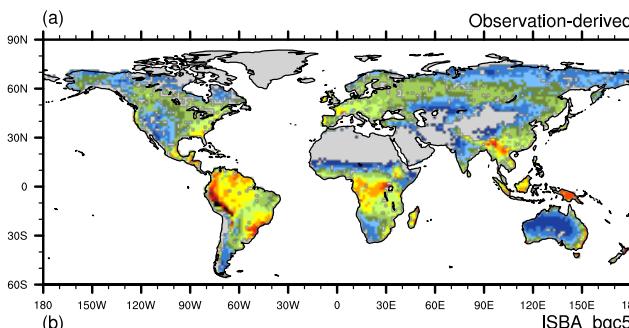
ISBA_bgc5 - Obs

ISBA_bgc6 - Obs

Net Photosynthesis

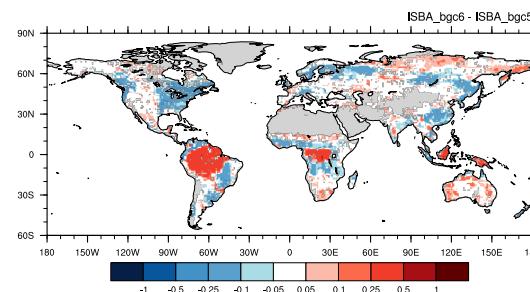


MODIS17A3
(*Zhao et al, 2015;*)



ISBA_bgc5 - Obs

ISBA_bgc6 - Obs



ISBA_bgc6 - ISBA_bgc5

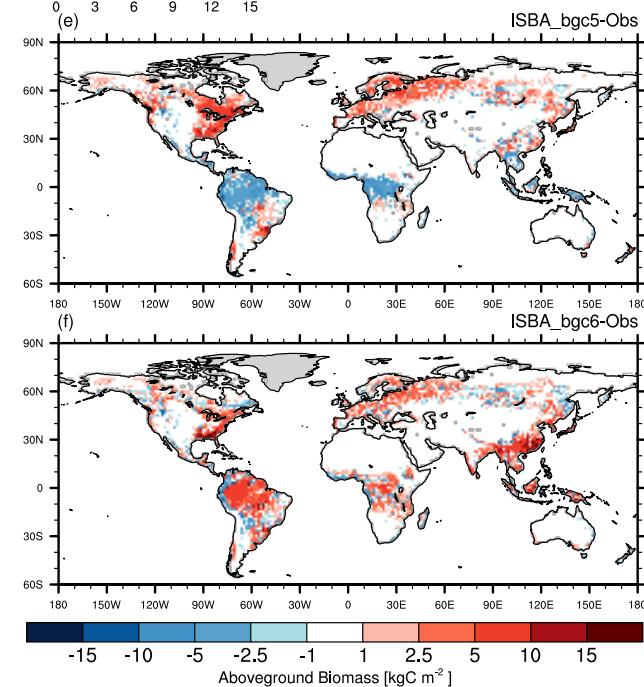
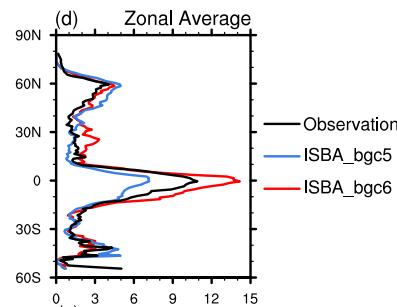
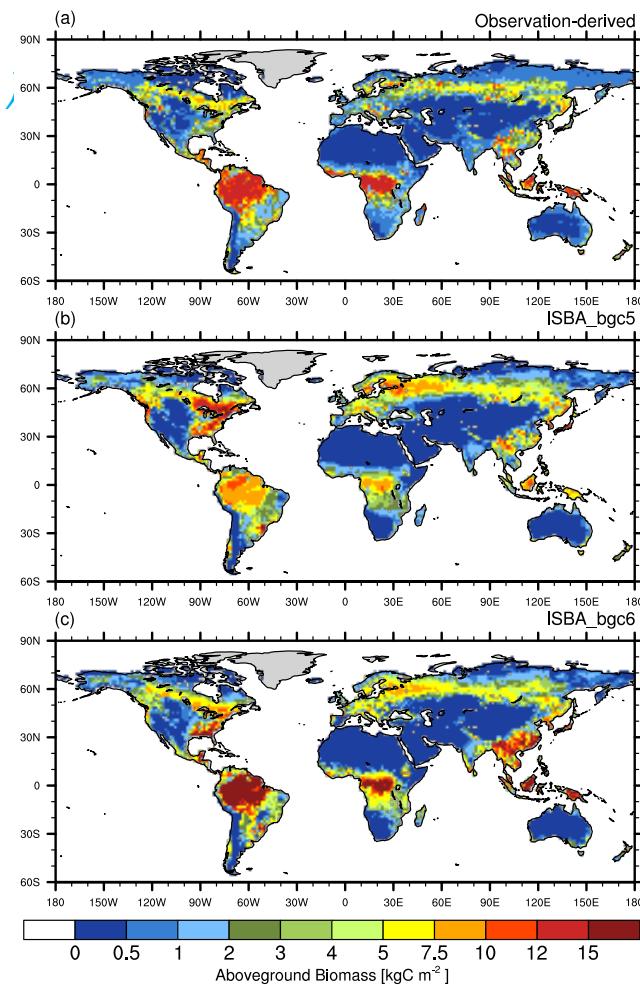
Aboveground biomass



(Liu et al, 2015)

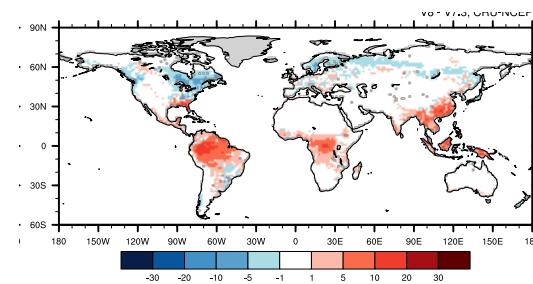
ISBA_bgc5

ISBA_bgc6



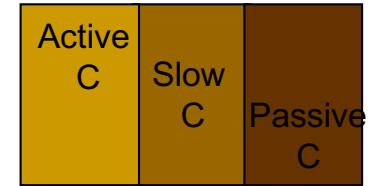
ISBA_bgc5 - Obs

ISBA_bgc6 - Obs

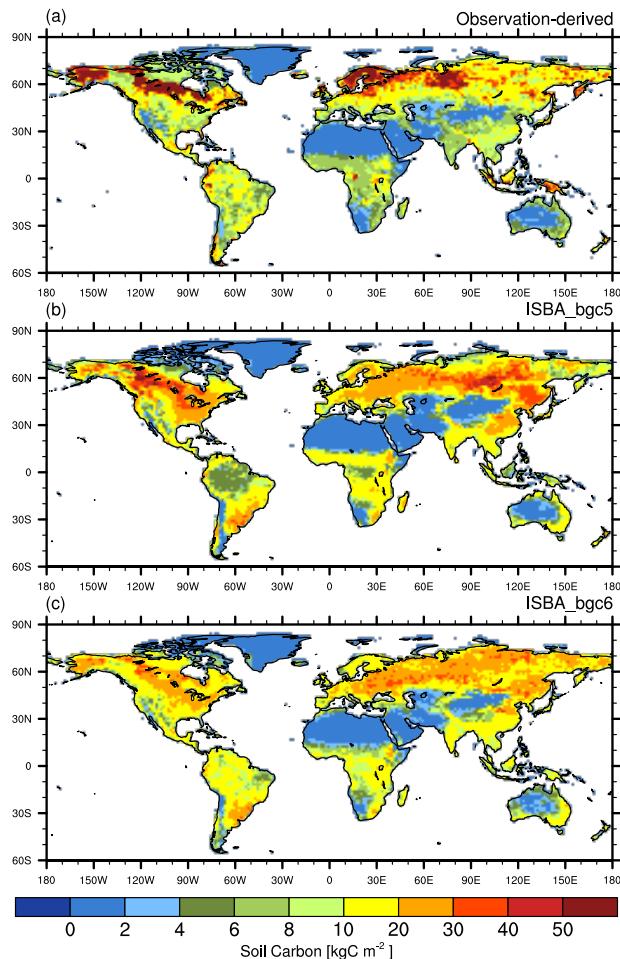


HWSD
(FAO/IIASA, JRC 2012)

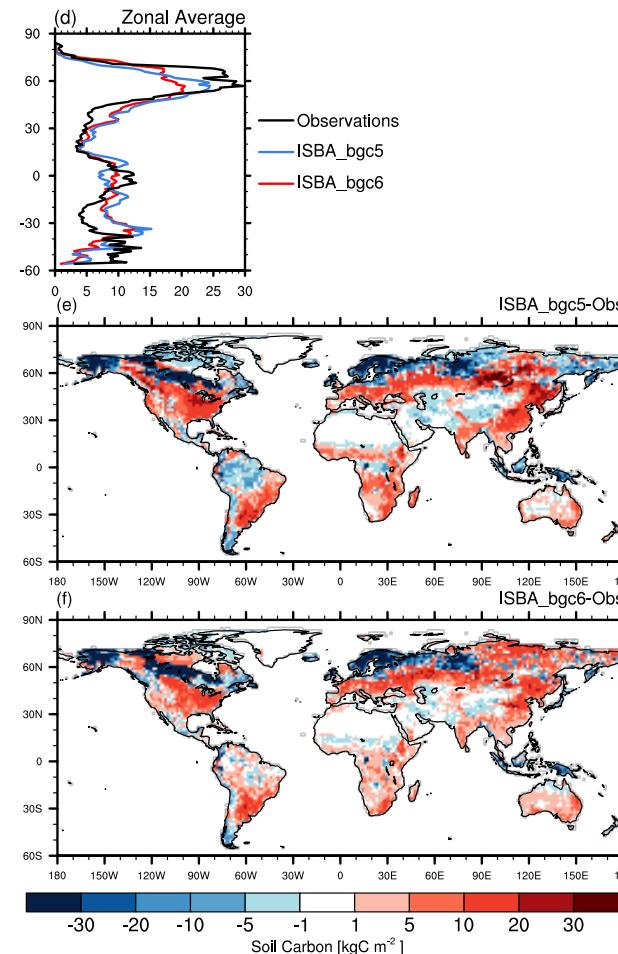
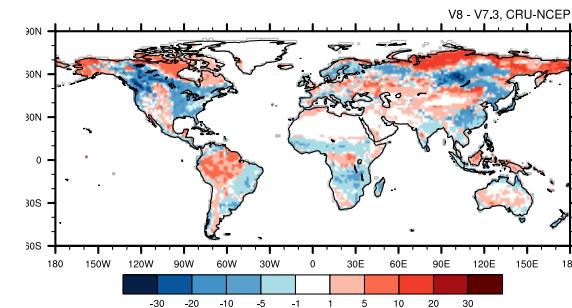
Soil Carbon



ISBA_bgc5



ISBA_bgc6



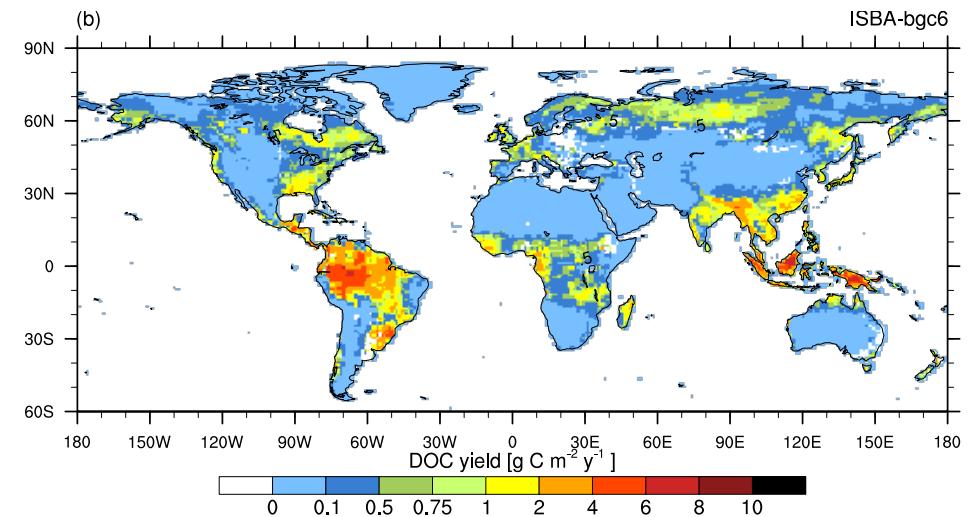
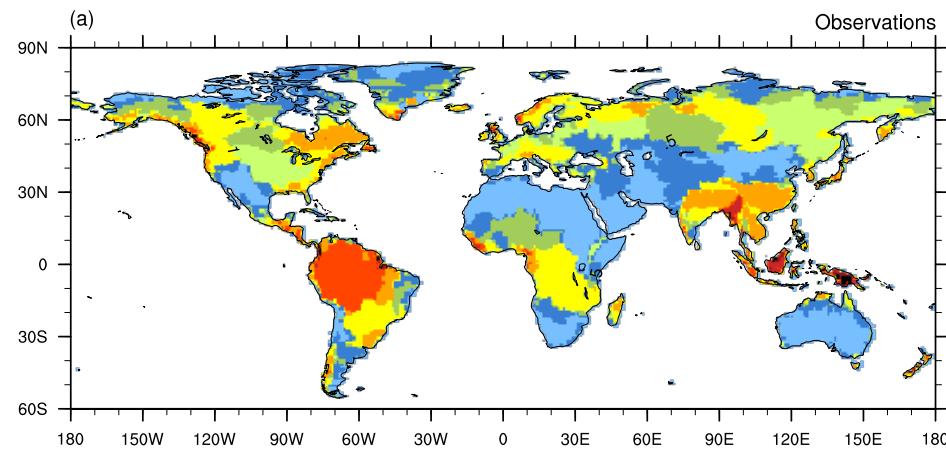
ISBA_bgc6 - ISBA_bgc5

ISBA_bgc5 - Obs

ISBA_bgc6 - Obs

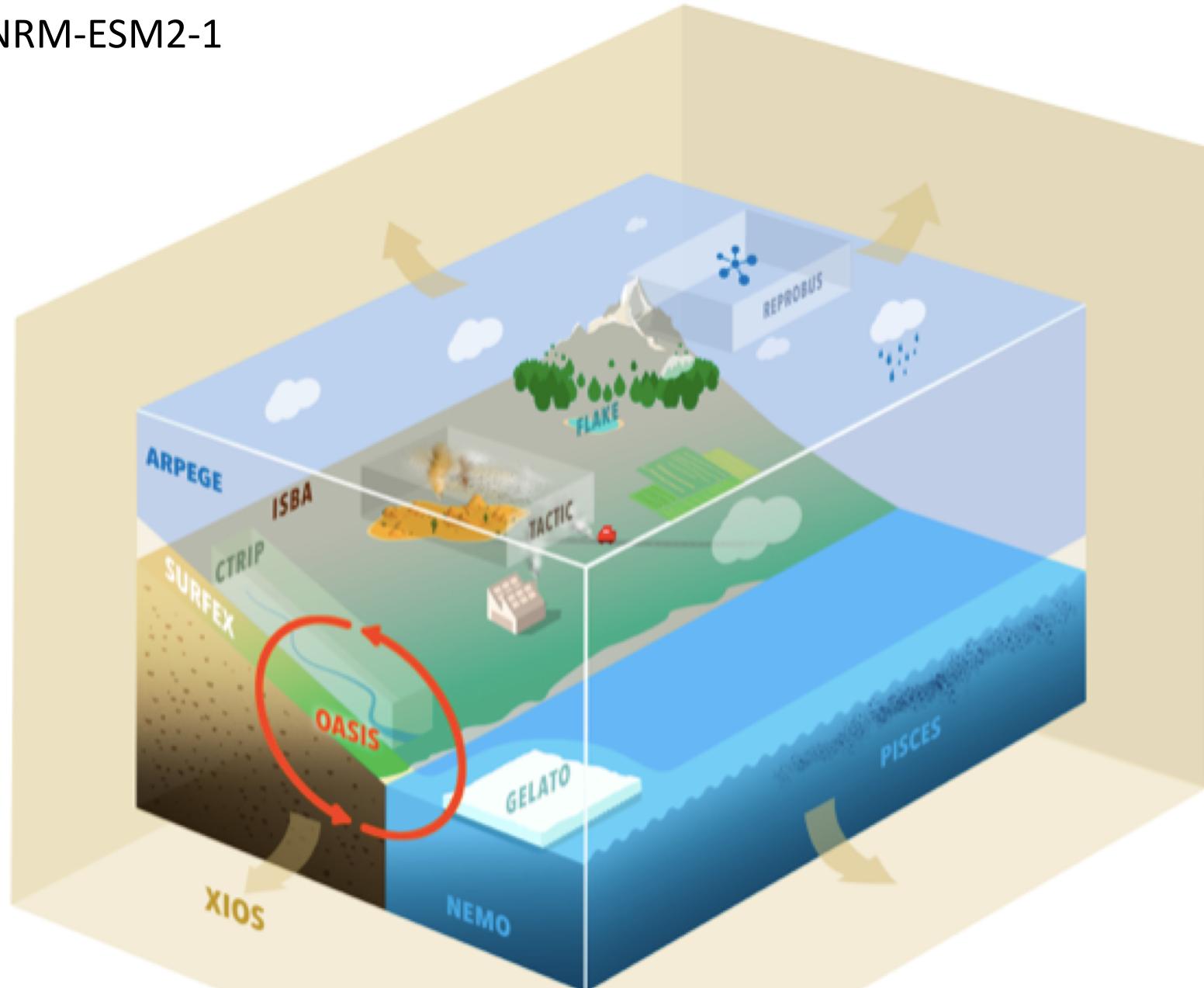
Dissolved Organic Carbon

GlobalNEWS2
(Mayorga et al, 2010)

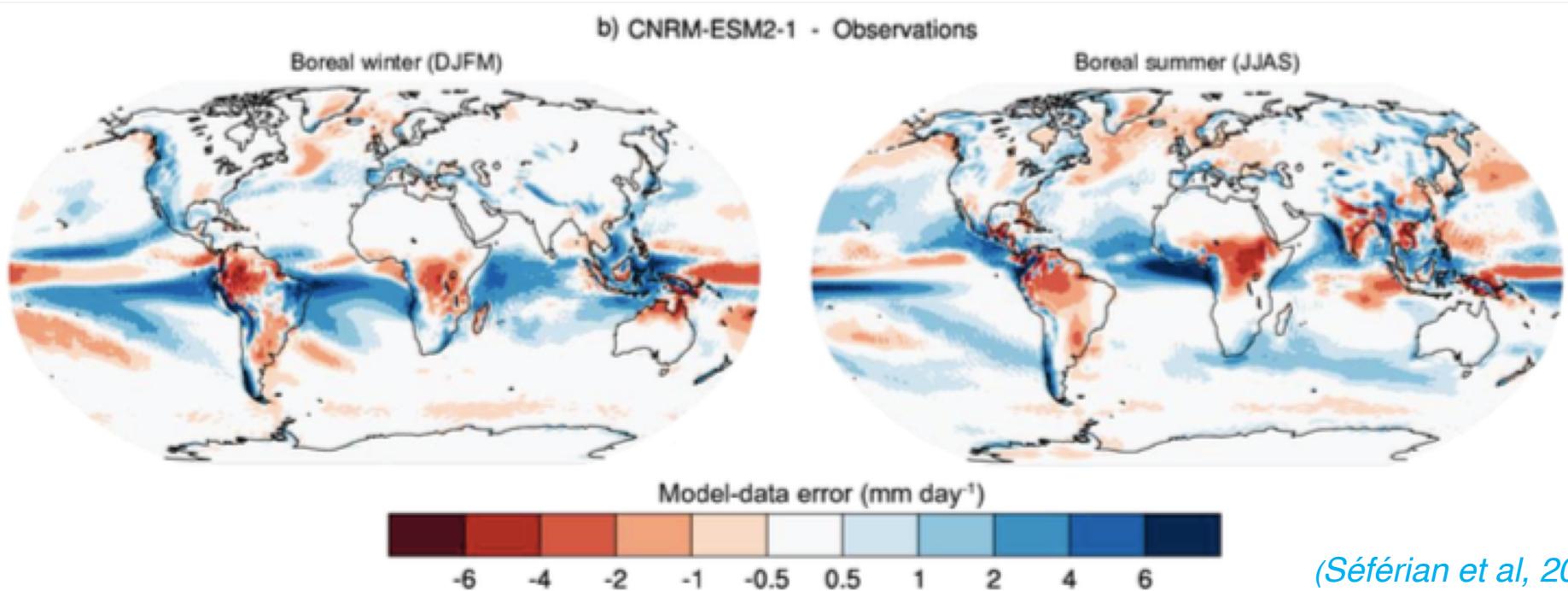
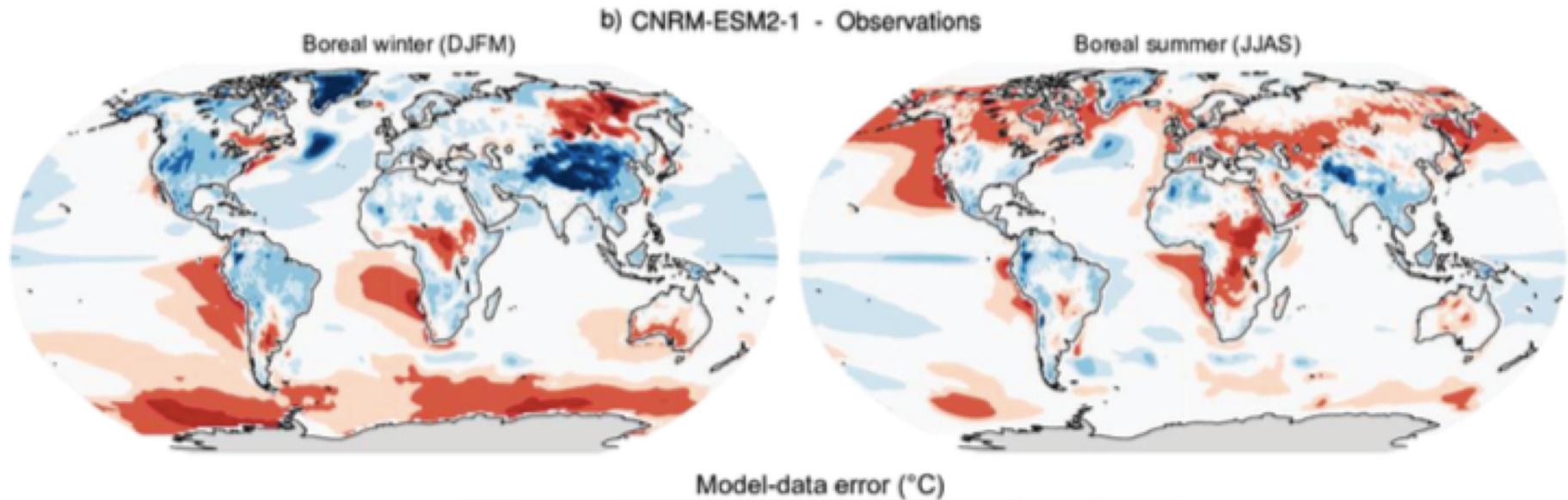


Global estimates: 0.18 TgC/yr

ISBA: 0.08 TgC/yr



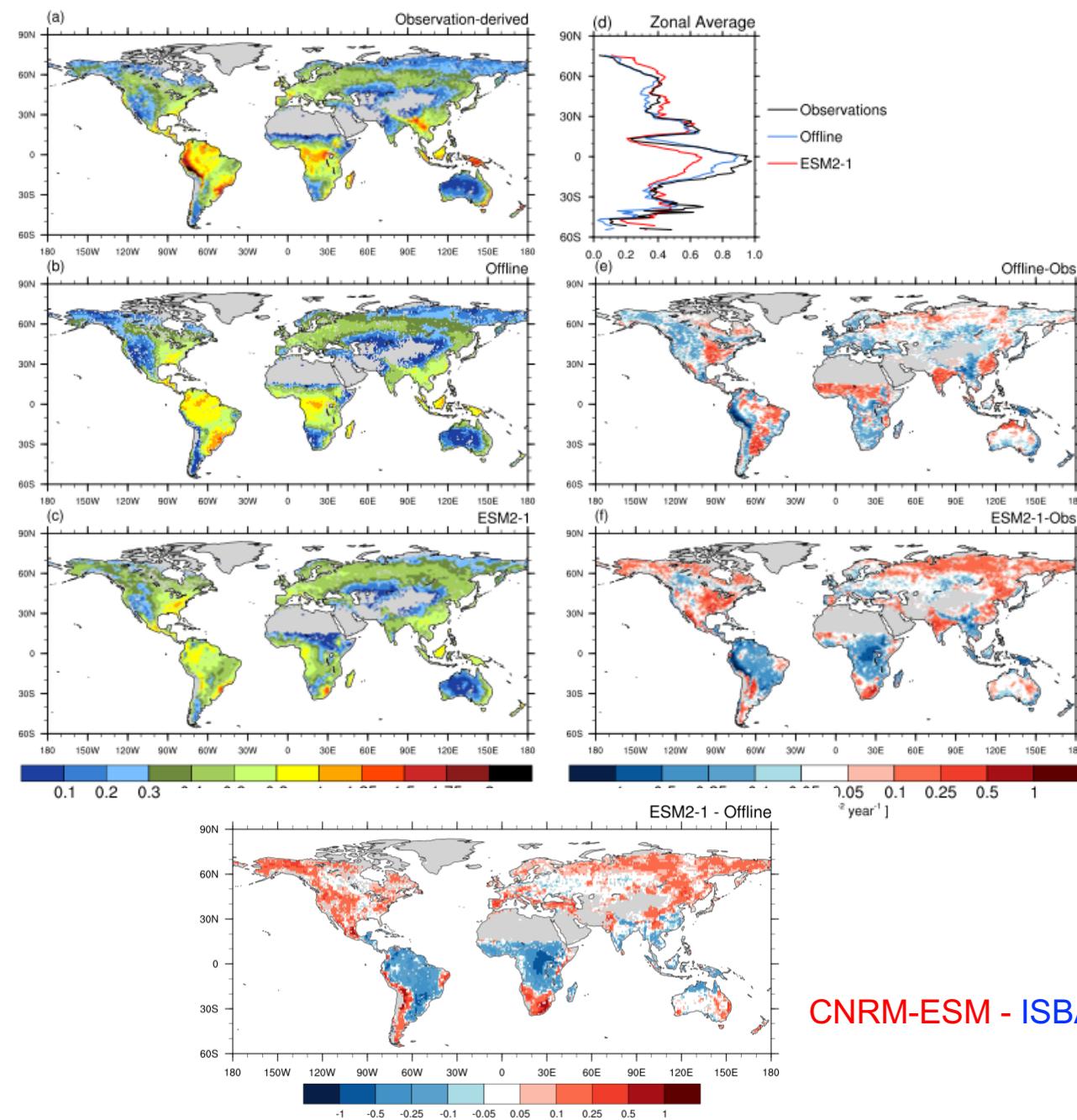
CNRM-ESM2-1 Simulated climate



MODIS17A3
(*Zhao et al, 2015;*)

ISBA_bgc6

CNRM-ESM



Net Photosynthesis

NPP



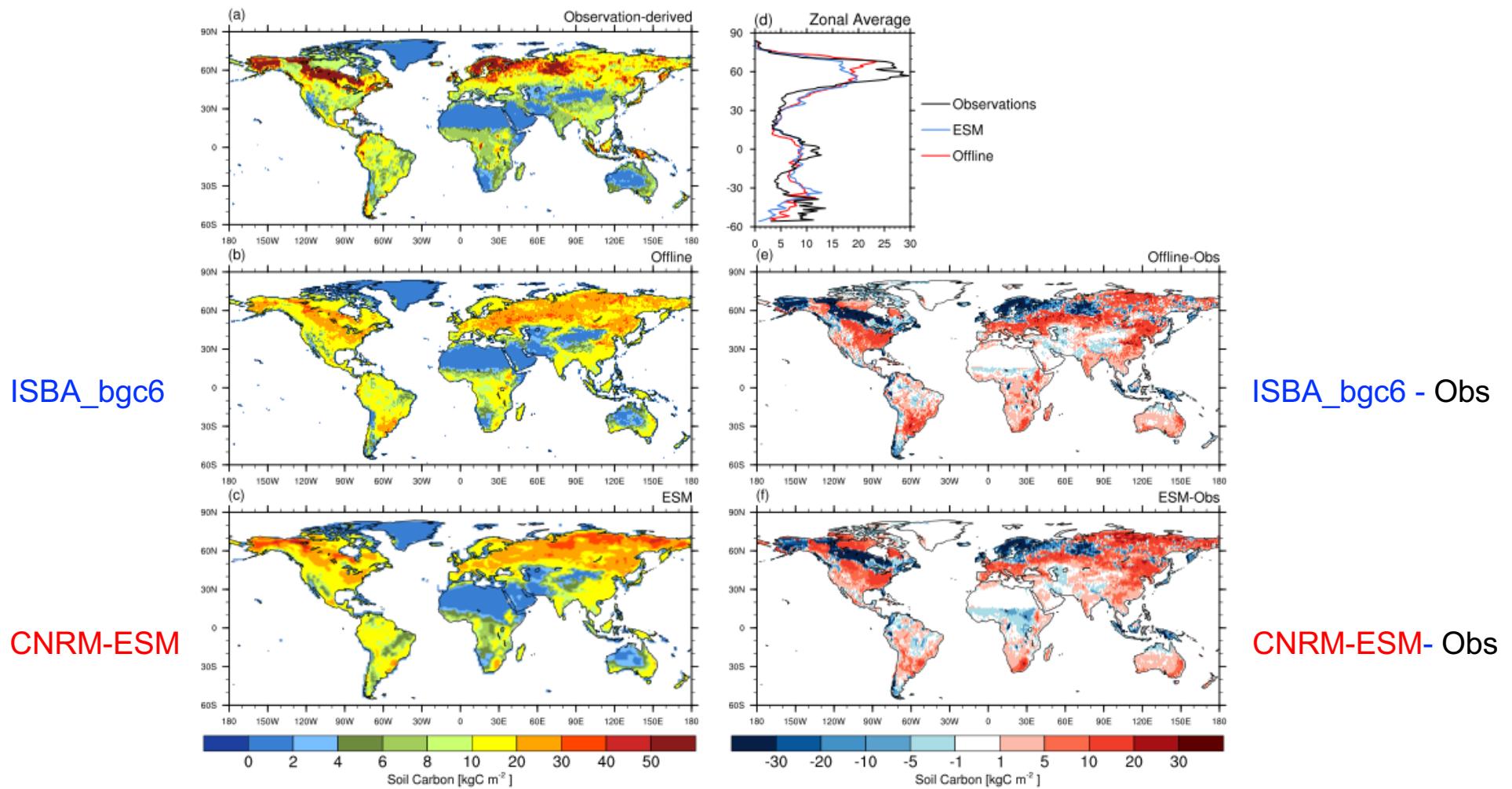
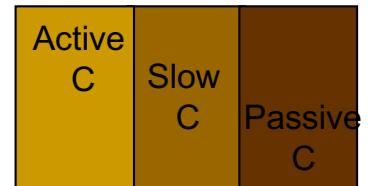
ISBA_bgc6 - Obs

CNRM-ESM - Obs

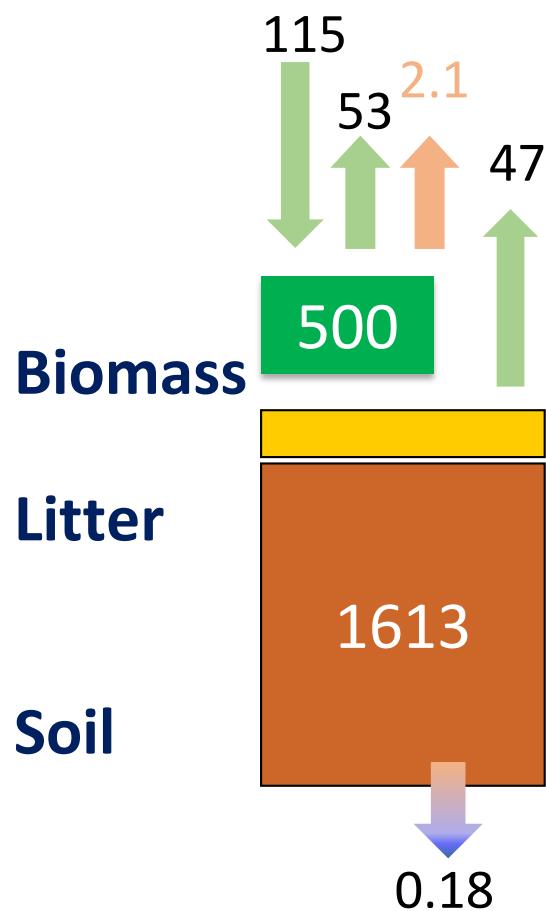
CNRM-ESM - ISBA_bgc5

HWSD
(FAO/IIASA, JRC 2012)

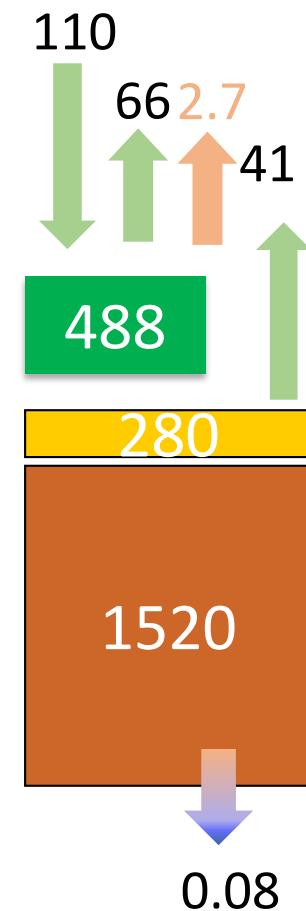
Soil Carbon



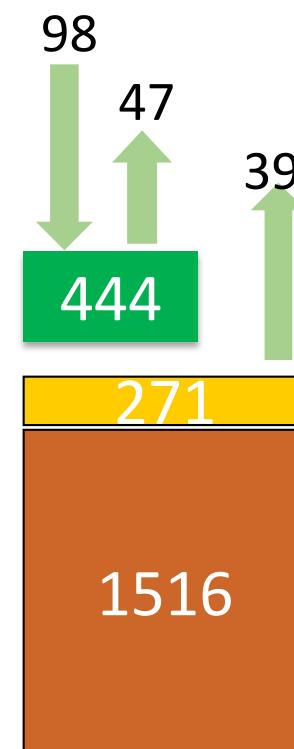
« obs »



lsba_bgc6



CNRM-ESM2-1



→ PgC / yr
PgC