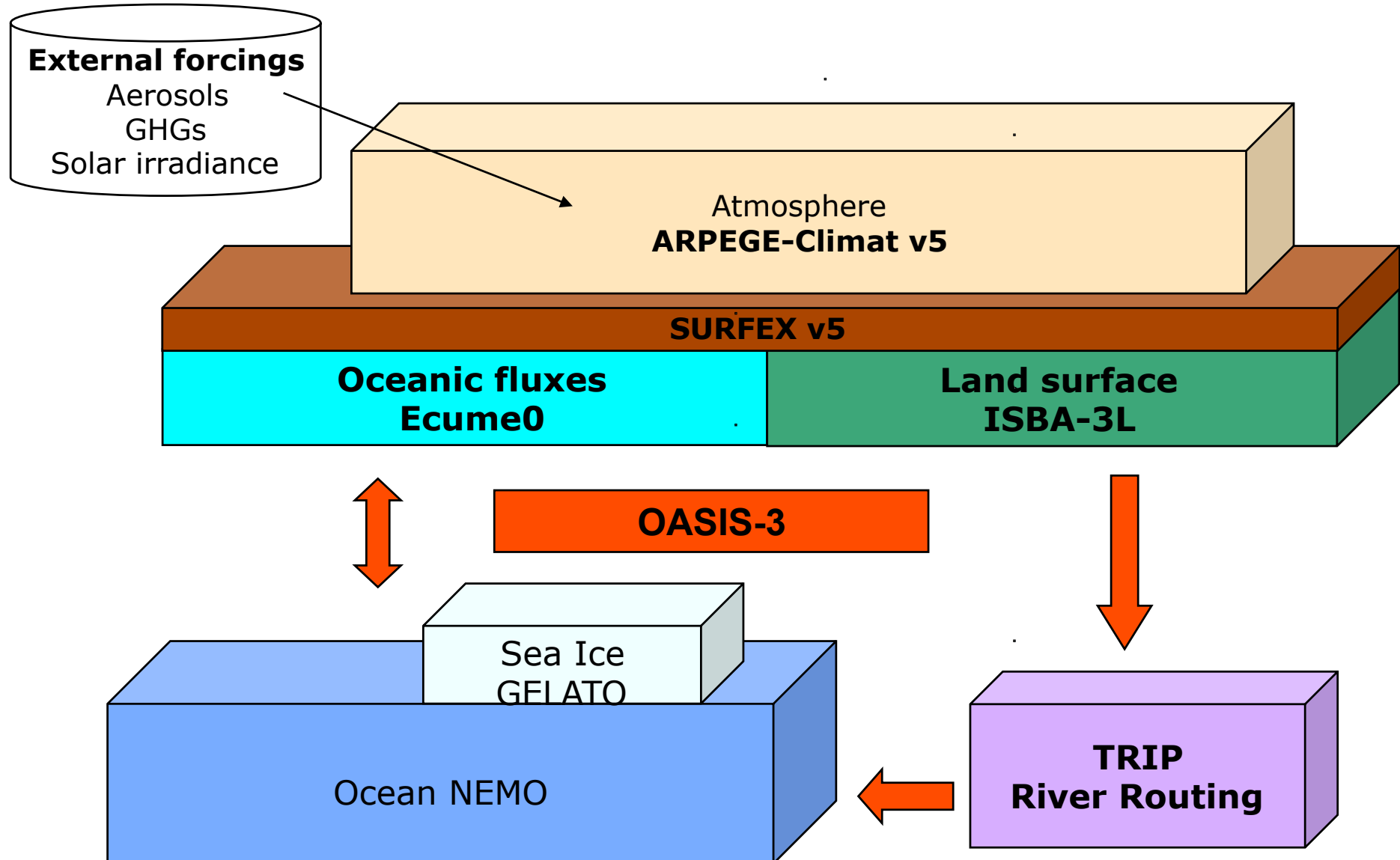


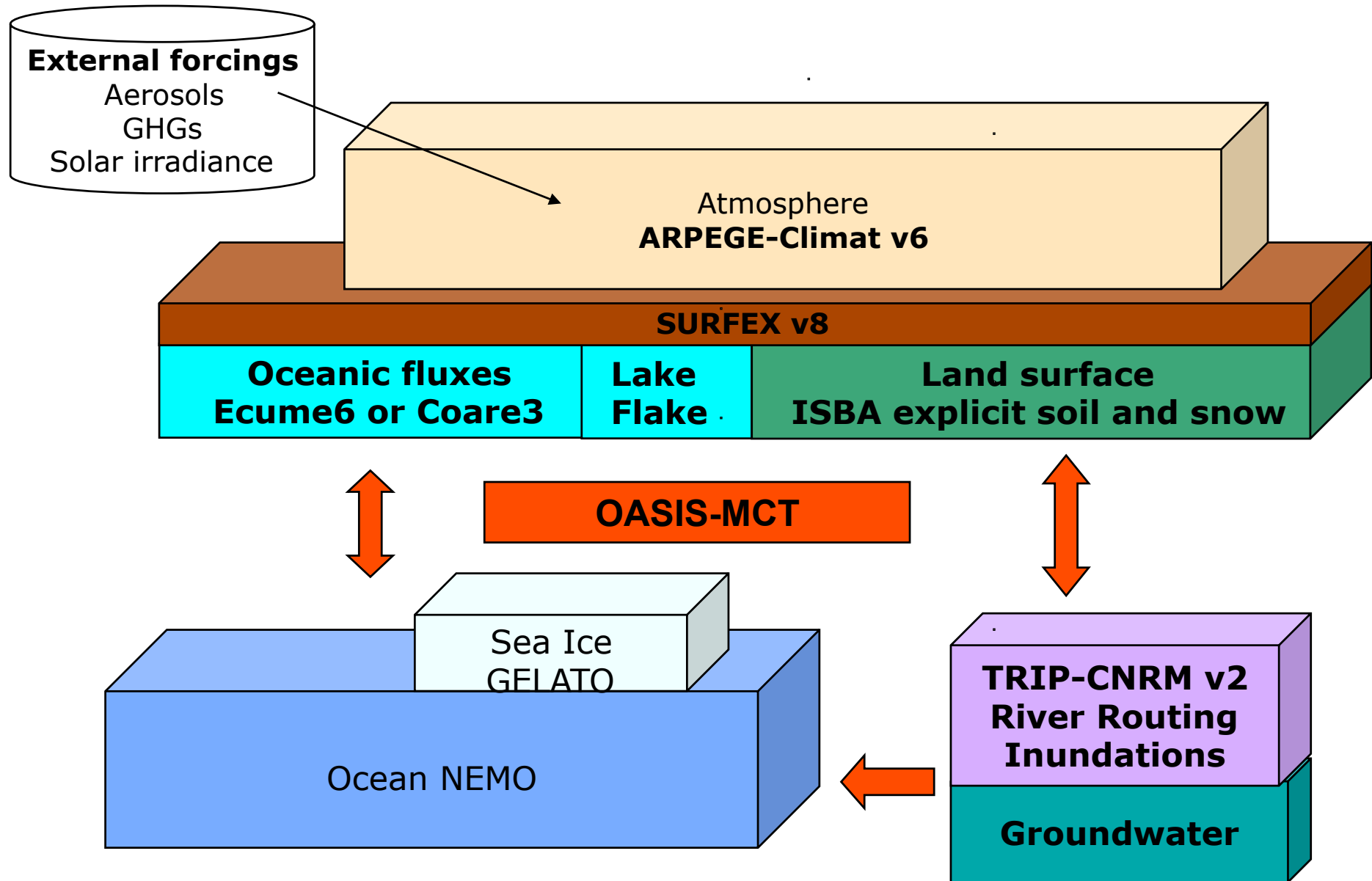
# **Modélisation des surfaces continentales au CNRM**

**Bertrand Decharme, Jeanne Colin, Aurore Voldoire, David Saint-Martin et al.**

# SURFEX-TRIP pour CNRM-CM5



# SURFEX-TRIP pour CNRM-CM6

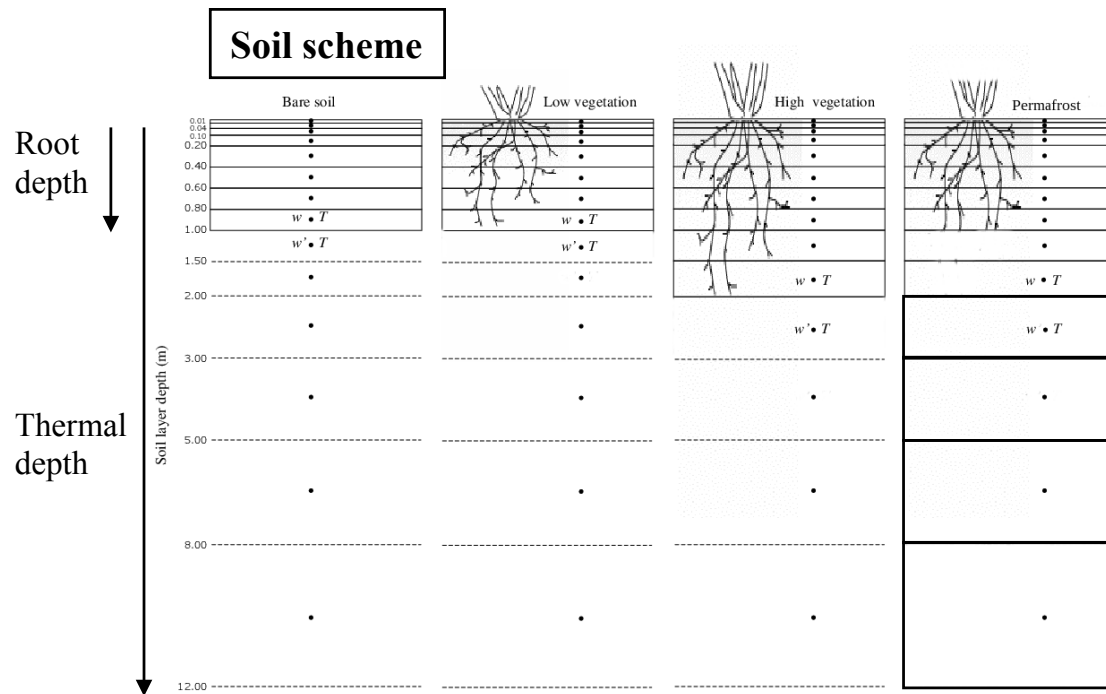


# SURFEX-TRIP pour CNRM-CM6

<b>SURFEX-TRIP</b>	<b>Evaluation Off-line</b>	<b>Evaluation On-line</b>	<b>Publications</b>
<b>Flake (schéma de lac)</b>	Ok	Ok	(offline) LeMoigne et al. 2013, Tellus A (offline/online) LeMoigne et al. 2015, à soumettre
<b>Gelato-1d pour run AMIP</b>	Ok	Ok	
<b>Ecume6</b>	En cours	En cours	
<b>Albédo Land MODIS</b>	Ok	Ok	(Methodologie) Carrer et al. 2014, RSE
<b>Explicit diff. 14 couches</b>	Ok	Ok	(Offline) Decharme et al. 2011, JGR (Offline) Decharme et al. 2013, JGR
<b>Explicit Snow 12 couches</b>	Ok	Ok	(Offline) Decharme et al. 2015, soumis, The Cryosphere D.
<b>Végétation interactive et Cycle du carbone</b>	Ok	Ok	(Offline) Joetzjer et al. 2015, GMD (Online) Séférian et al. 2015, en revu, GMDD
<b>Albédo Océan Diff / Dir</b>	Ok	Ok	(Online) in prep
<b>Aquifères</b>	Ok	OK	(offline) Vergnes et al. 2012, J. Hydromet. (offline) Vergnes and Decharme 2012, HESS (offline) Vergnes et al. 2014, JGR
<b>Inondations</b>	Ok	En cours	(offline) Decharme et al. 2008, JGR (offline) Decharme et al. 2012, Clim. Dyn.

# SURFEX sol et neige pour CNRM-CM6

- 14 soil layers over 12m « thermal » depth (Fourier law)
- Soil/Root « hydrological » depth varies according to 12 PFT (1m for bare soil, ~1.5m for grass/crop, ~2m forest, 8m for tropical forest)
- 12 snow layers within an Explicit Snow scheme
- Effect of soil organic carbon on thermal and hydrological soil properties



(Decharme et al. 2013, JGR)

Snow scheme	New version (based on Crocus)
<b>Layers</b>	12 (adjusted only if thickness of layer 1, 2 or 12 become too large)
<b>Albedo</b>	3-bands: 1 visible + 2 nir accounting for snow grain size (Brun et al. 1992)
<b>Compaction/Settling</b>	Viscosity from Brun et al. (1992) (accounting for liquid water) Surface compaction during wind drift (Brun et al. 1997)
<b>Thermal conductivity</b>	Yen et al. (1981) Interfacial harmonic average

(Decharme et al. 2015, Submitted)

# Validation “offline” du schéma de sol sur la France

## **Forcing**

SAFRAN

1-hr, 8km, 1992-2012  
20 years Spin up (4 x 1992-1996)

## **Vegetation & Soil parameters**

ECOCLIMAP & HWSD (1km)

PFTs, LAI, Clay, Sand, etc...

**SURFEX**  
(ISBA + MODCOU)

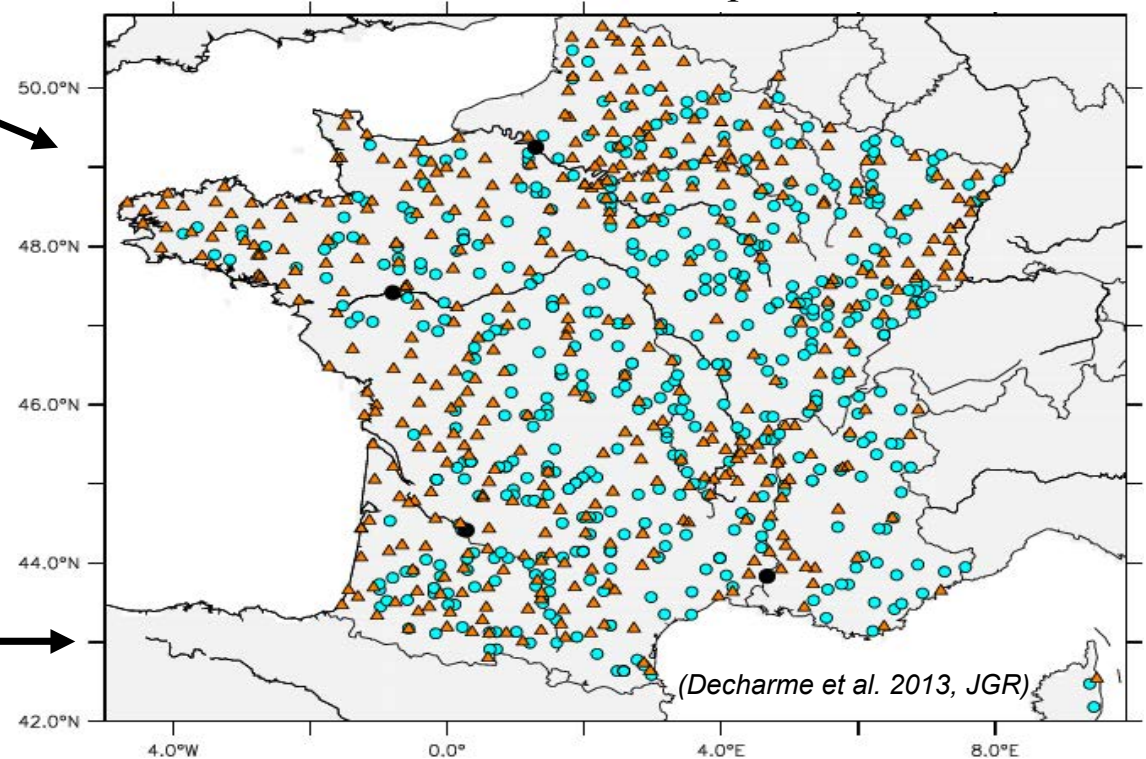
Soil temperature

Runoff & Drainage

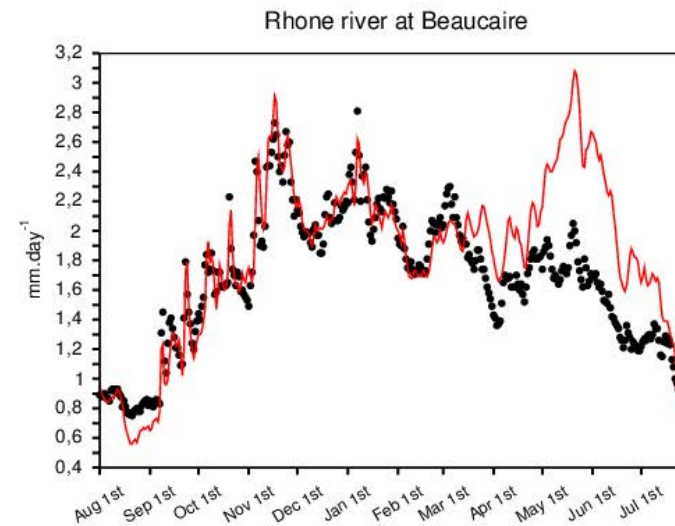
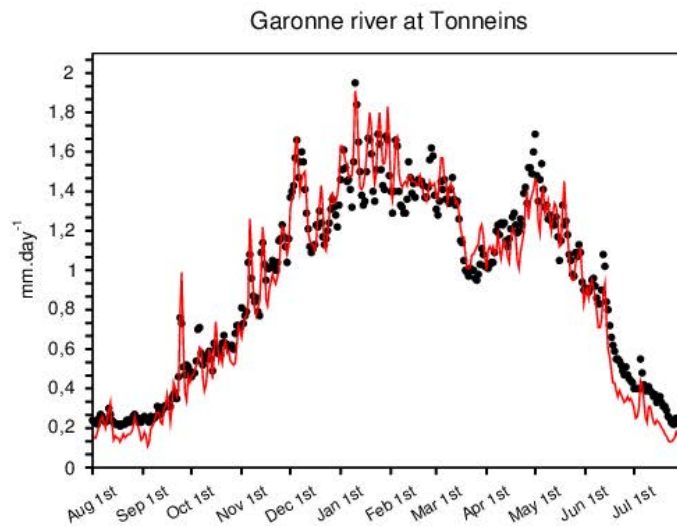
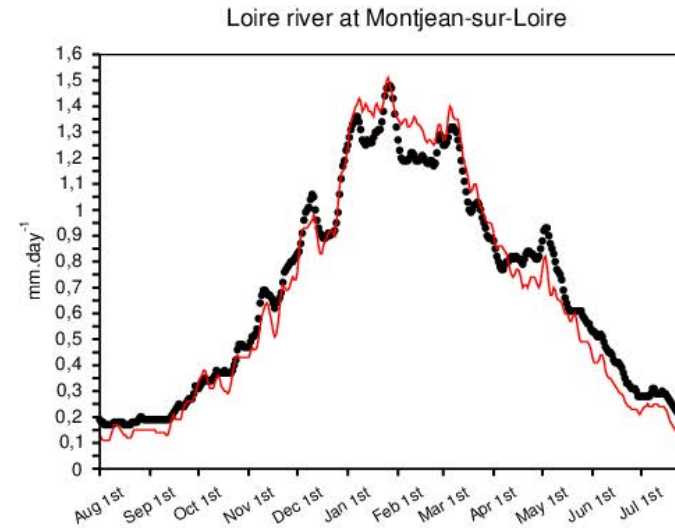
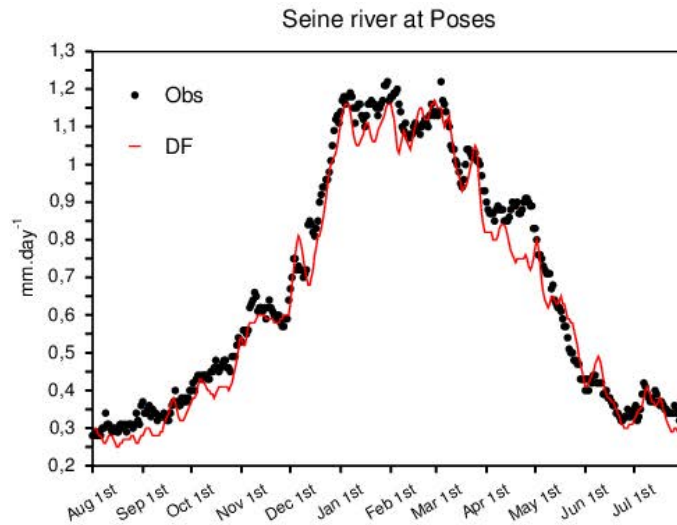
MODCOU

Discharges

Discharges and Soil  
Temperature stations

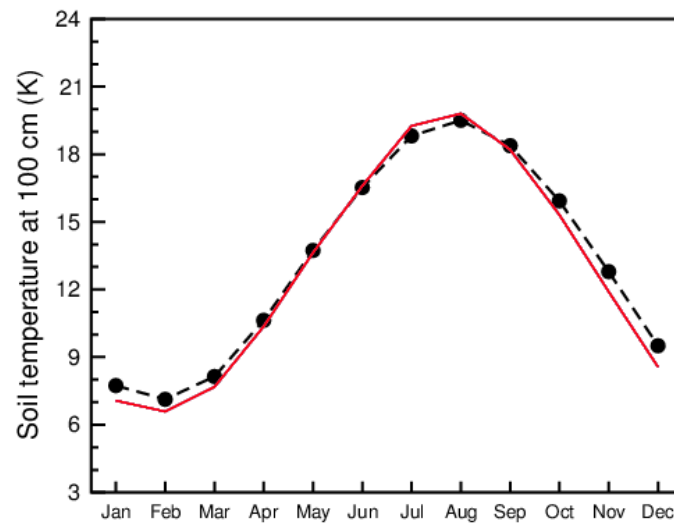
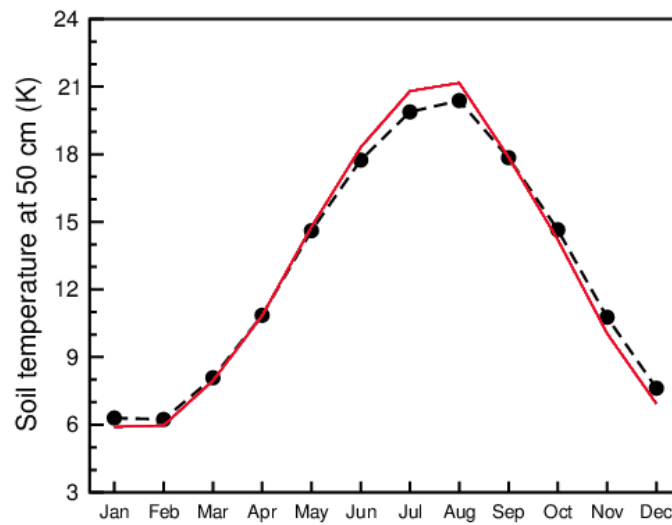
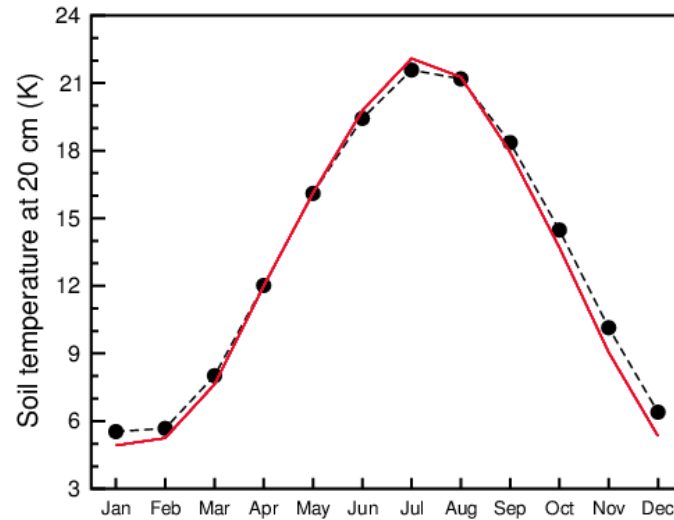
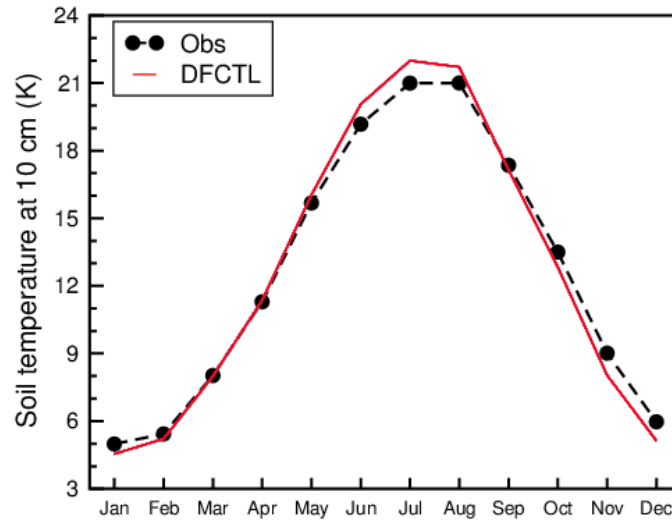


# Discharges: daily climatology over 1992 – 2012



(Decharme et al. 2013, JGR)

# Soil Temperature: monthly climatology over 1992 – 2012



(Decharme et al. 2013, JGR)



# ISBA Explicit Snow and Soil Validation over Siberian data

## Forcing

ERA-I. Reanalysis + GPCC  
3-hr, 0.5°, 1979-1993  
100 years Spin up (10 x 1979-1988)

## Soil parameters

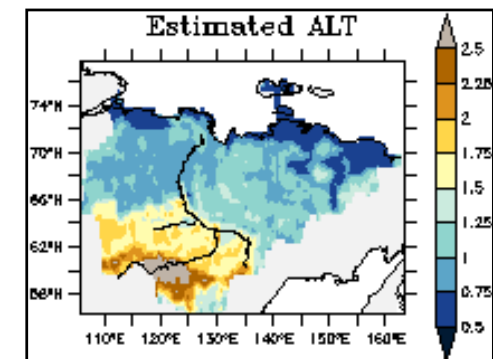
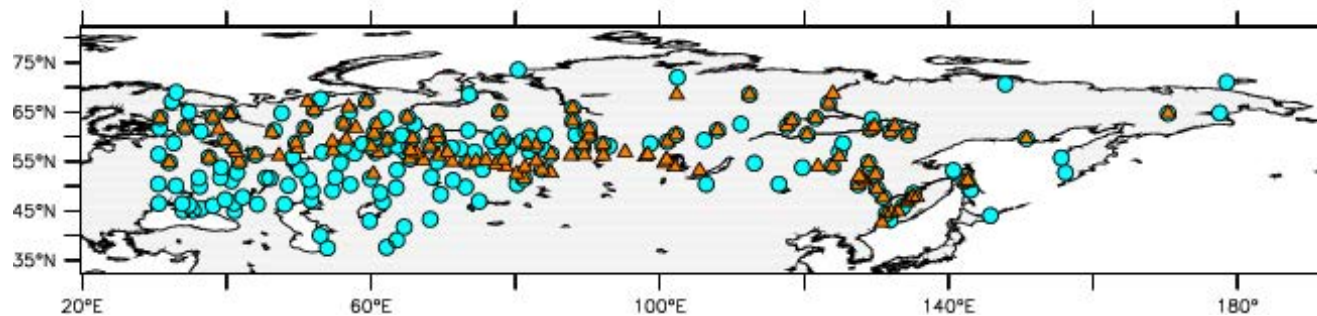
HWSD (1km)  
Clay, Sand, Topsoil and Subsoil OC

**SURFEX**  
(ISBA)

Snow depth  
Soil temperature  
« open field only »

Active Layer Thickness  
over Yakutia

Snow Depth (circles) and Soil Temperature (triangles) Stations

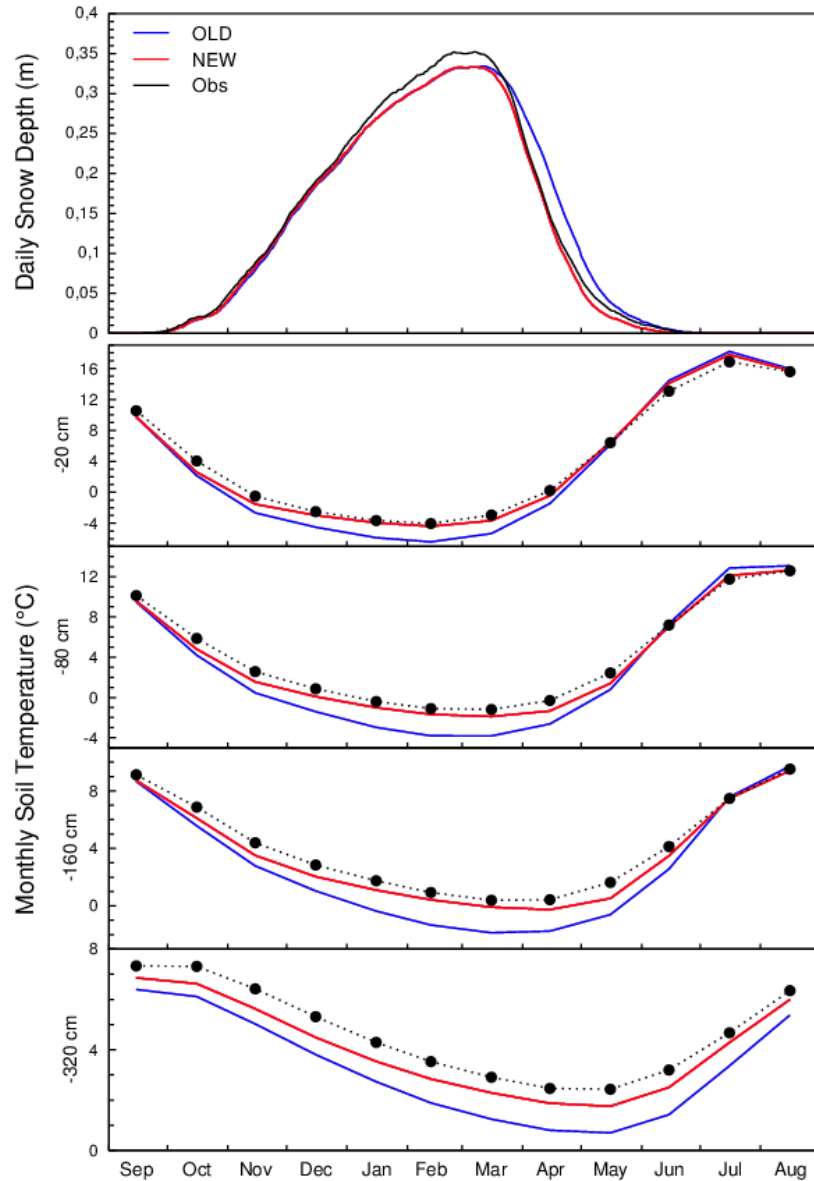


*From Beer et al. [2013]*

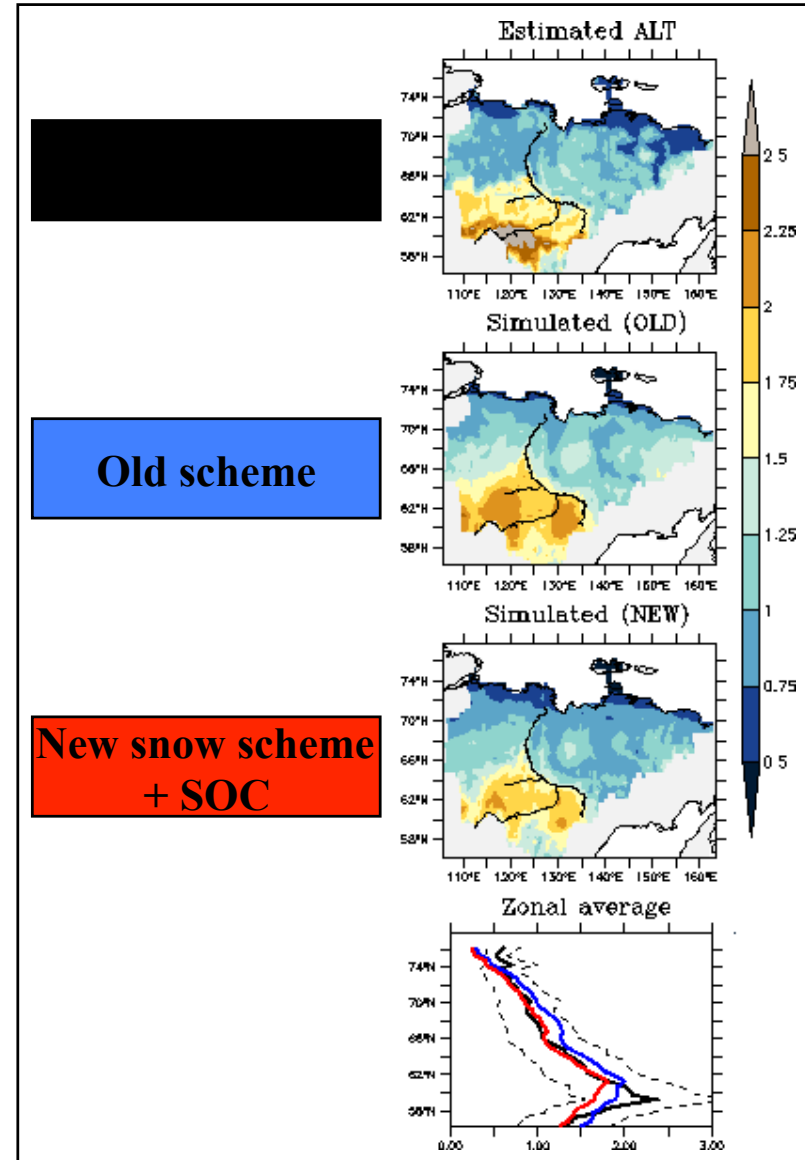
*(Decharme et al. 2015, Submitted)*

# Offline validation over Siberian data (1979-1992)

## Snow depth and soil temperatures



## Maximum Active Layer Thickness



# Comparaison « on-line » SFX-CM5 vs. SFX-CM6

Période 1979-2007

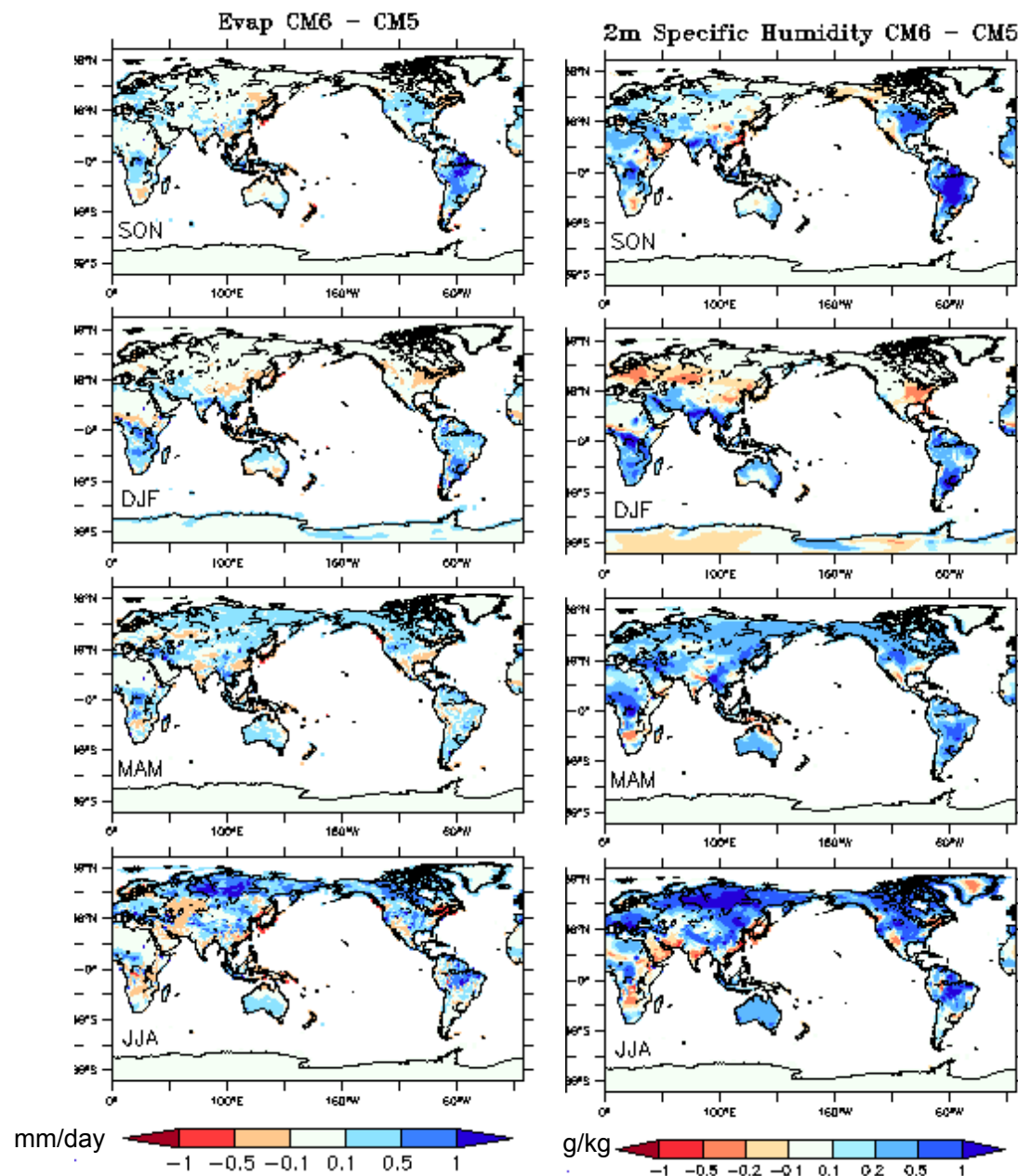
Même physique atmosphérique (Arpègev6) :

Même Albedo MODIS

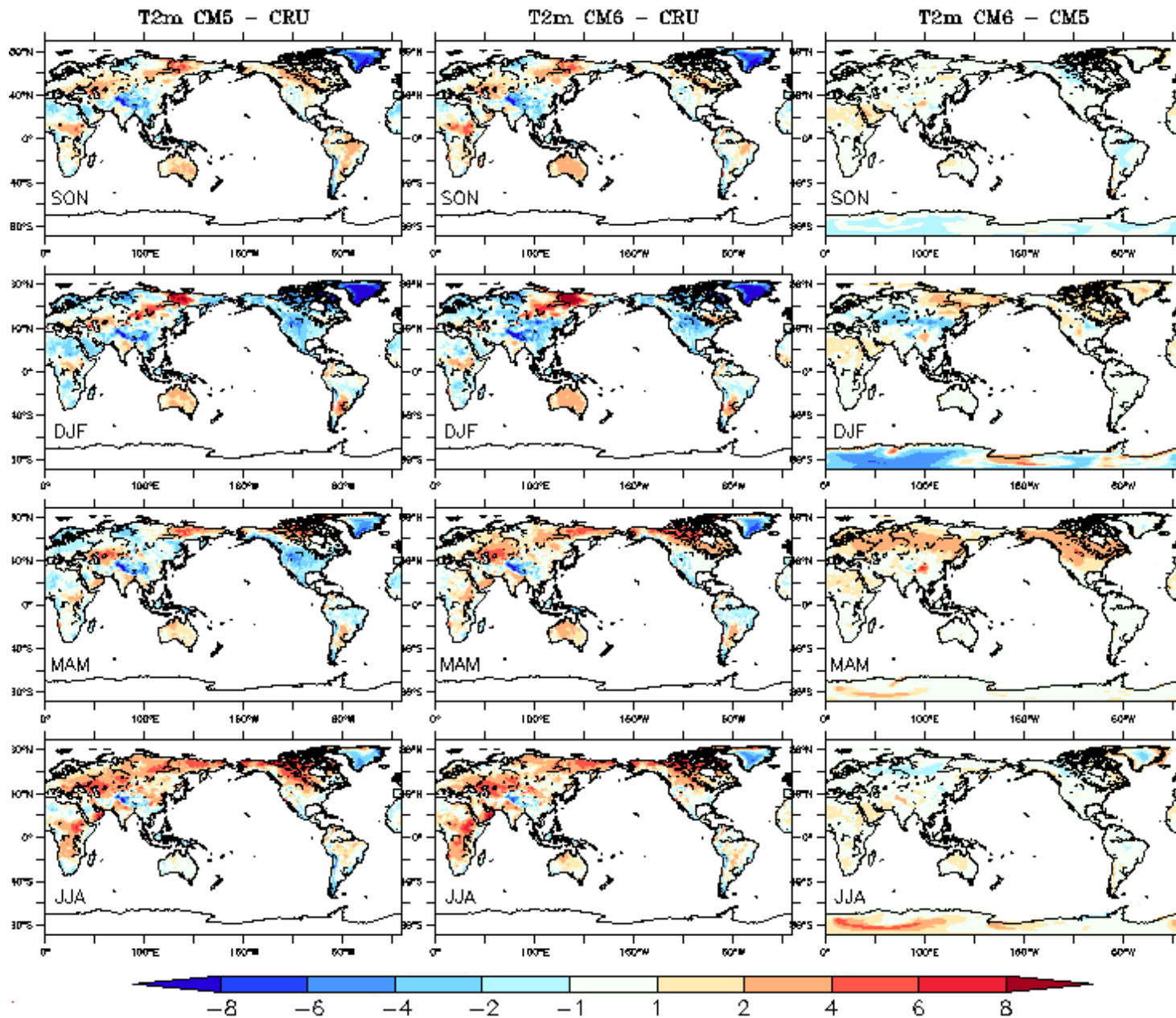
Flake activé dans les 2 cas suivant :

-CM5 : ISBA 3L + neige 1L

-CM6 : ISBA 14L + neige 12L + groundwater



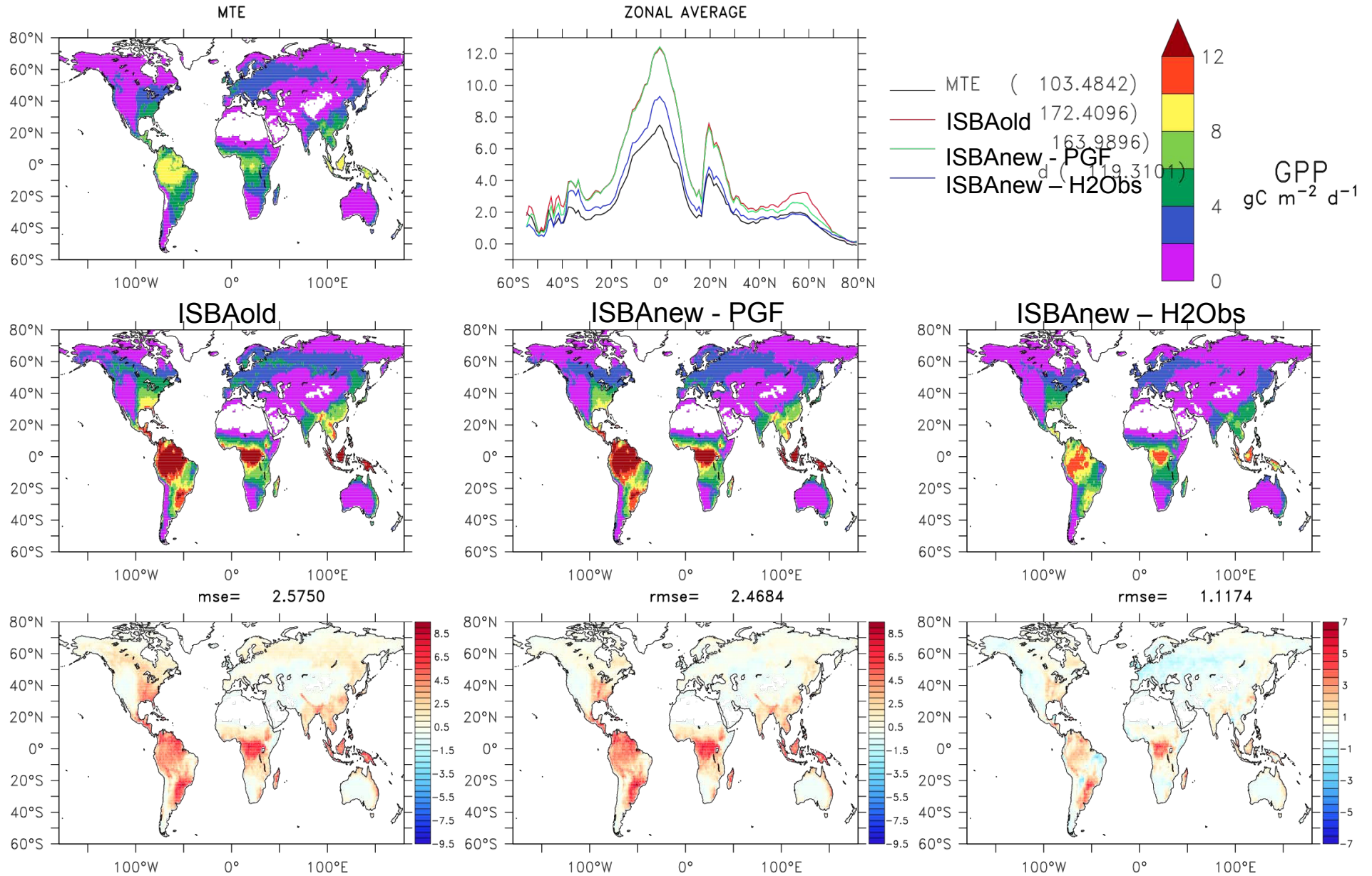
# Biais T2m « on-line » SFX-CM5 vs. SFX-CM6



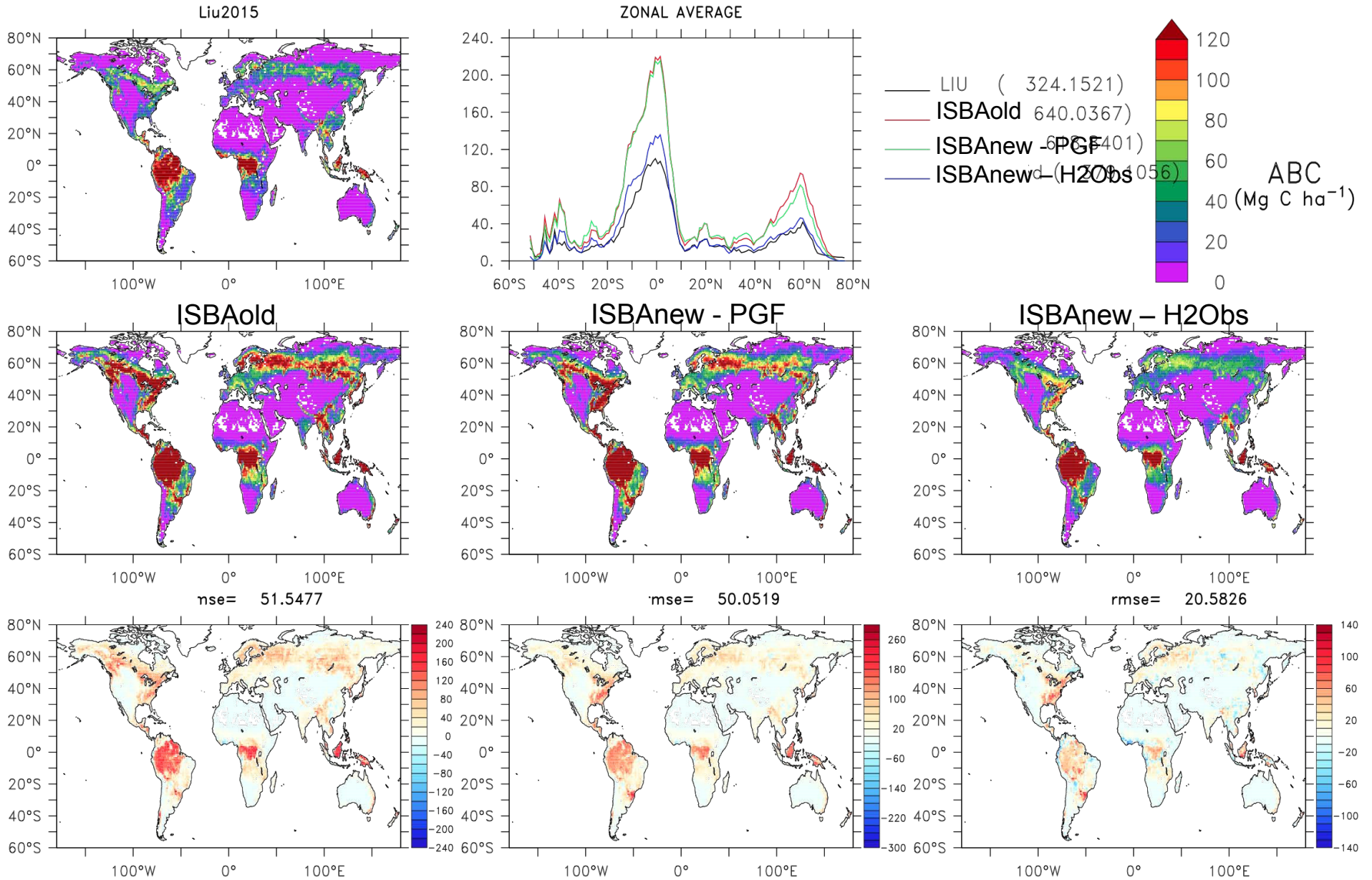
# SURFEX-TRIP pour CNRM-ESM2

<b>SURFEX-TRIP</b>	<b>Evaluation Off-line</b>	<b>Evaluation On-line</b>	<b>Modifications/améliorations</b>
<b>Végétation</b>	Ok	Ok	Passage à 19 PFTs séparation par biomes boréaux/tempérés/tropicaux
<b>Photosynthèse</b>	Ok	En cours	Calibration à partir de la base TRY
<b>Limitation azote</b>	Ok	En cours	Revisité sur la base des travaux de Yin et al., 2002 (loi allométrique)
<b>Respiration autotrophe</b>	Ok	En cours	Application des travaux Joetzjer 2015 aux autres PFTS
<b>Feux naturels</b>	Ok	Ok	Implémentation de GlobFirm/IFM + couplage hydrologie 14-L
<b>Land-use</b>	En cours	...	Implémentation et adaptation des PFTs à Hurrt et al.

# Comparison GPP SURFEXv7 vs SURFEXv8



# Comparaison Biomasse SURFEXv7 vs SURFEXv8



# Feux naturels dans SURFEXv8

