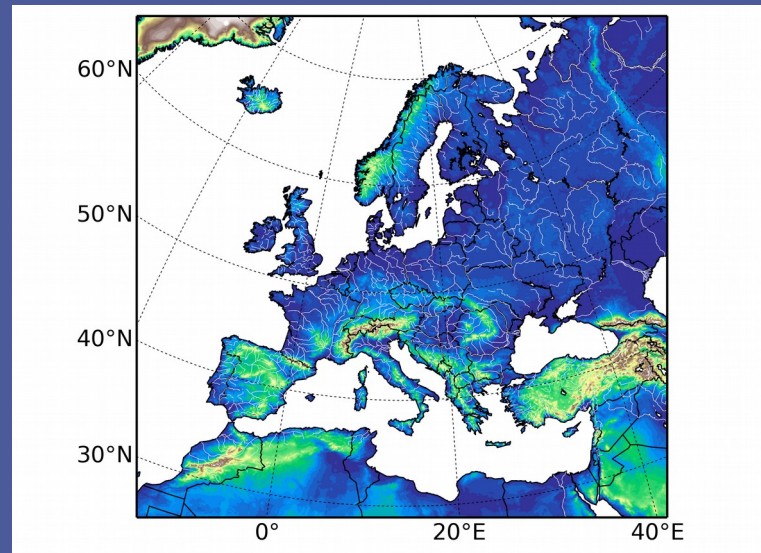


Design of the MESCOAN-SURFEX-TRIP hydro-meteorological system over Europe



Szczypta, C., P. Le Moigne, B. Decharme, A. Verrelle, E. Bazile and R. Abida

Project overview and objectives

UERRA (*Uncertainties in Ensembles of Regional ReAnalyses*)

- European project
- Production and development of an ensemble system of regional reanalysis

- Europe

- 1960-2010

Objectives

- Estimation of ECVs uncertainties
- Setup of a coupled hydro-meteorological modelling system
 - Climatology of land surface variables
 - Long time series of discharges over the main European rivers

- Evaluation of the system (observations in situ)

UERRA GA4 Nov. 2016

The coupled hydro-meteorological modelling system

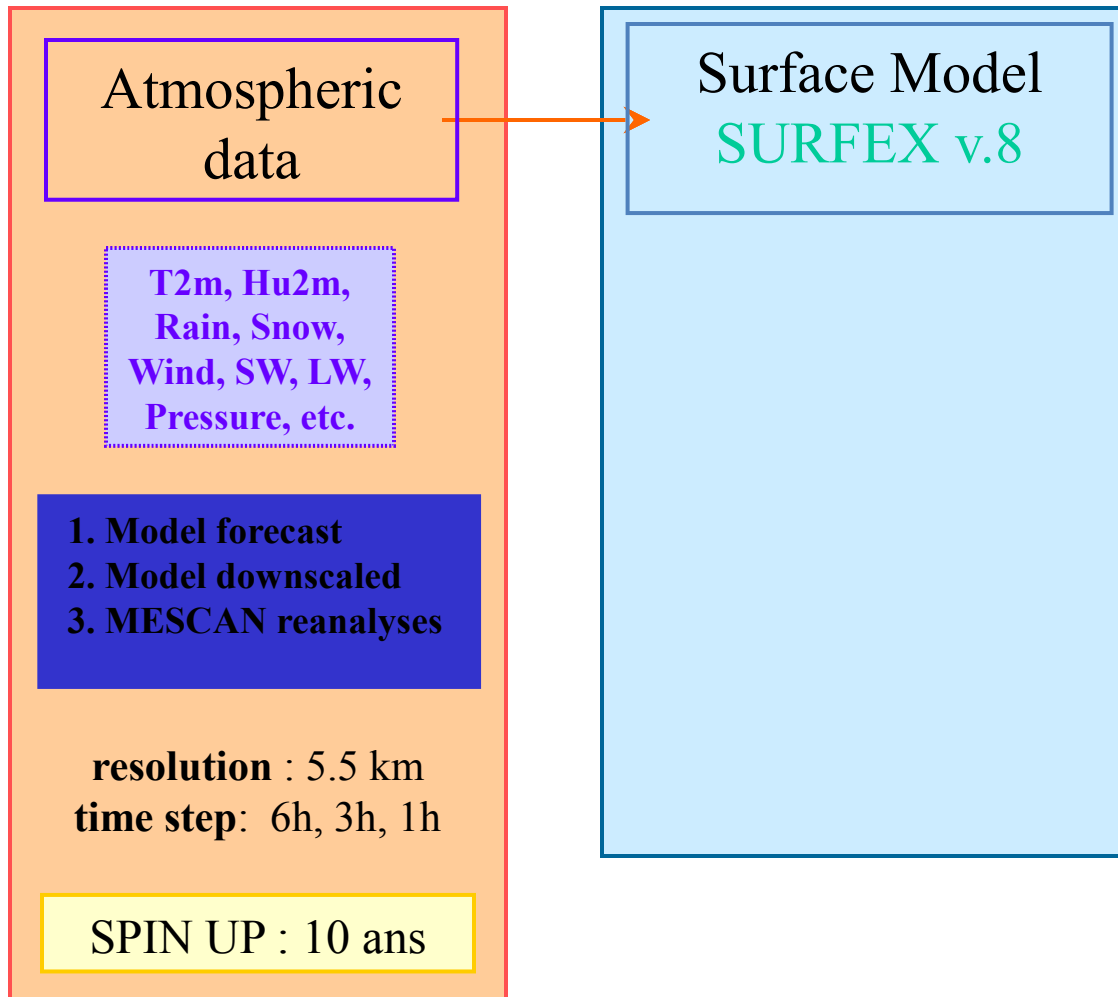
Atmospheric data

T2m, Hu2m,
Rain, Snow,
Wind, SW, LW,
Pressure, etc.

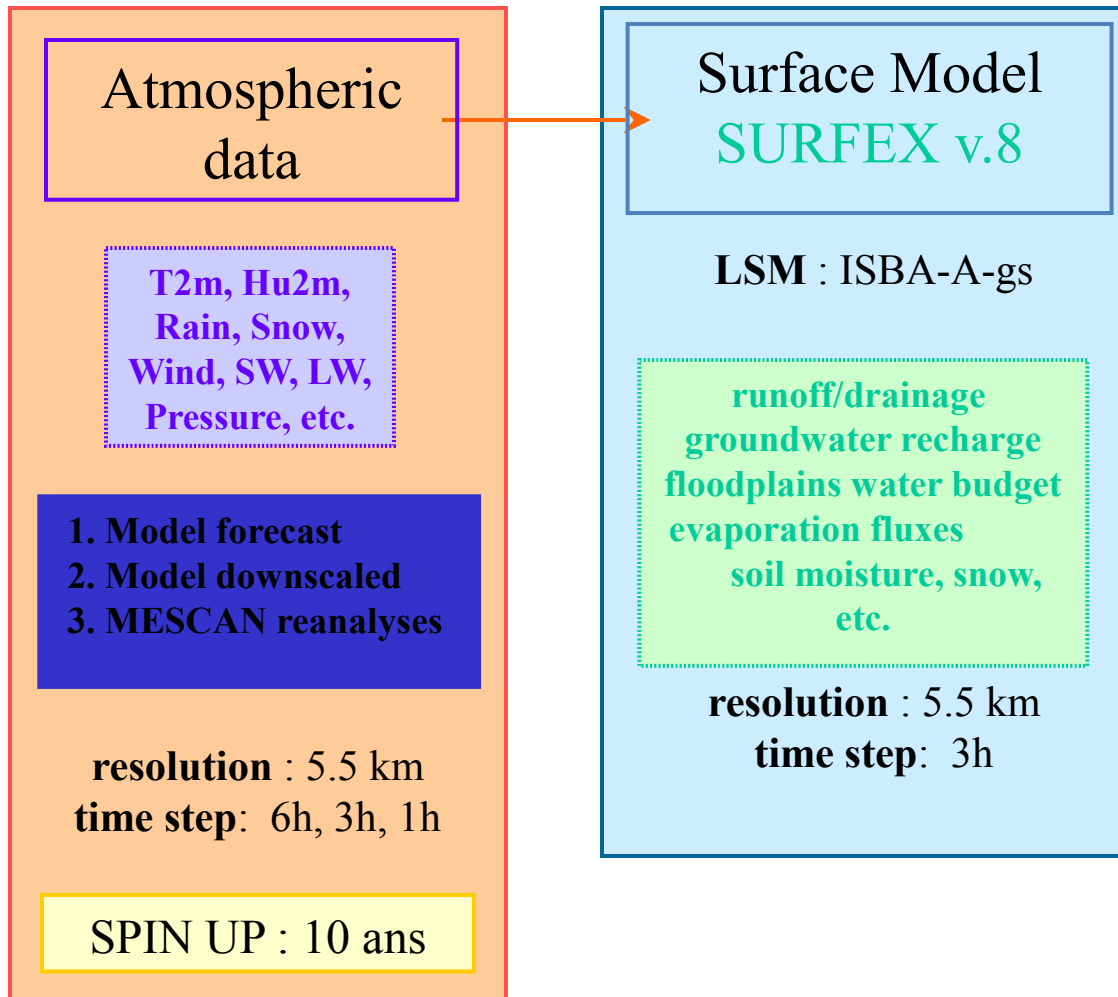
1. Model forecast
2. Model downscaled
3. MESCAN reanalyses

resolution : 5.5 km
time step: 6h, 3h, 1h

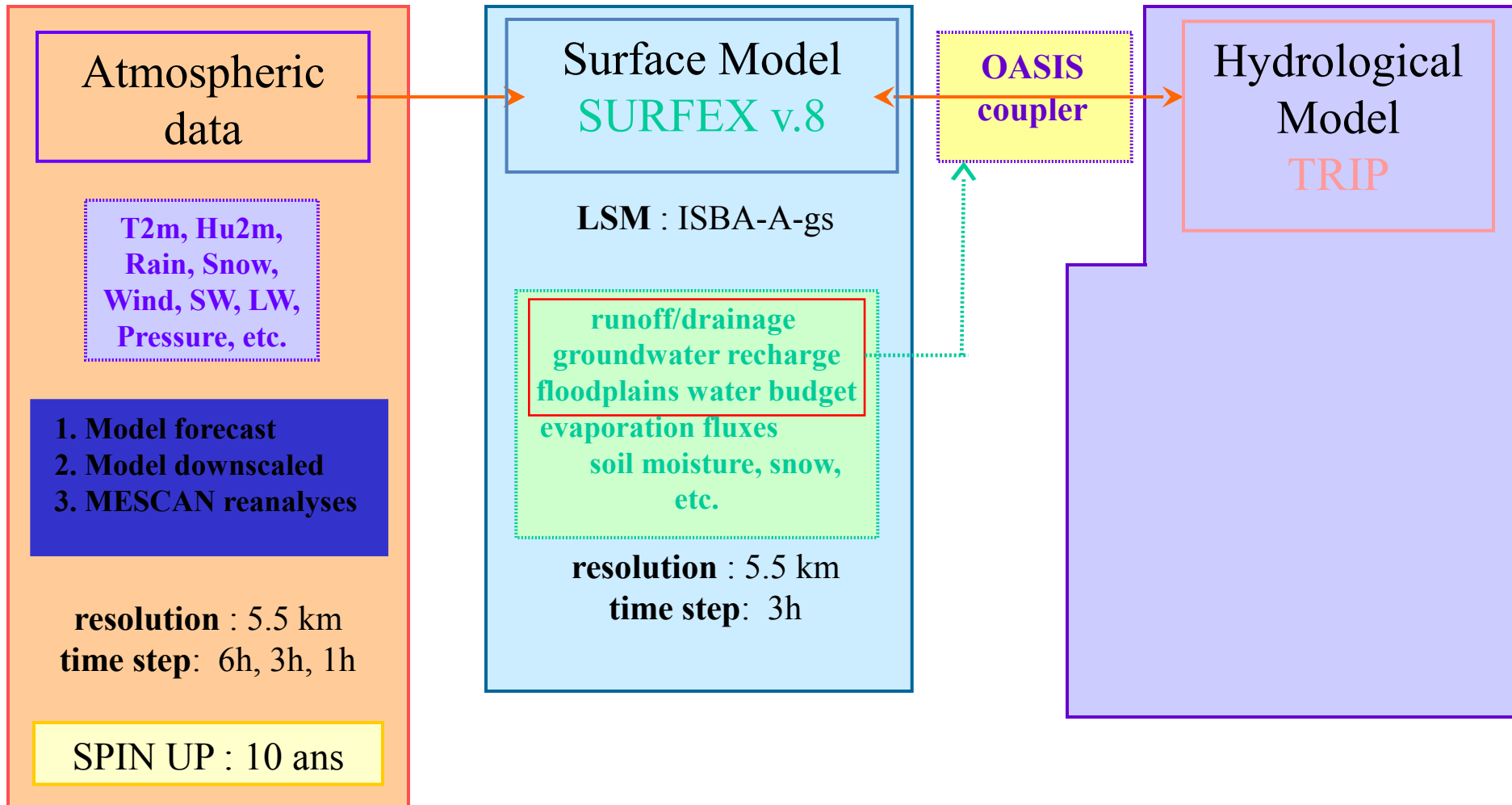
The coupled hydro-meteorological modelling system



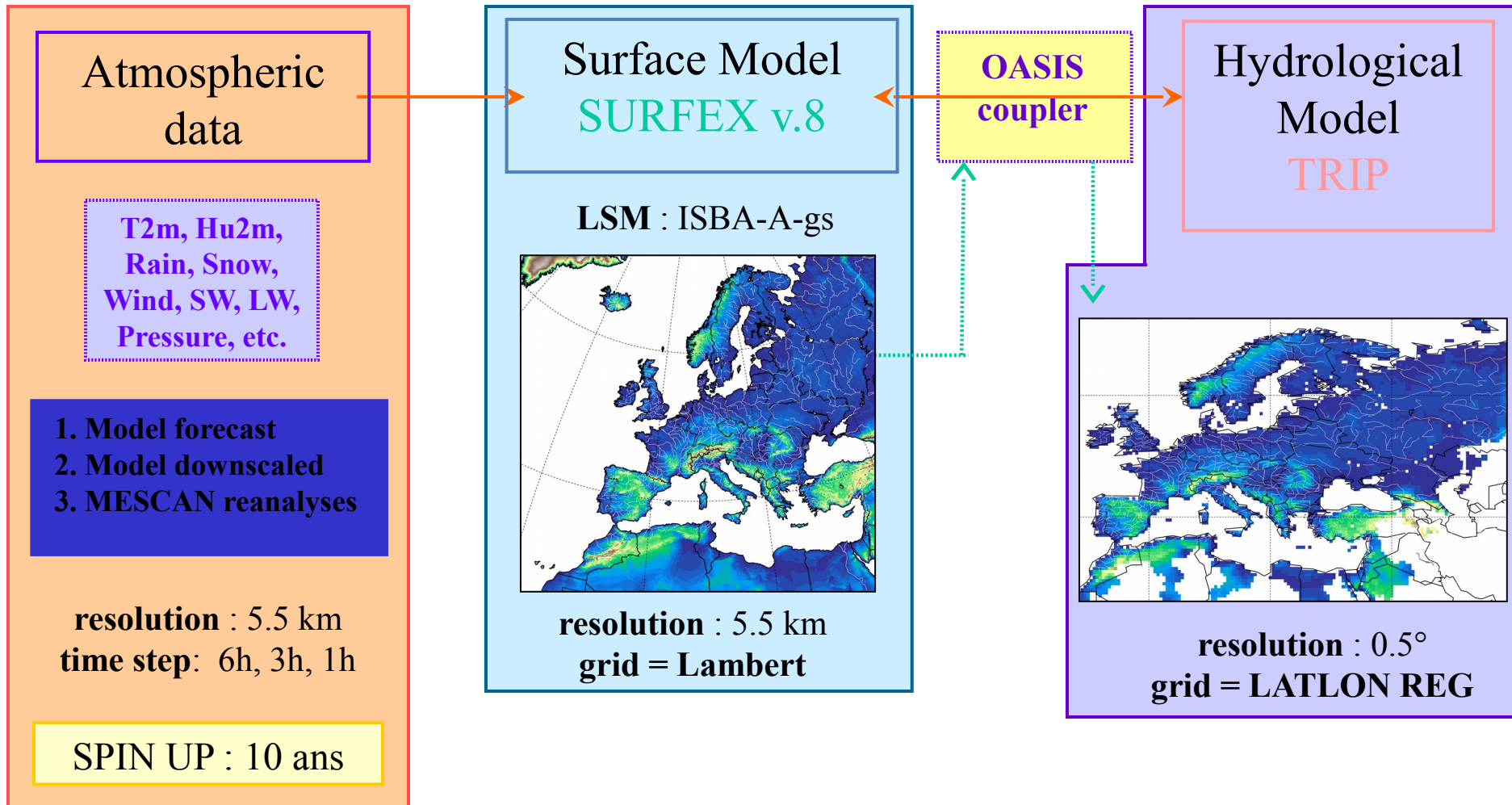
The coupled hydro-meteorological modelling system



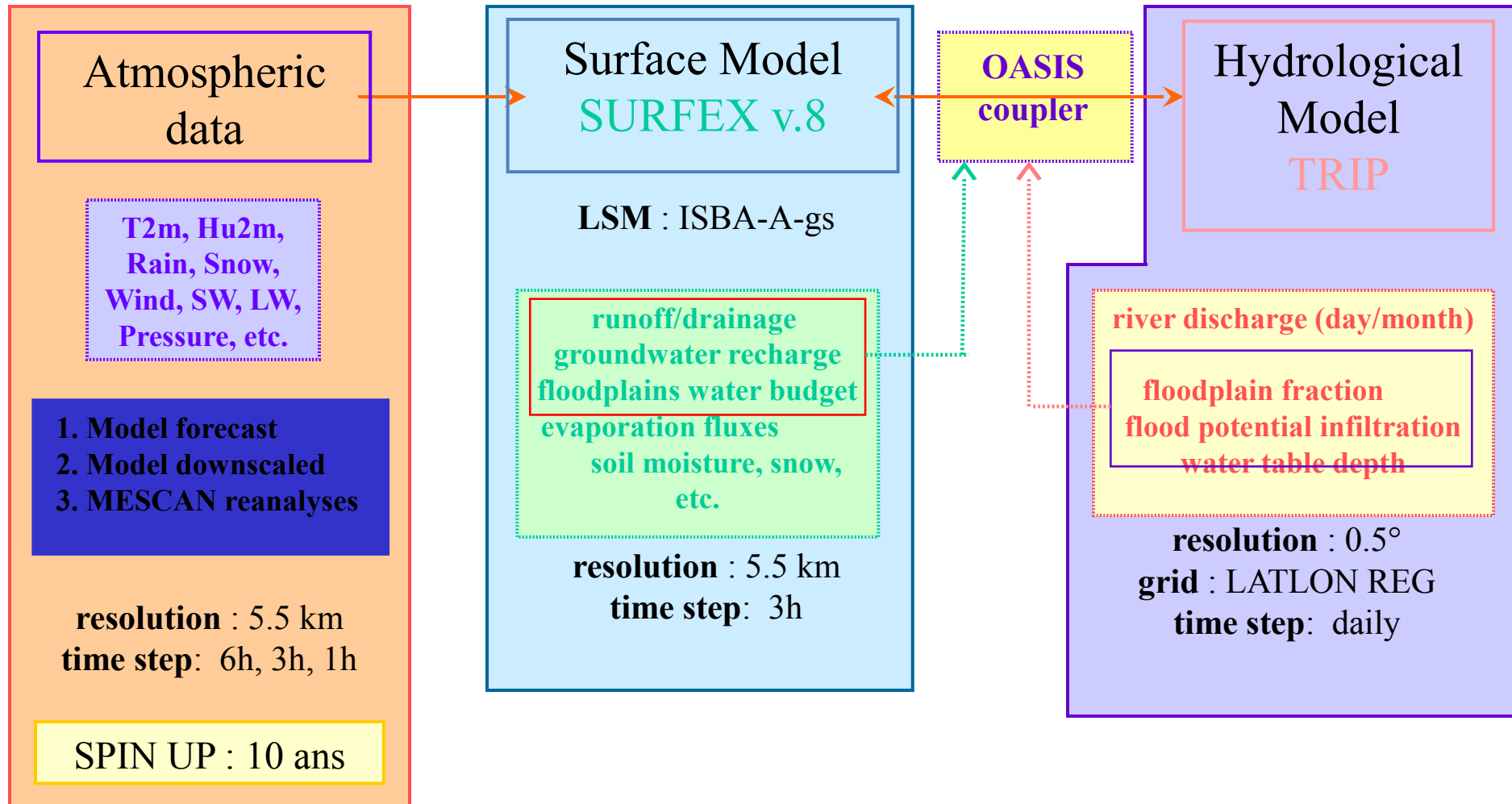
The coupled hydro-meteorological modelling system



The coupled hydro-meteorological modelling system



The coupled hydro-meteorological modelling system



Atmospheric forcing

MODEL DOWNSCALED

Alaro Model

11km/6h

Aladin Model

11km/6h

+ Reanalysis 11km/6h



Static downscaling



Alaro DS

5.5 km/6h

1

Aladin DS

5.5 km/6h

2

Atmospheric forcing

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MESCAN reanalysis (T2m, Hu2m, PP)

Low Density Network

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5.5 km/6h

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forecast

5.5 km/3h

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forecast

5.5 km/1h

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MESCAN reanalysis (T2m, Hu2m, PP)

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Atmospheric forcing

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Low Density Network

MESCAN reanalysis (T2m, Hu2m, PP)

Reference Density Network

Alaro-ds-
mescan-ldn

5.5 km/6h

Aladin-ds-
mescan-ldn

5.5 km/6h

Aladin-fc-
mescan-ldn

5.5 km/6h

Aladin
forecast

5.5 km/6h

Aladin
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MESCAN reanalysis (T2m, Hu2m, PP)

Low Density Network

MESCAN reanalysis (T2m, Hu2m, PP)

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5.5 km/6h

Alaro-ds-
mescan-rdn
5.5 km/6h

Aladin-ds-
mescan-rdn
5.5 km/6h

Aladin-fc-
mescan-rdn
5.5 km/6h

Comparison of the precipitation datasets

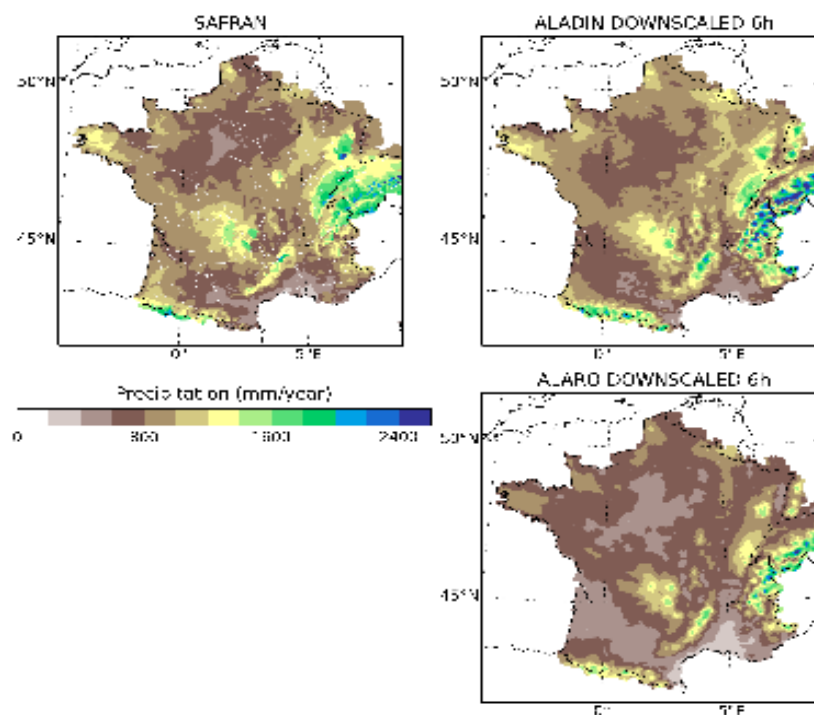
- over France in comparison to SAFRAN reference -

Comparison of 2006 accumulated precipitation for SAFRAN, ALADIN DS and ALARO DS

ALADIN DS overestimates PRCP over Mountainous areas

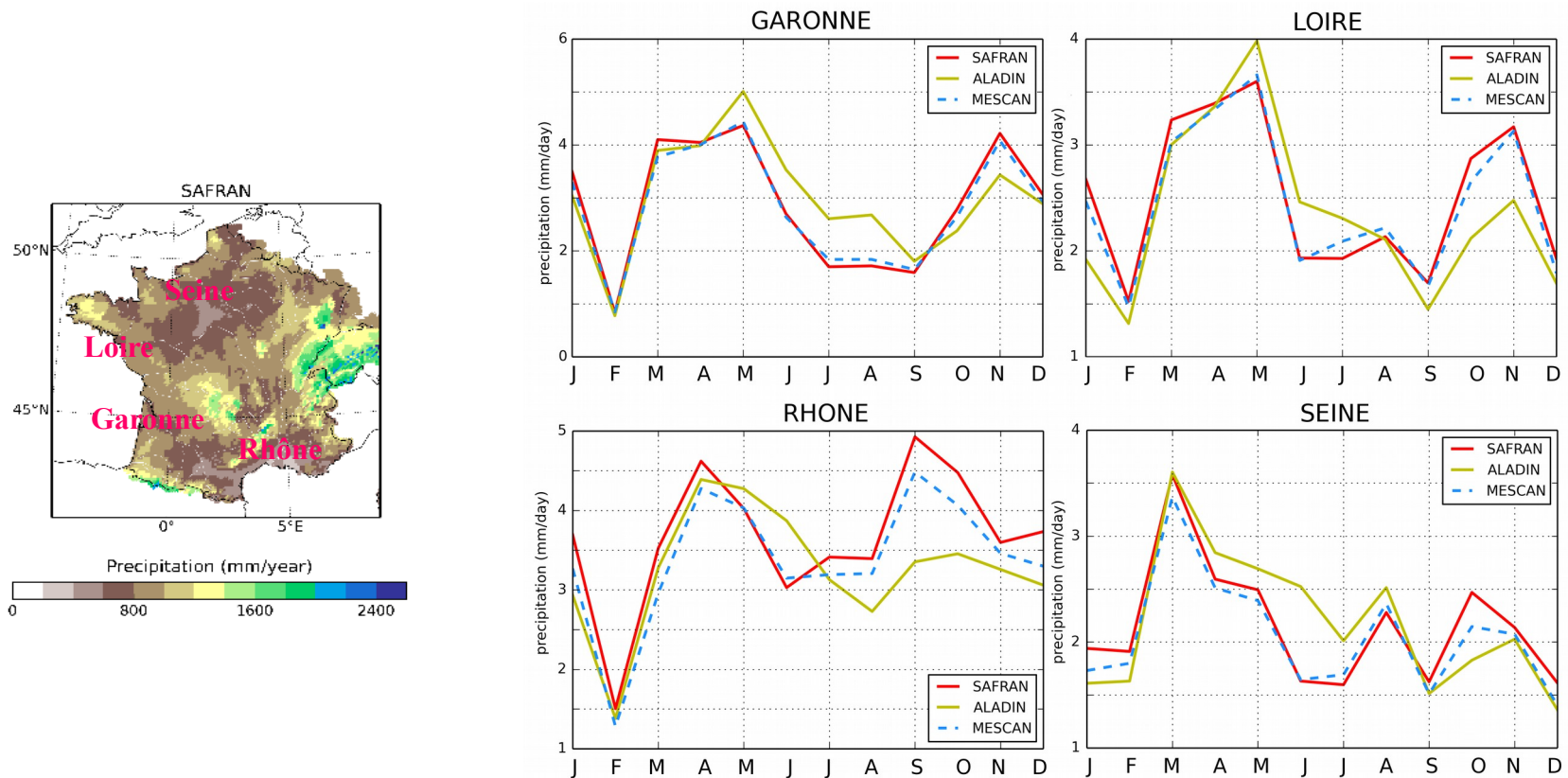
Over plains ALADIN DS and SAFRAN Compares satisfactorily

ALARO DS highly underestimated
As compared to SAFRAN



Impact of MESCAN precipitation analysis

Comparison of ALADIN and ALADIN+MESCAN precipitation against SAFRAN over French basins for 2008 (3yr spinup)



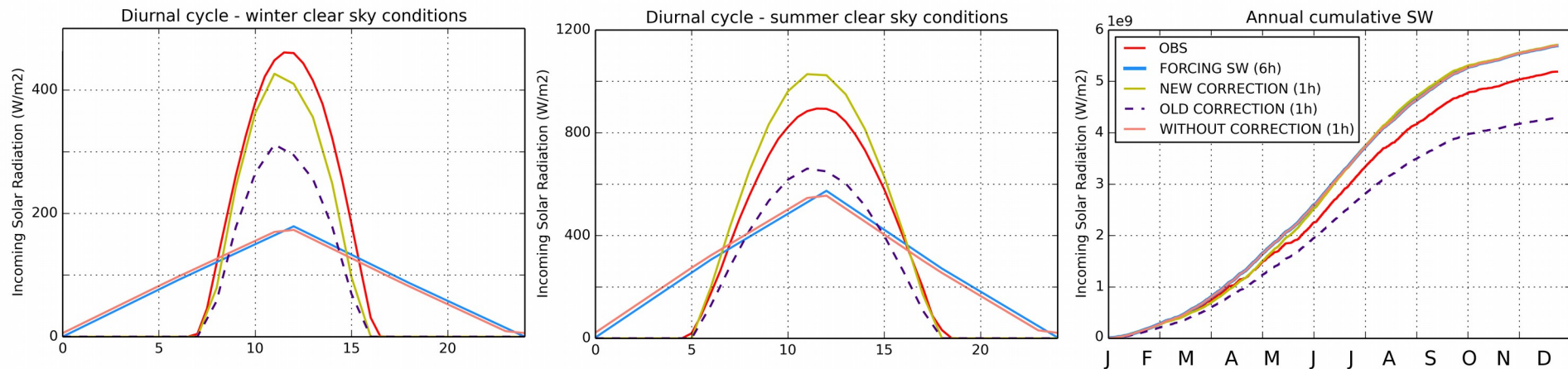
MESCAN improves precipitation over France

UERRA GA4 Nov. 2016

Shortwave radiation forcings

Improvement of the diurnal cycle

1 measurement site in southwest of France



Difficult to correctly represent diurnal cycle with a 6h forcing
Solar radiation at night

Improvement when accounting for solar zenith angle

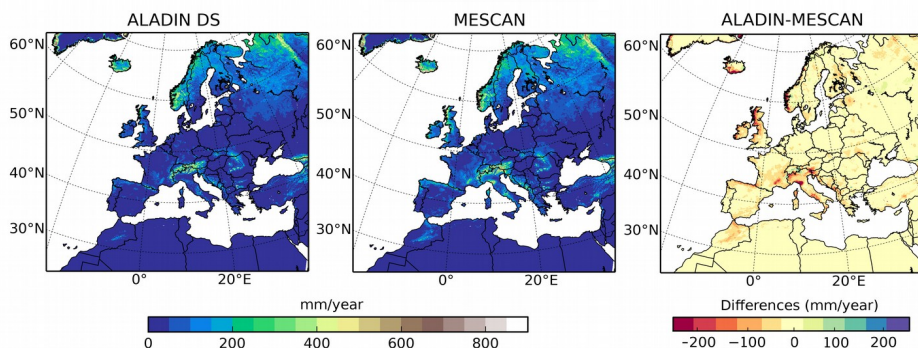
- A first attempt (old correction on the graph) was accounting for radiation only between sunrise and sunset → underestimation of energy supply
- 2nd attempt by calculating the energy lost before sunrise and after sunset and redistribute the energy during day (new correction)

Preliminary SURFEX-TRIP results

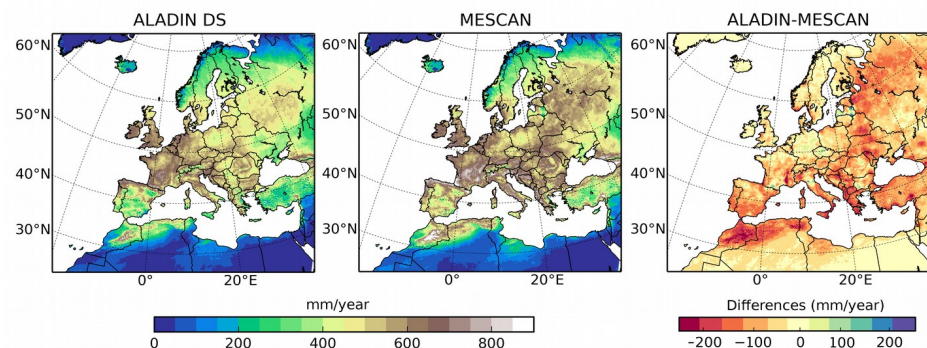
SURFEX water components - 2008

Atmospheric forcing comes from ALADIN DS and ALADIN DS+MESCAN
Focus is made on 2008 - Evaluation of the system against river discharge

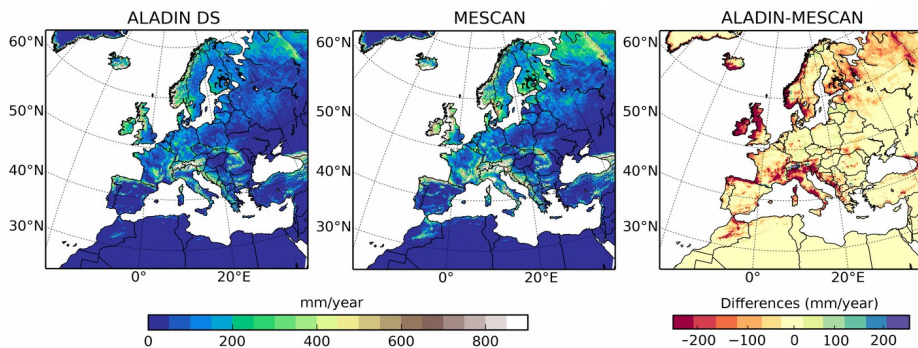
2008 ANNUAL RUNOFF



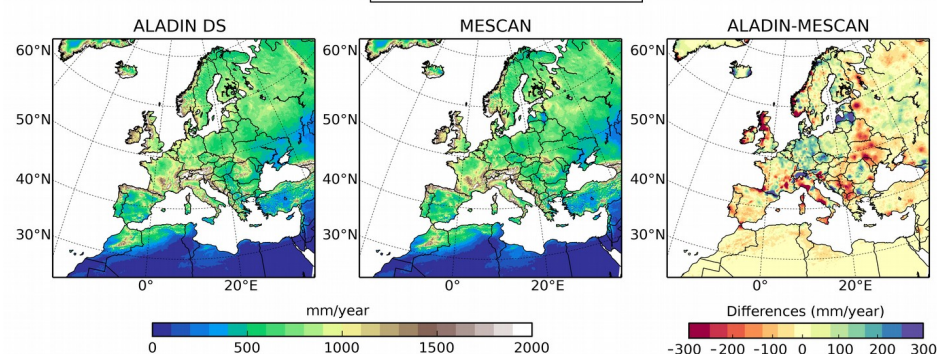
2008 ANNUAL EVAPORATION



2008 ANNUAL DRAINAGE



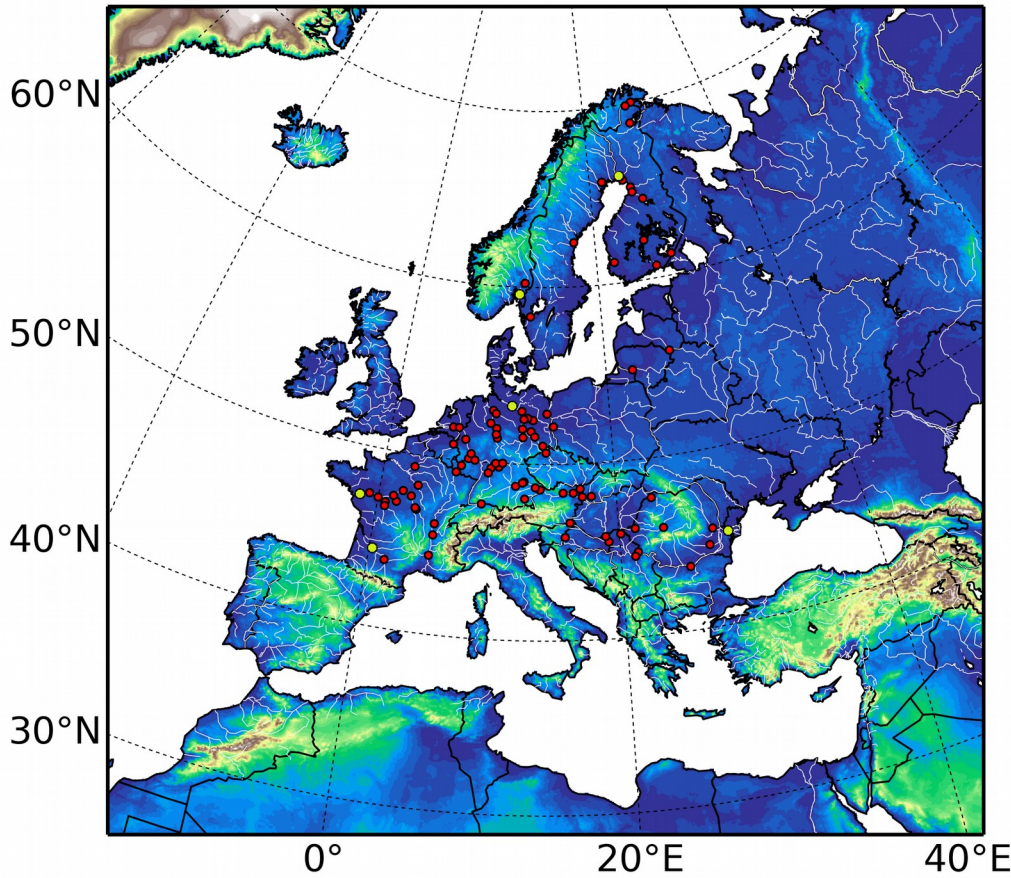
2008 ANNUAL PRECIPITATION



SURFEX-TRIP : 1 year in 1 day on MF HPC

Preliminary SURFEX-TRIP results

GRDC STATIONS



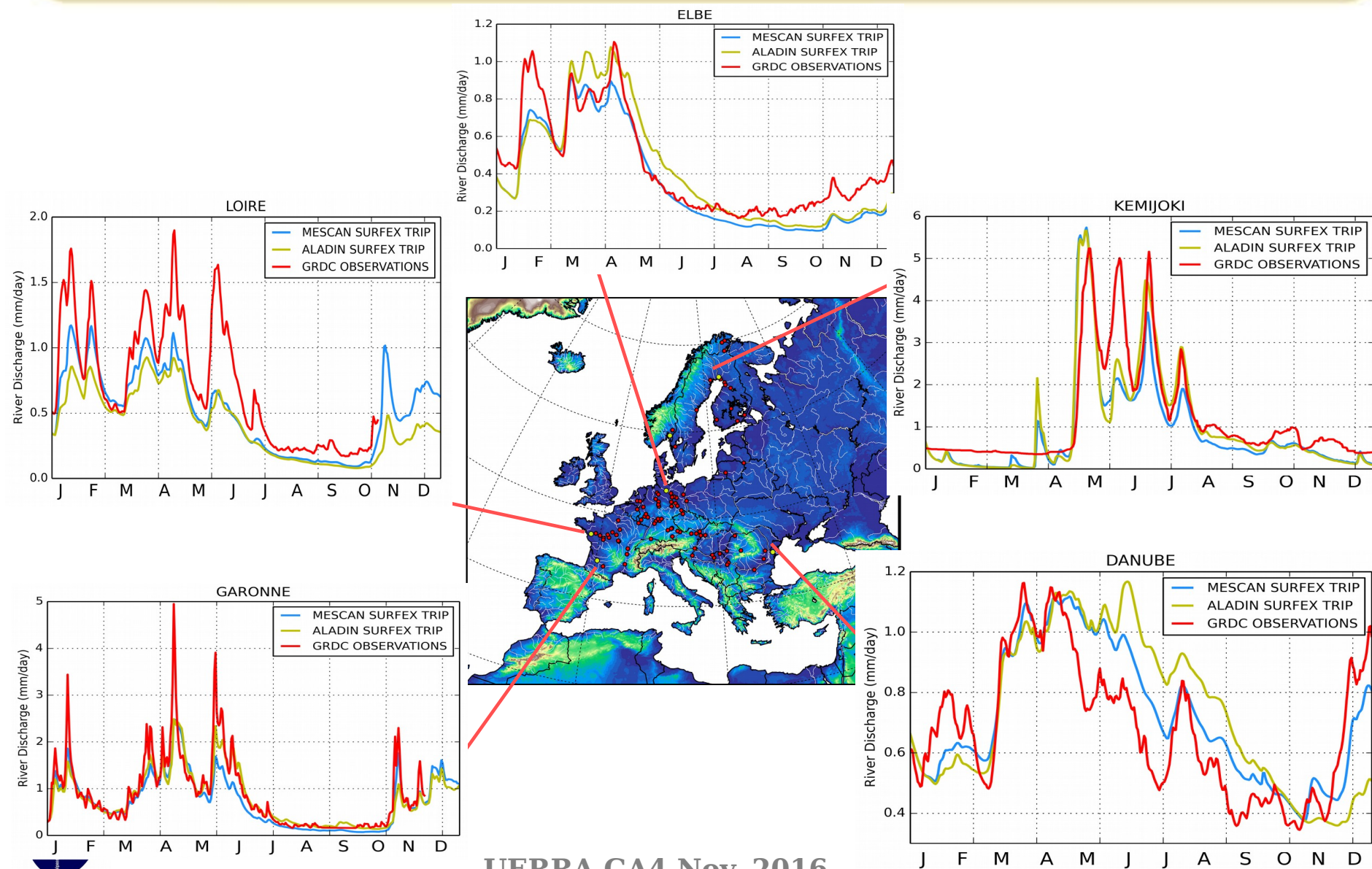
GRDC Network

Global Runoff Data Center observations

For the 2006-2010 period

- 101 stations with daily observations
- Monthly observations on Spanish and Italian rivers

TRIP river discharges



Summary

- MESCOAN analysis improves precipitation field over France
- 6h atmospheric forcing require adaptation especially to correctly catch the diurnal cycle
- First runs with SURFEX land surface model and TRIP hydrological model coupled system
- Discharges look reasonable with positive impact of MESCOAN, but more analyse needed

Further work

Comparison to snow depth

More comparison to GRDC river discharges

Longer period simulations, run on the MESCOAN-ensemble...