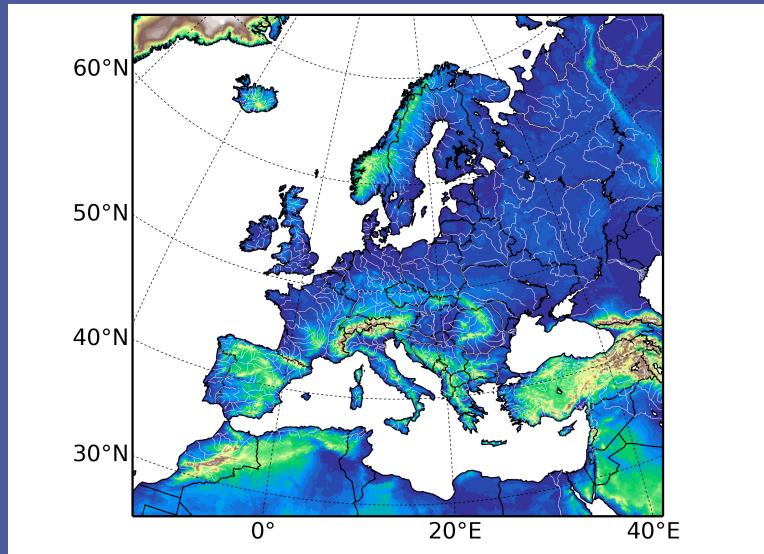


Setup and first evaluation of the coupled hydro-meteorological MESCAN-SURFEX-TRIP modelling system over Europe



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*
- Estimation of ECVs uncertainties

Objectives

- 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)



The coupled hydro-meteorological modelling system

Atmospheric data

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

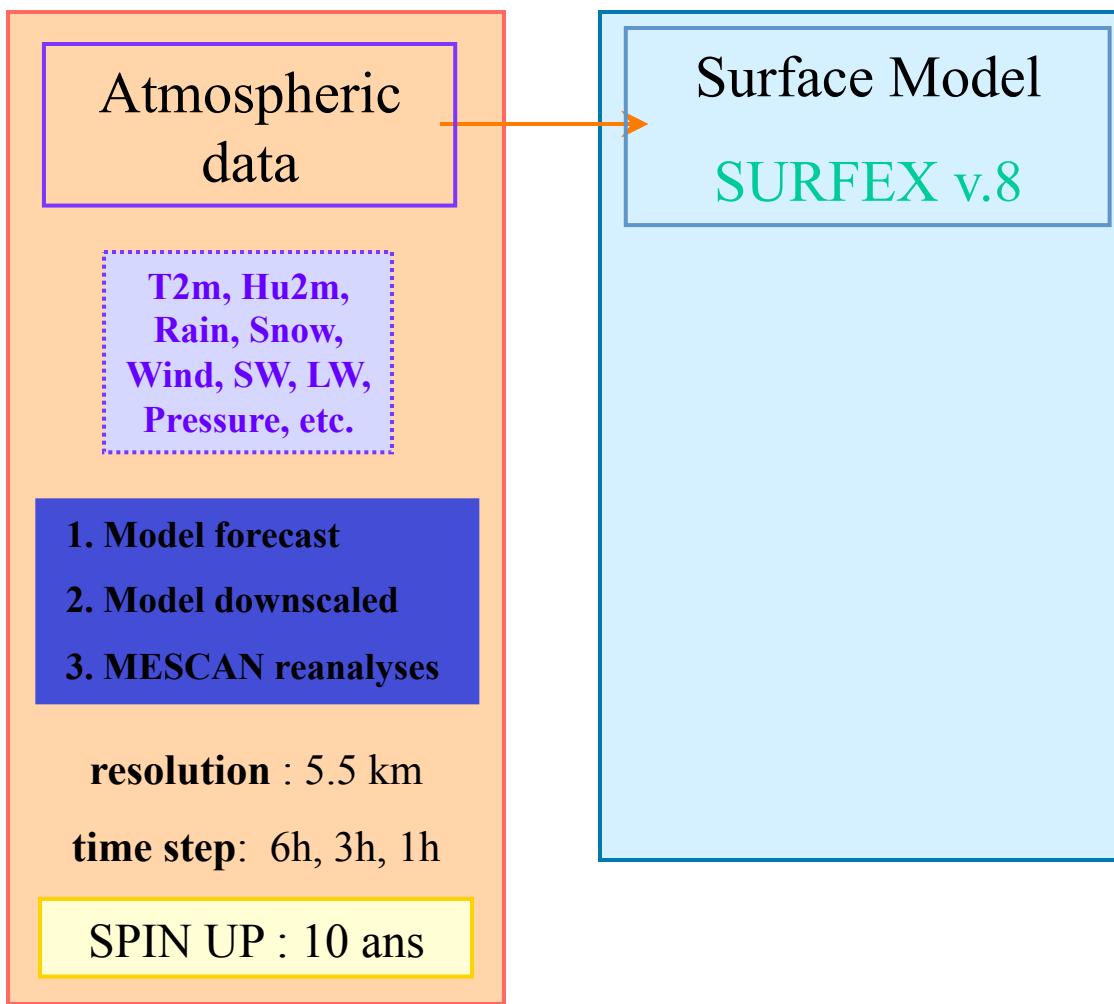
1. Model forecast
2. Model downscaled
3. MESCAN reanalyses

resolution : 5.5 km

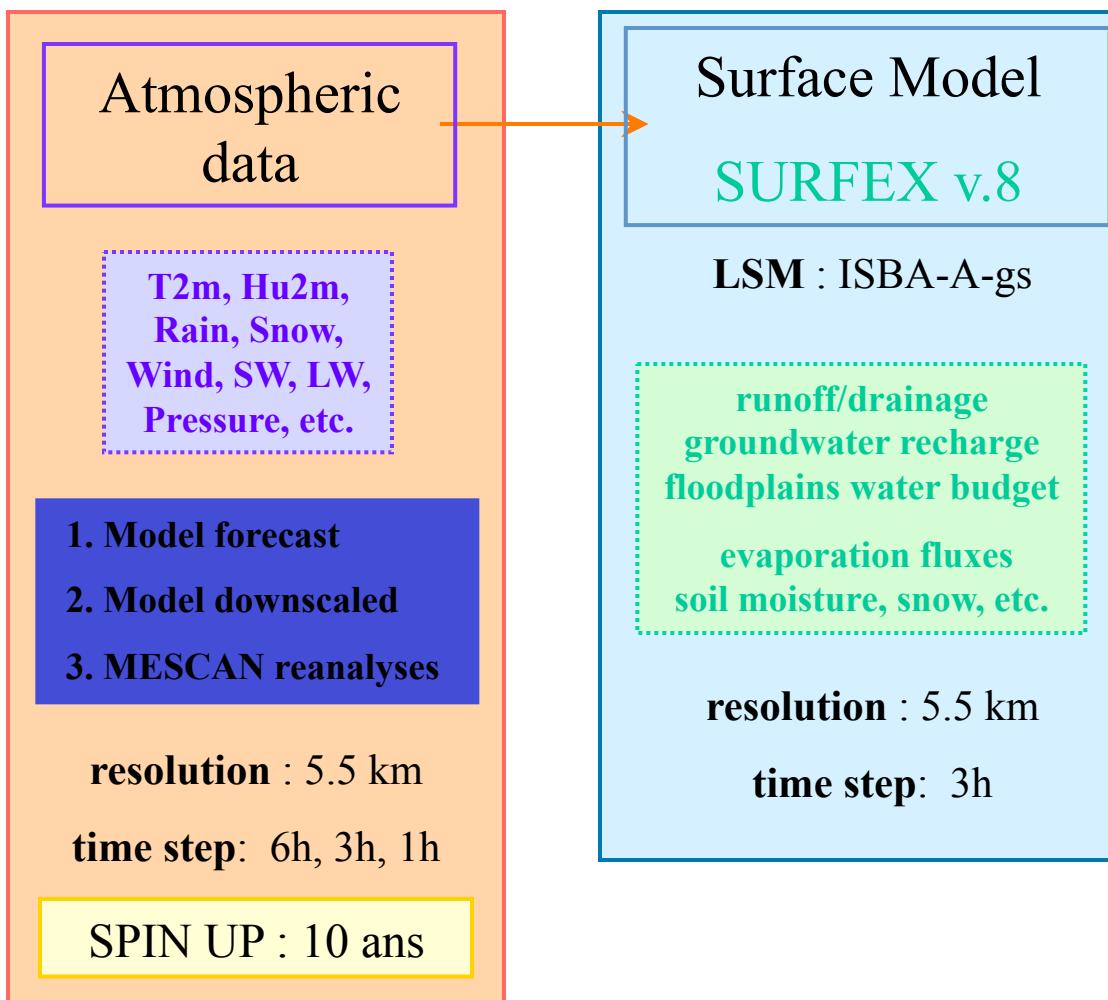
time step: 6h, 3h, 1h



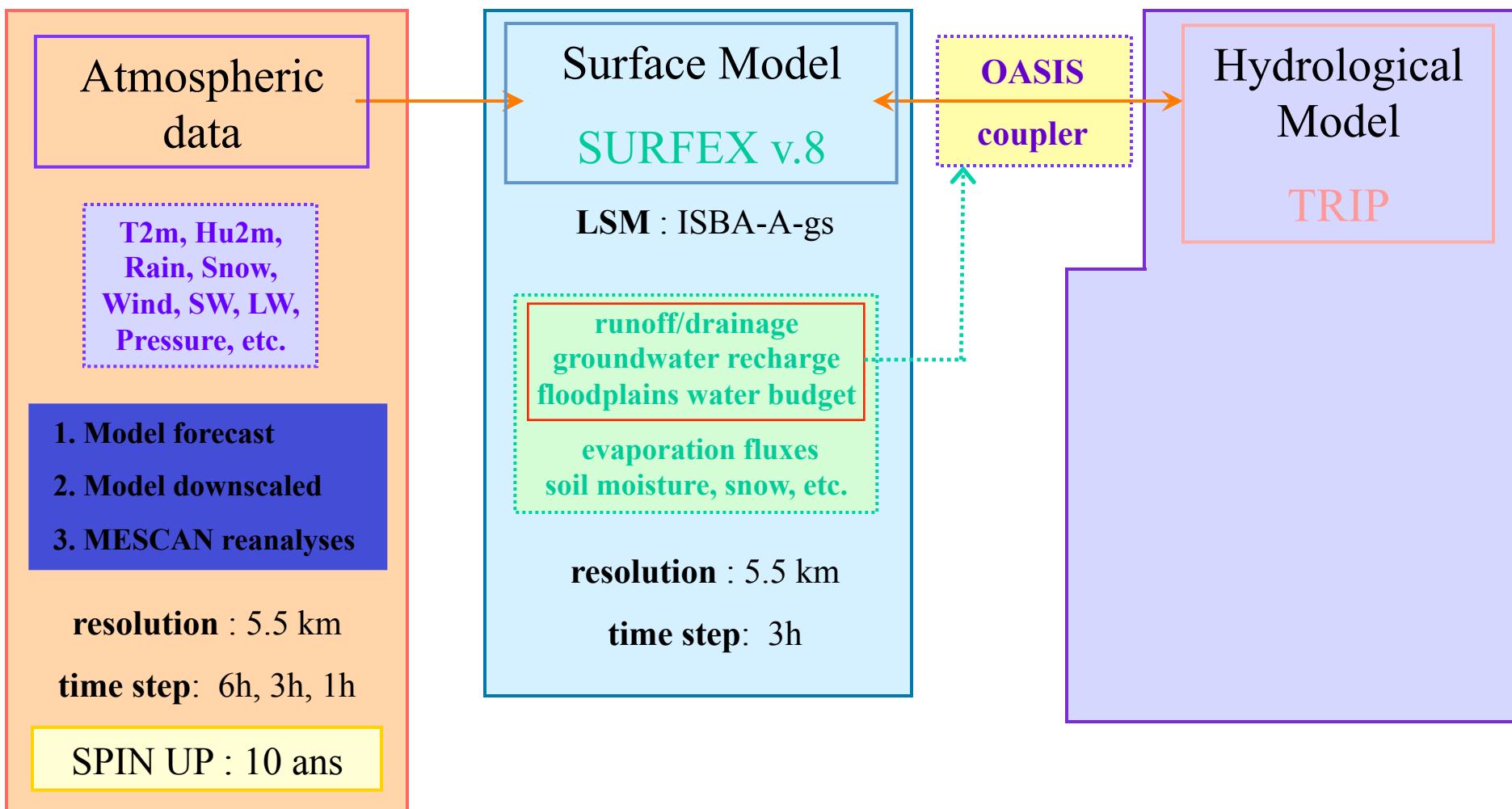
The coupled hydro-meteorological modelling system



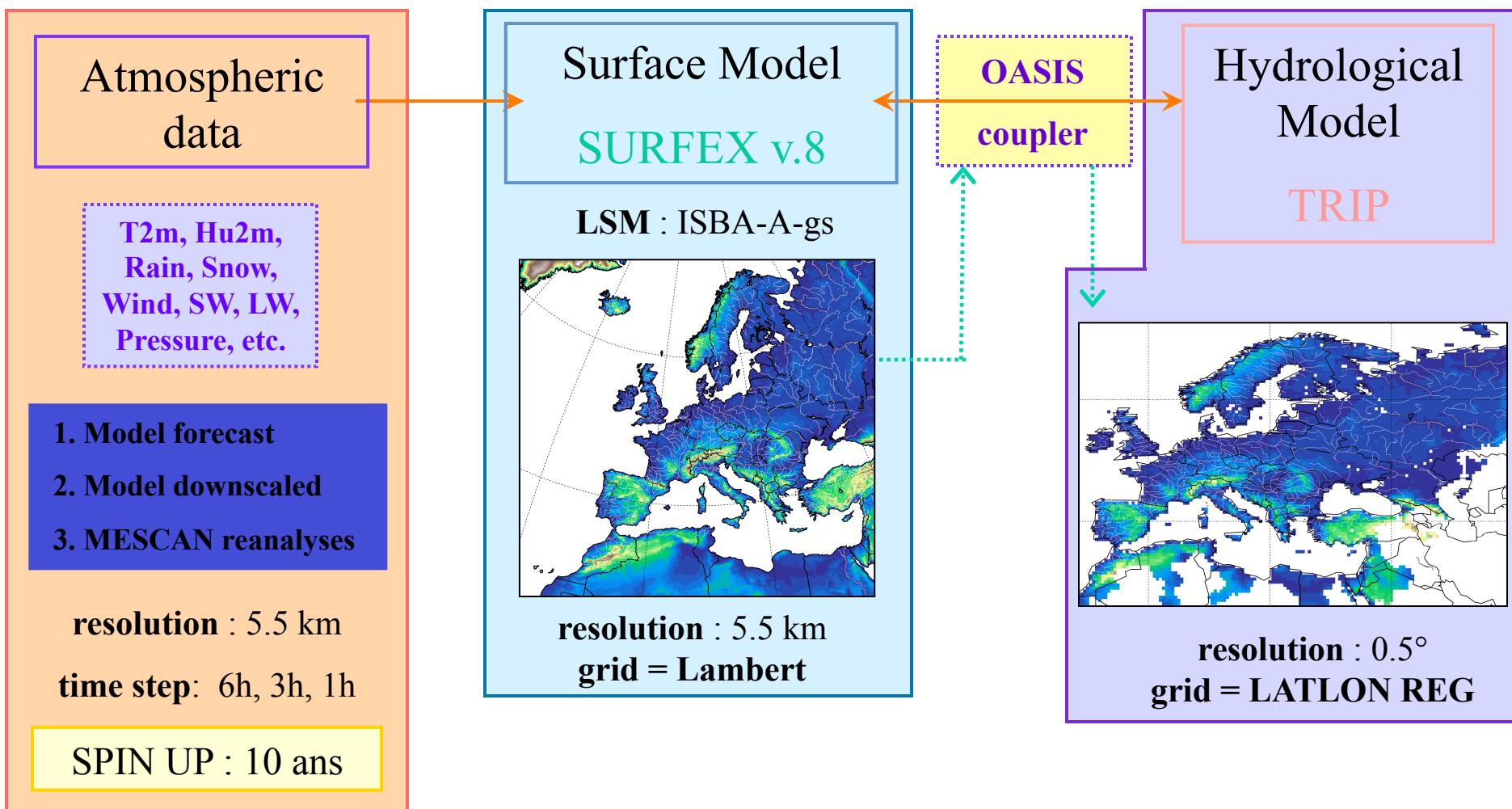
The coupled hydro-meteorological modelling system



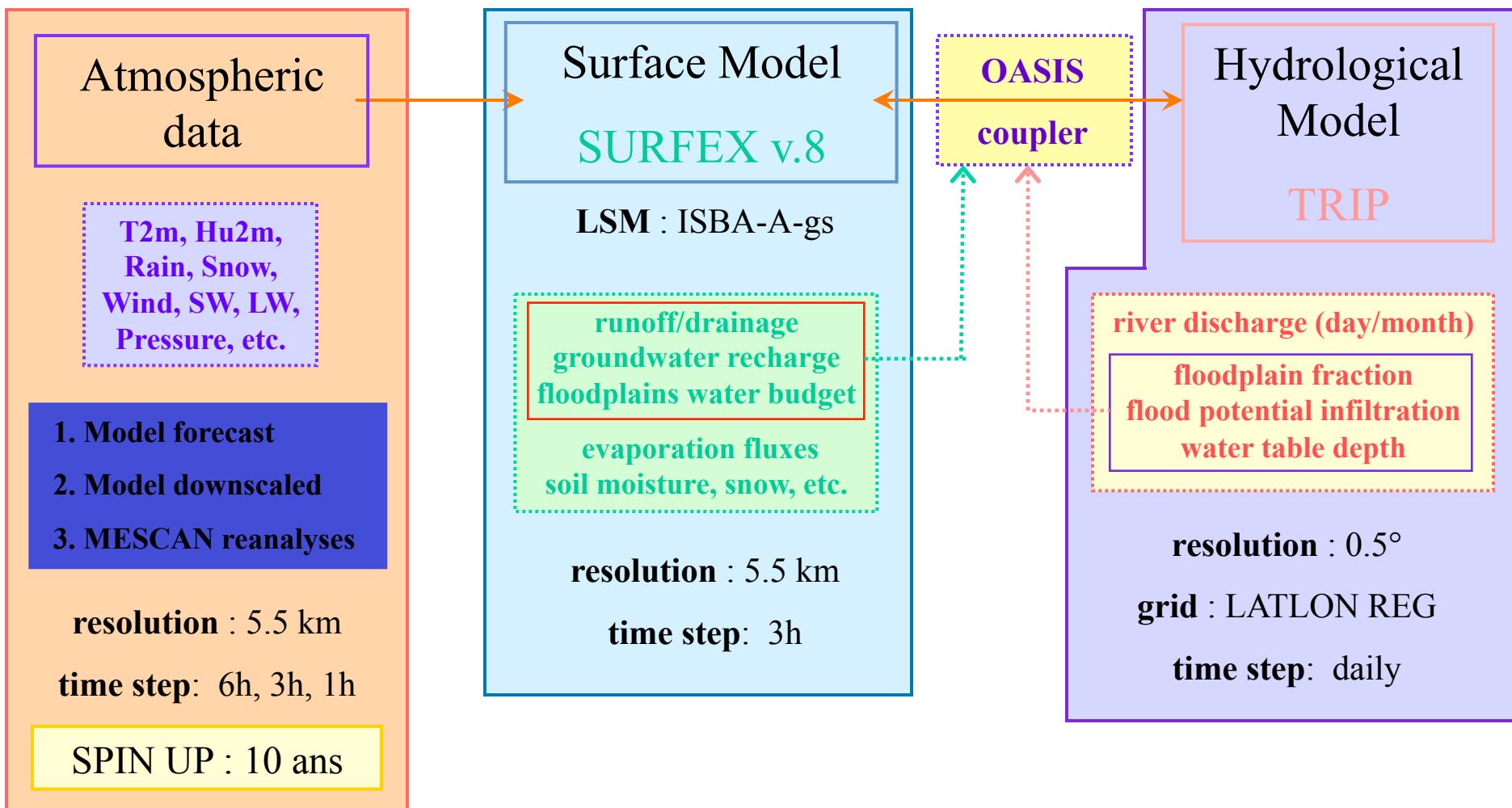
The coupled hydro-meteorological modelling system



The coupled hydro-meteorological modelling system

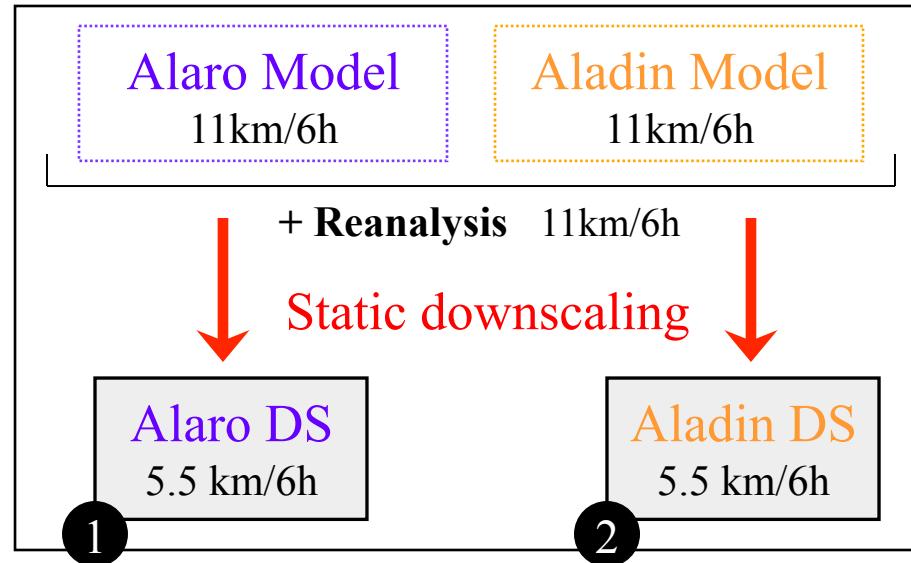


The coupled hydro-meteorological modelling system



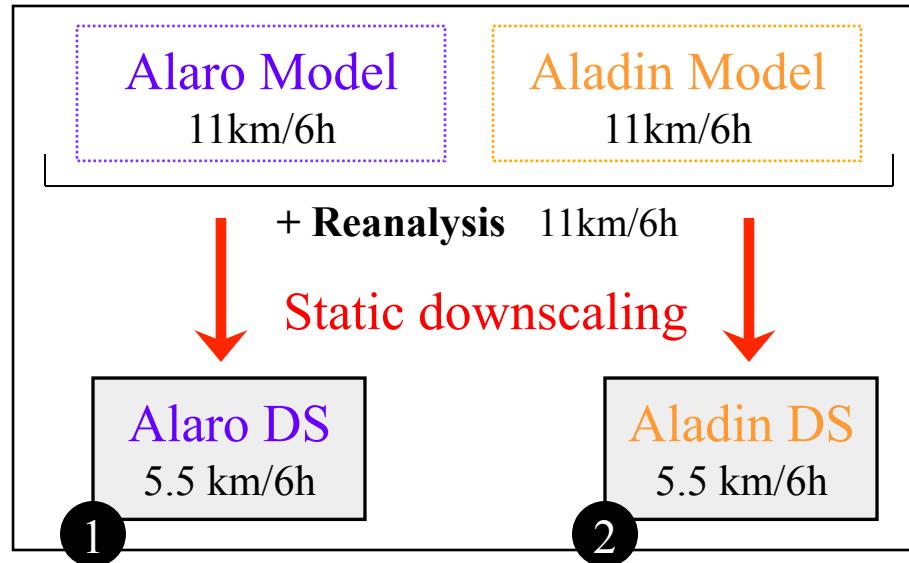
The different atmospheric forcing

MODEL DOWNSCALED

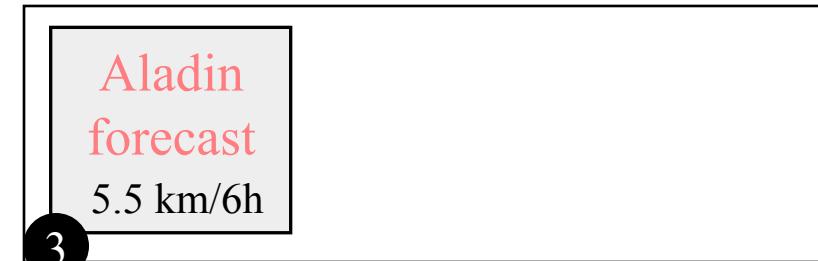


The different atmospheric forcing

MODEL DOWNSCALED

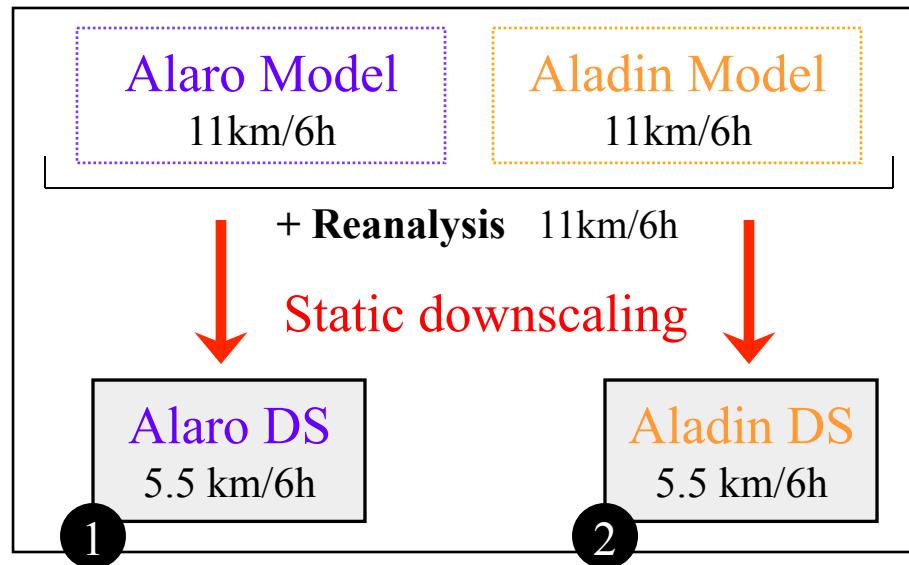


MODEL FORECAST

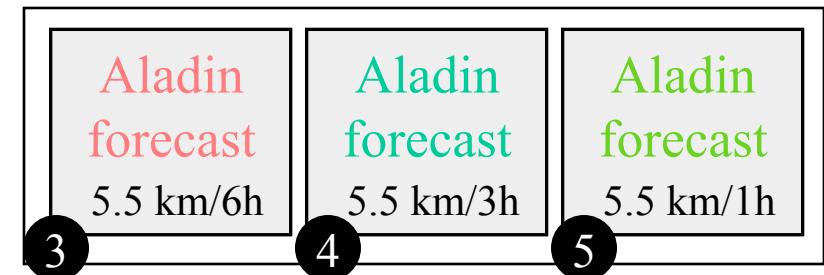


The different atmospheric forcing

MODEL DOWNSCALED

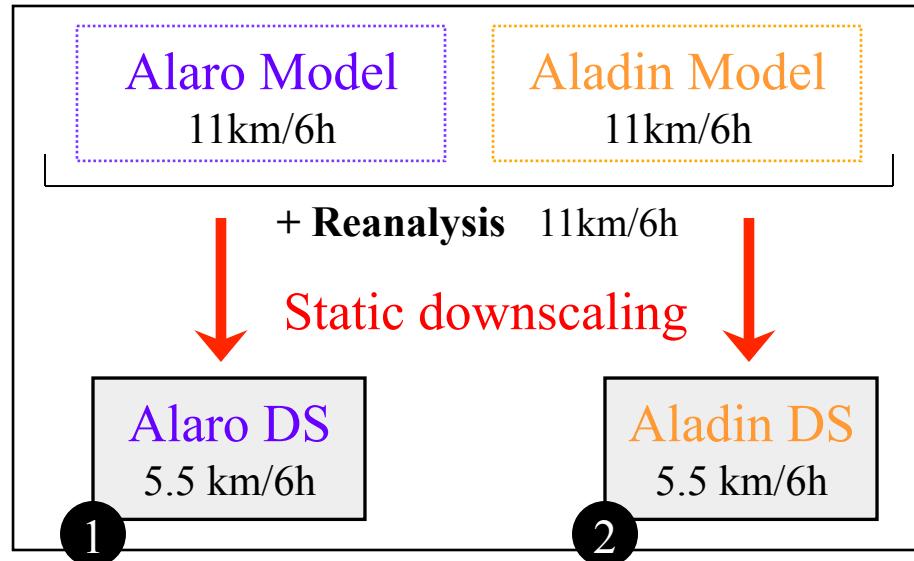


MODEL FORECAST

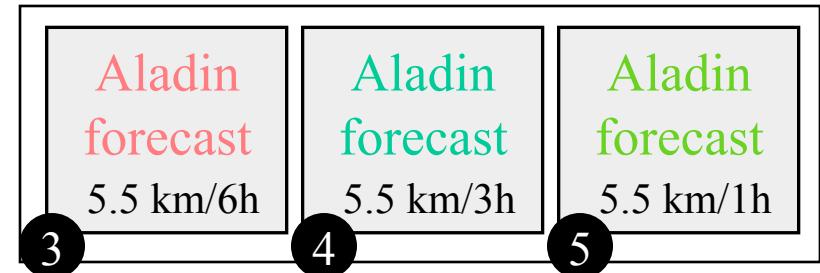


The different atmospheric forcing

MODEL DOWNSCALED



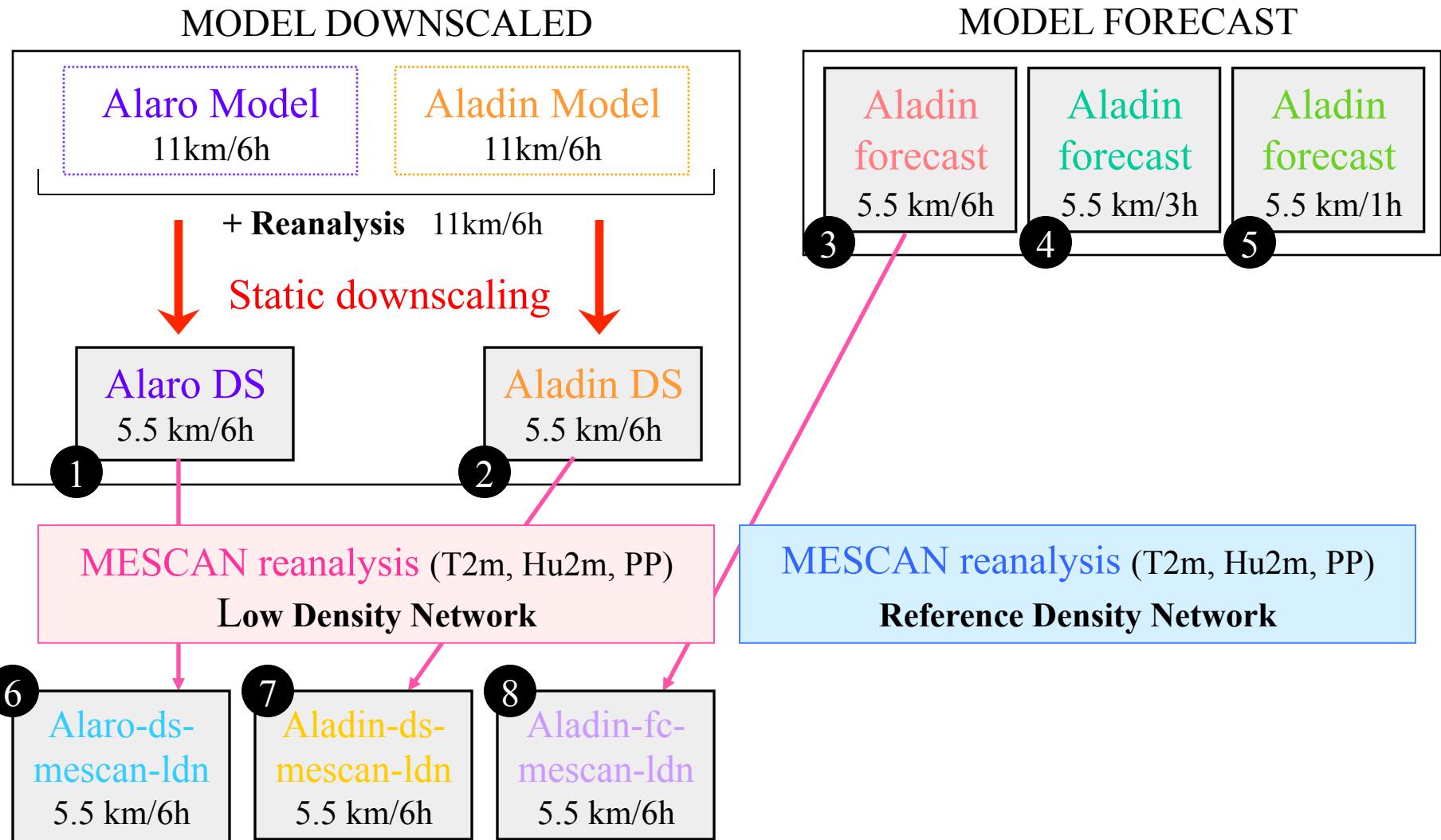
MODEL FORECAST



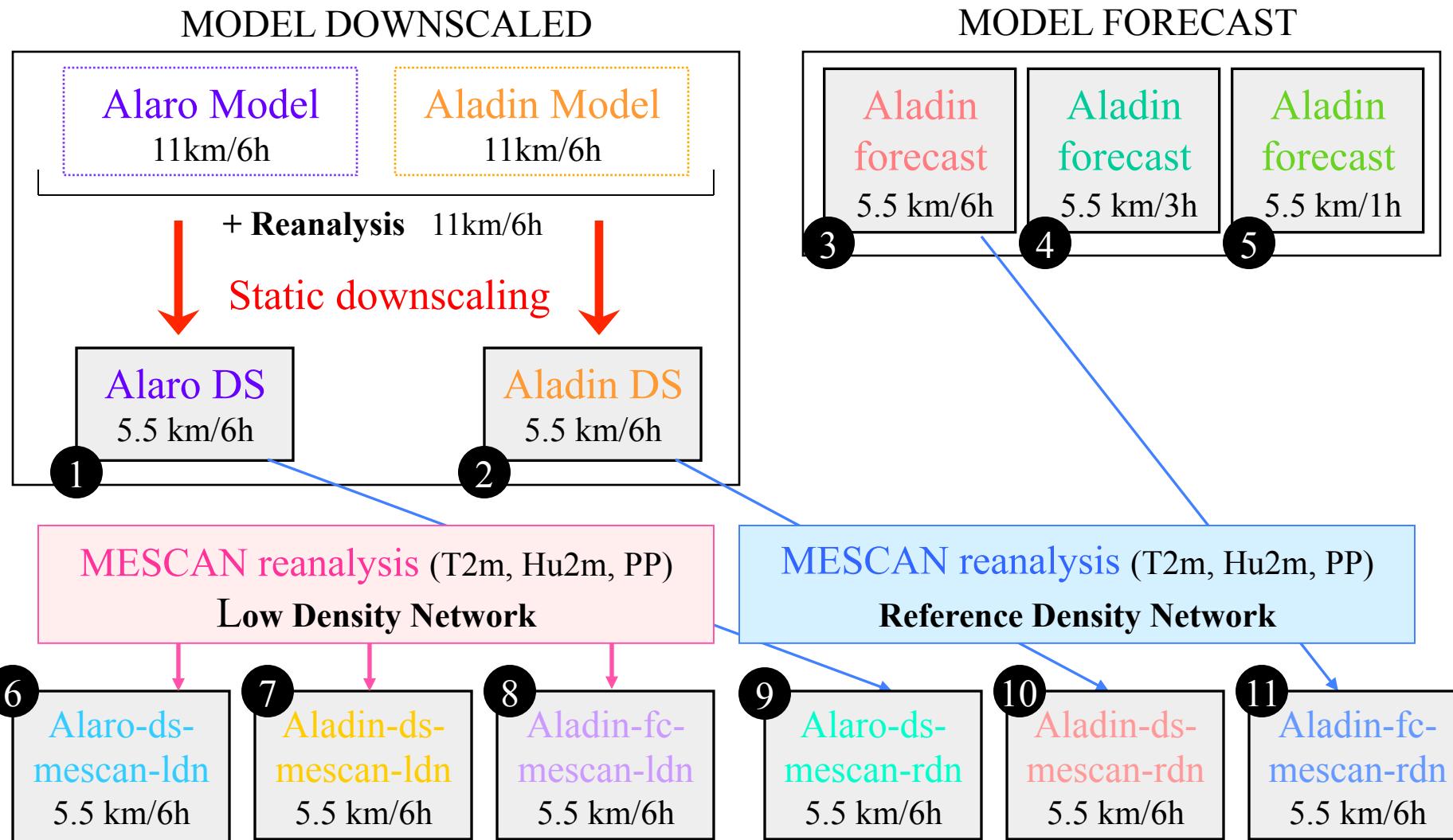
MESCAN reanalysis (T2m, Hu2m, PP)
Low Density Network

MESCAN reanalysis (T2m, Hu2m, PP)
Reference Density Network

The different atmospheric forcing



The different atmospheric forcing



Comparison of the different precipitation datasets

- over France in comparison to SAFRAN reference -

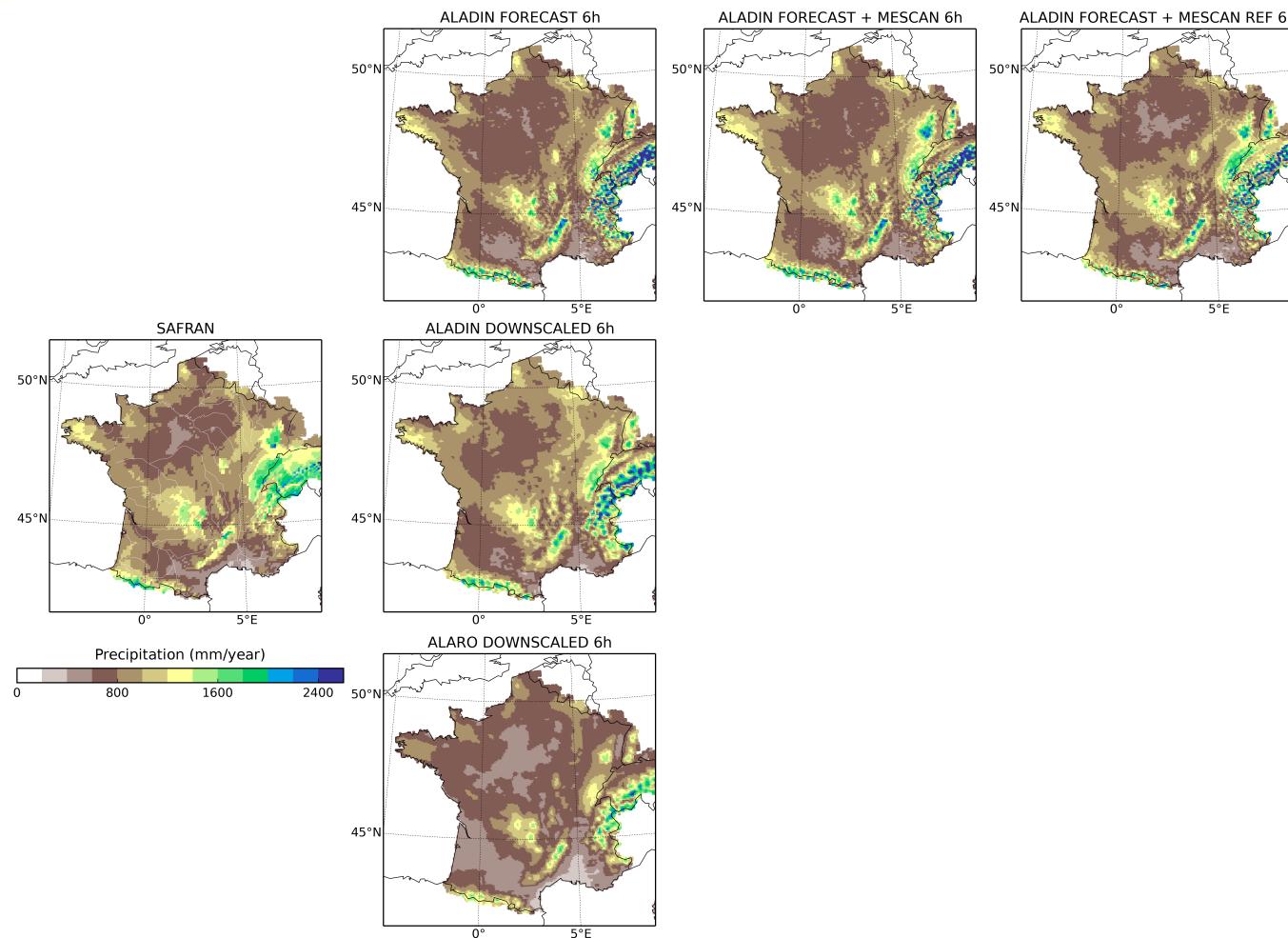
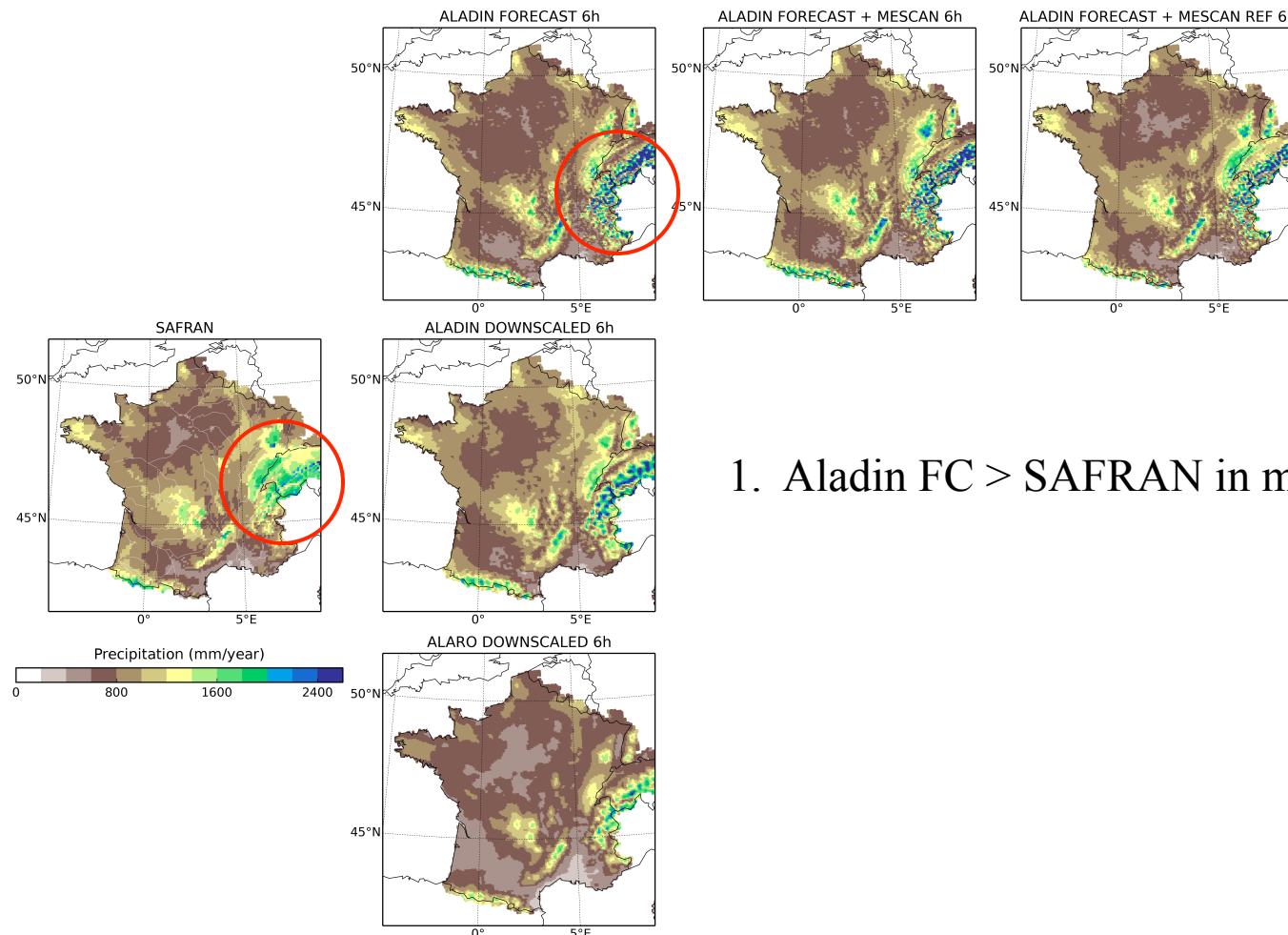


Fig. 2. France maps of the annual cumulative 2006 precipitation obtained with the ensemble of UERRA precipitation, compared to SAFRAN reference data

EMS 2016 – 14/09/2016

Comparison of the different precipitation datasets

- over France in comparison to SAFRAN reference -



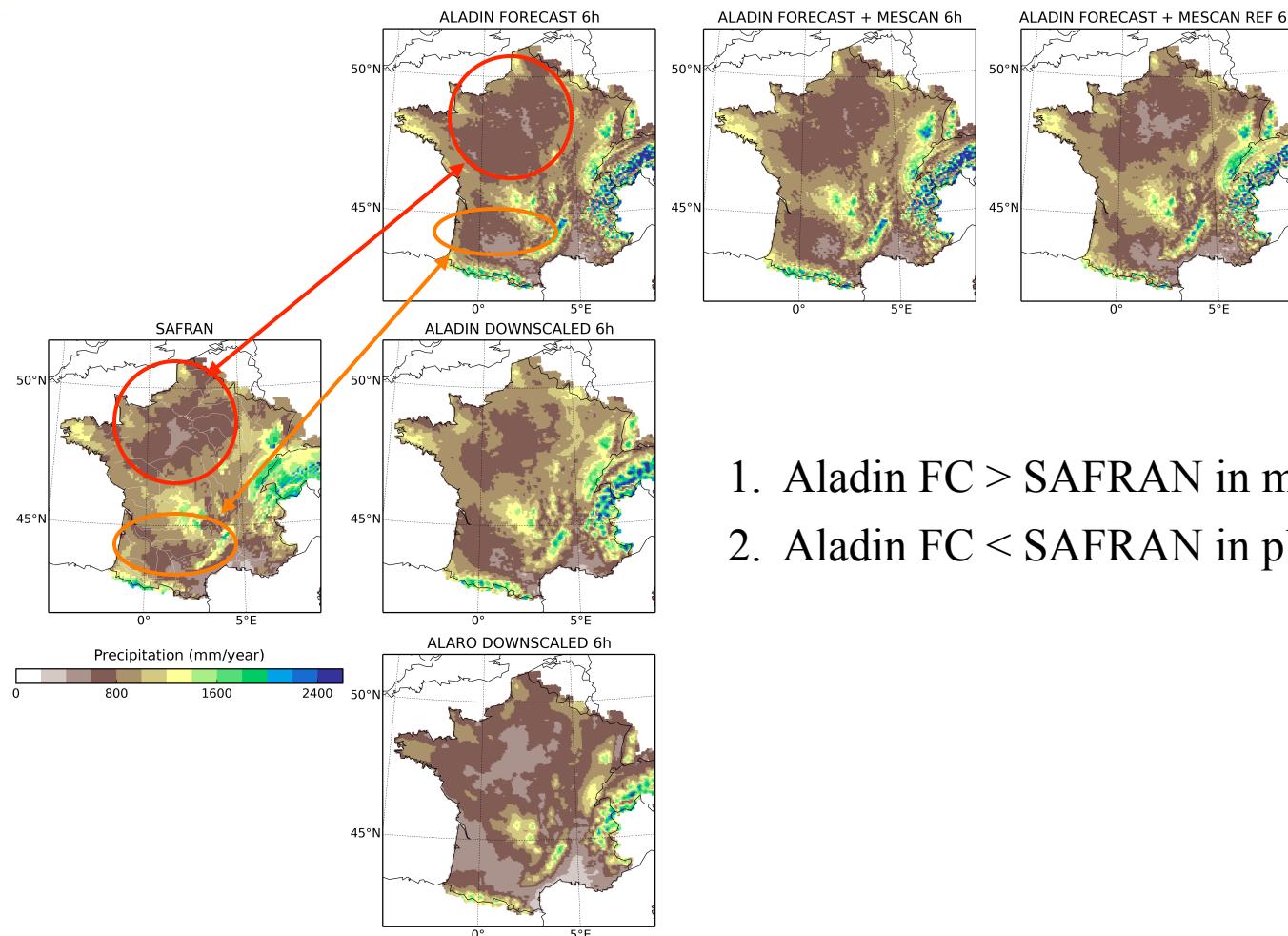
1. Aladin FC > SAFRAN in mountainous areas

Fig. 2. France maps of the annual cumulative 2006 precipitation obtained with the ensemble of UERRA precipitation, compared to SAFRAN reference data

EMS 2016 – 14/09/2016

Comparison of the different precipitation datasets

- over France in comparison to SAFRAN reference -



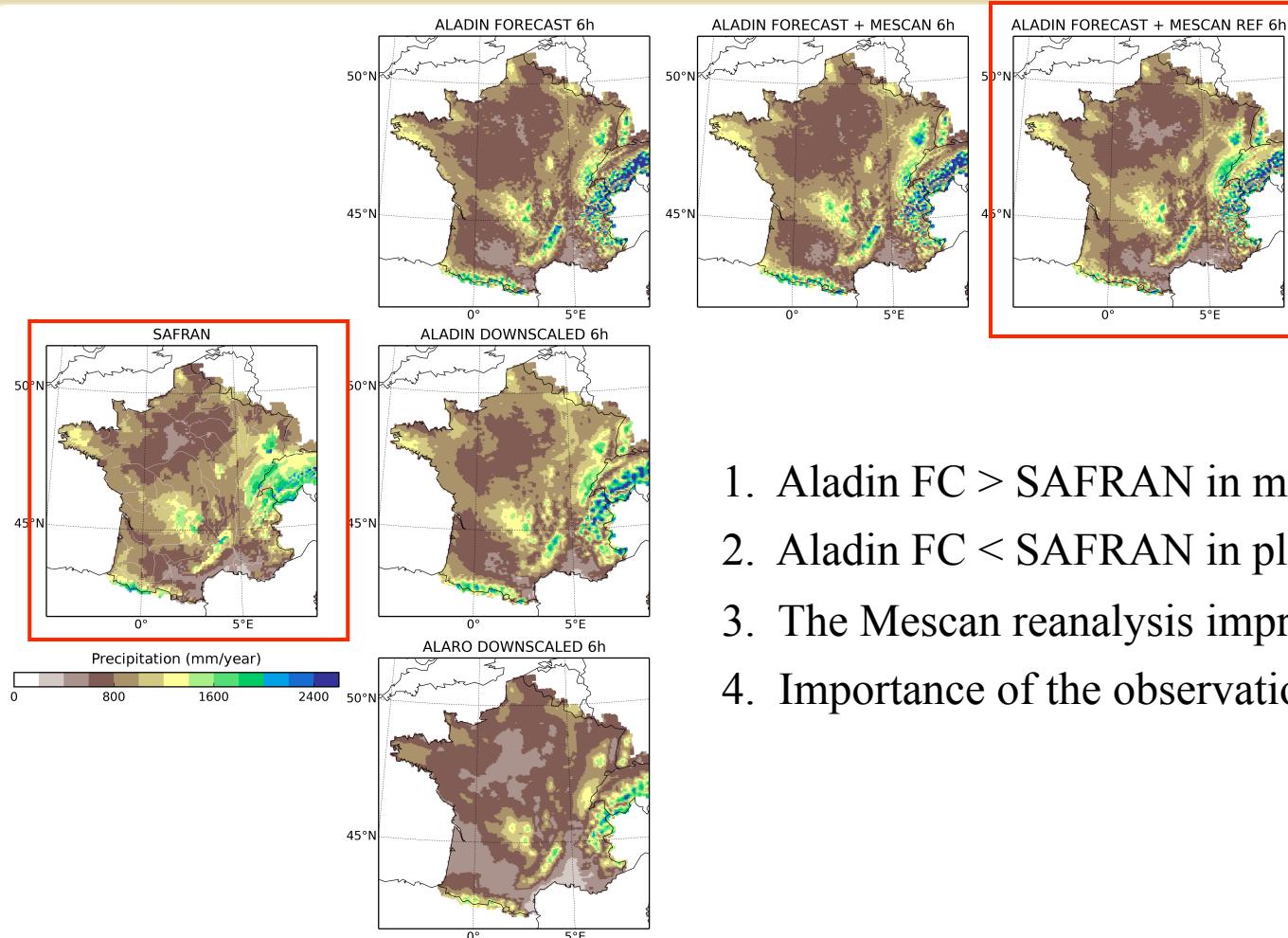
1. Aladin FC > SAFRAN in mountainous areas
2. Aladin FC < SAFRAN in plains

Fig. 2. France maps of the annual cumulative 2006 precipitation obtained with the ensemble of UERRA precipitation, compared to SAFRAN reference data

EMS 2016 – 14/09/2016

Comparison of the different precipitation datasets

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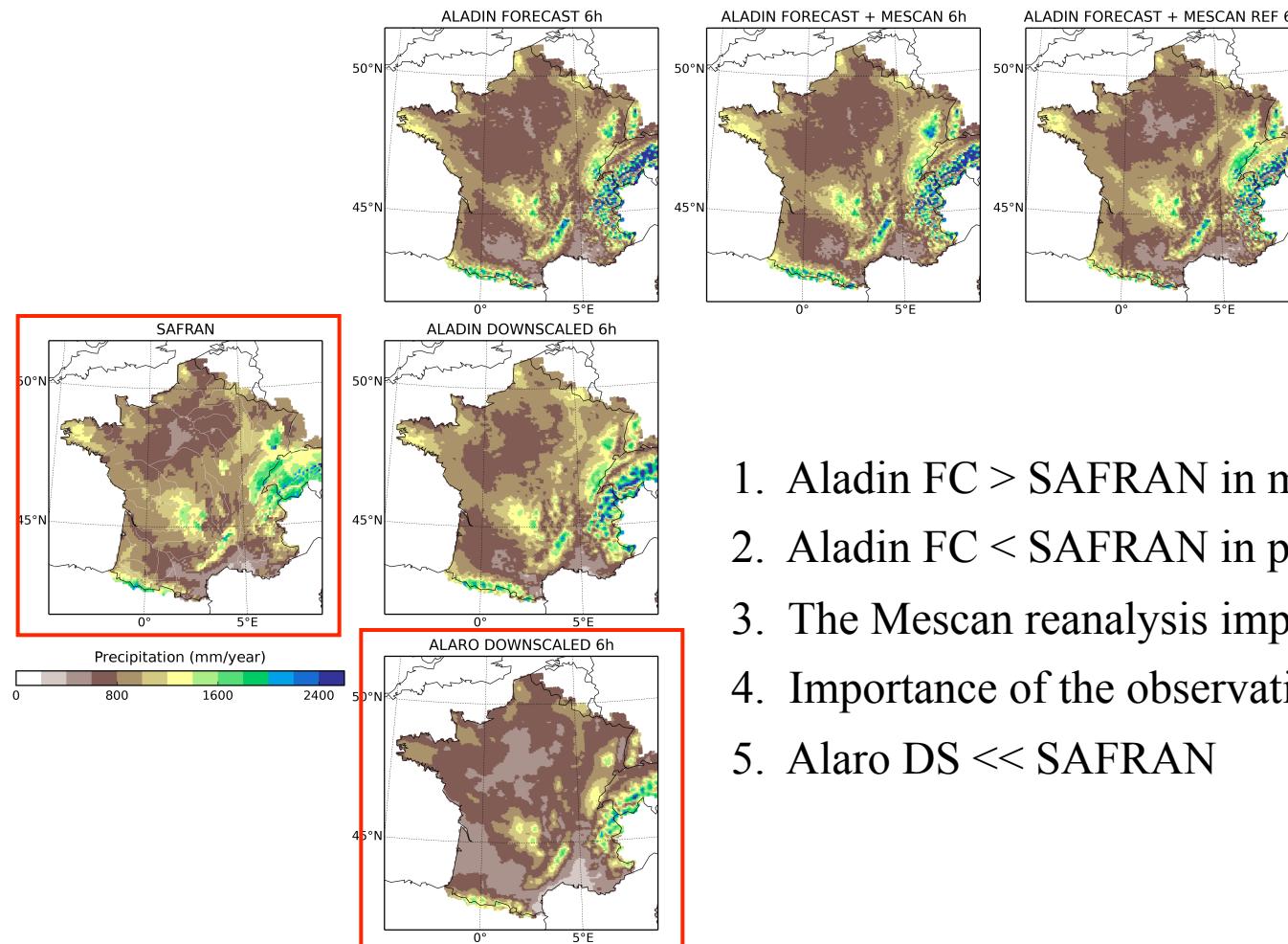
1. Aladin FC > SAFRAN in mountainous areas
2. Aladin FC < SAFRAN in plains
3. The Mescan reanalysis improves the precipitation
4. Importance of the observation network

Fig. 2. France maps of the annual cumulative 2006 precipitation obtained with the ensemble of UERRA precipitation, compared to SAFRAN reference data

EMS 2016 – 14/09/2016

Comparison of the different precipitation datasets

- over France in comparison to SAFRAN reference -



1. Aladin FC > SAFRAN in mountainous areas
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5. Alaro DS << SAFRAN

Fig. 2. France maps of the annual cumulative 2006 precipitation obtained with the ensemble of UERRA precipitation, compared to SAFRAN reference data

EMS 2016 – 14/09/2016

Comparison of the different incoming solar radiation

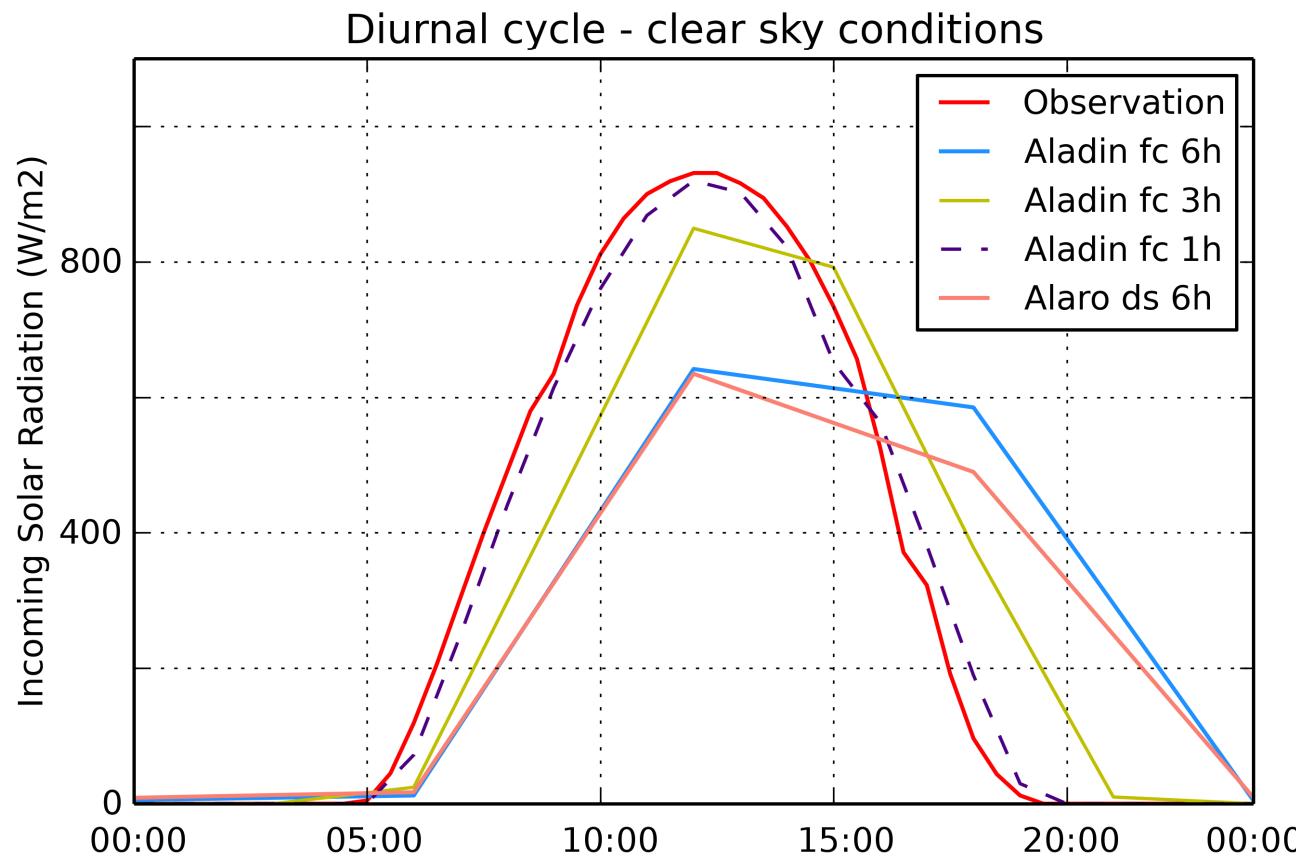


Fig. 3. Diurnal cycle of ISR obtained in south of France for a day with clear sky conditions with Aladin forecast at different time steps, in situ observation and Alaro

Evaluation of TRIP river discharge simulations

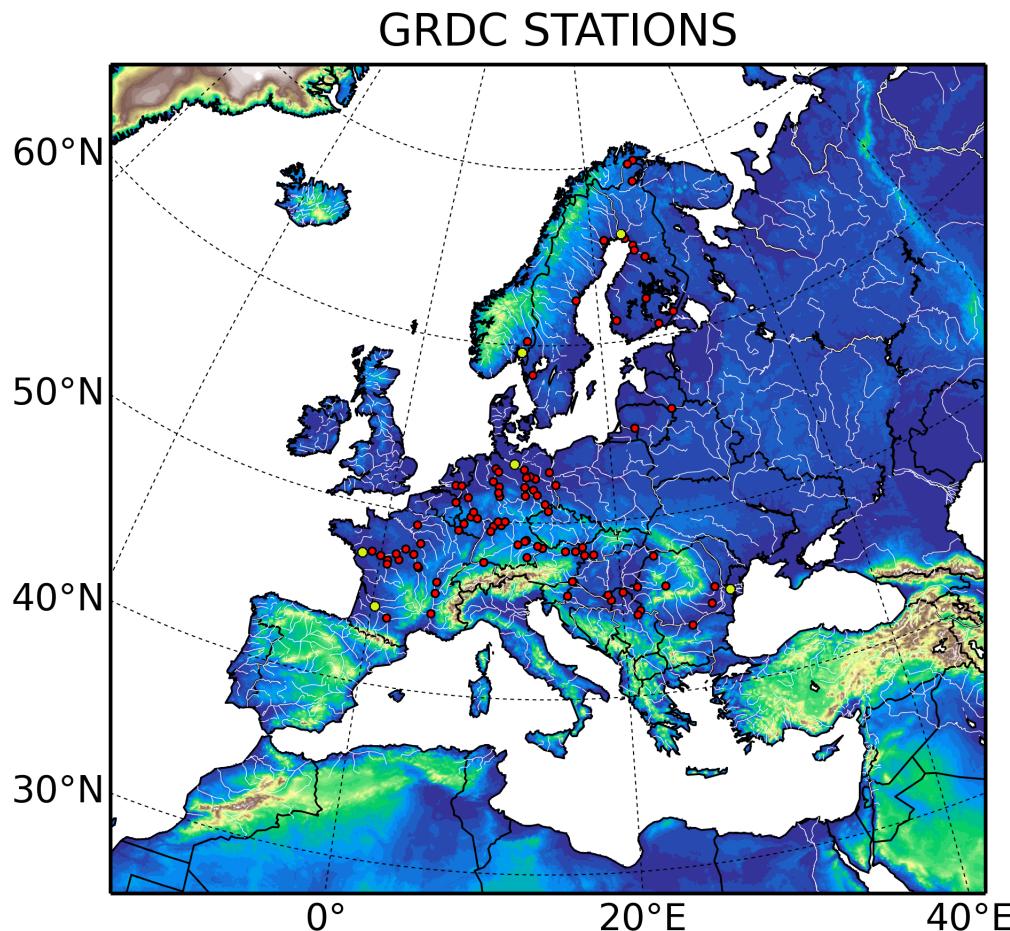


Fig. 4. Map of GRDC stations available between 2006 and 2010 over the UERRA domain

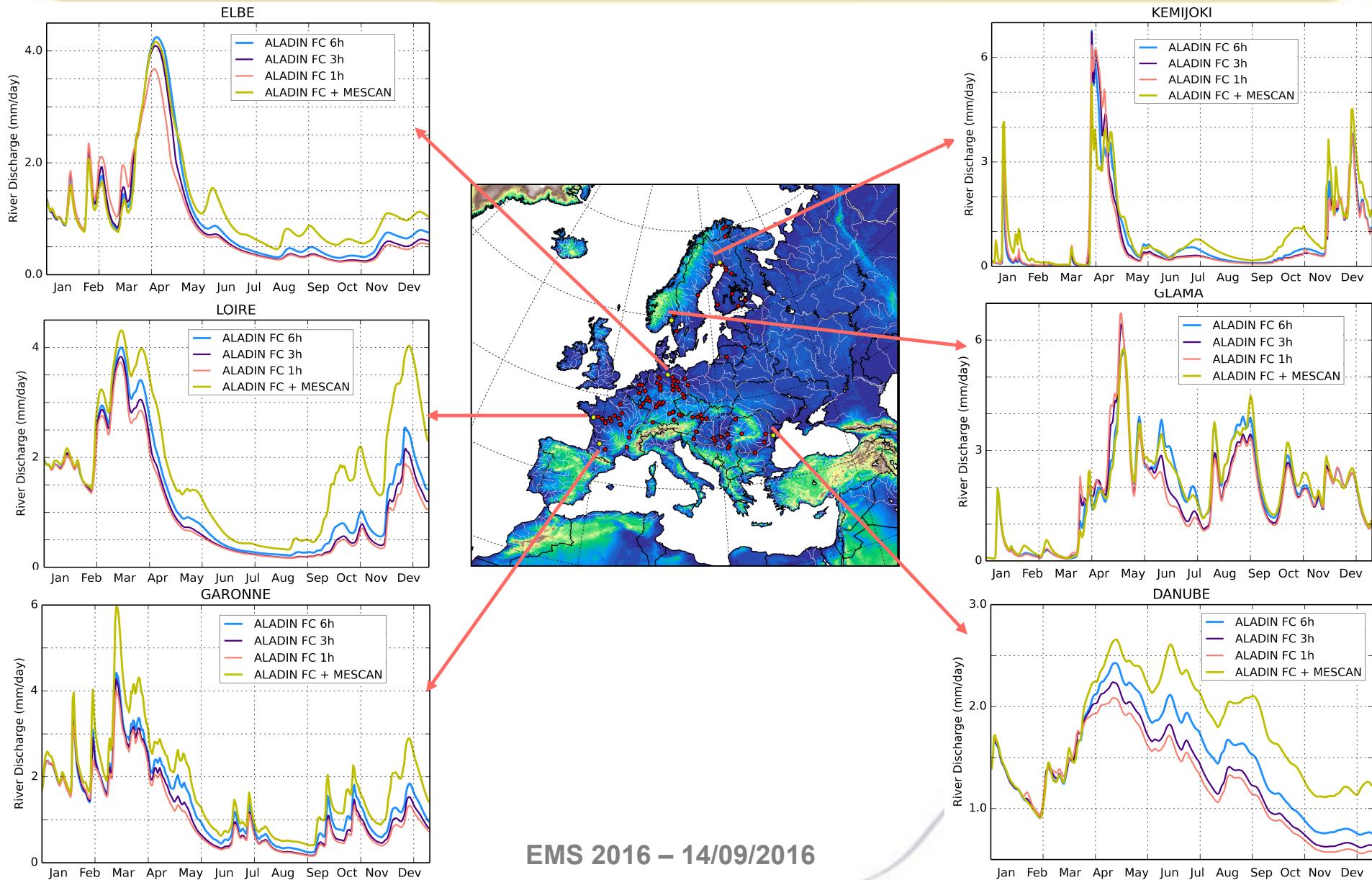
GRDC Network

Global Runoff Data Center observations

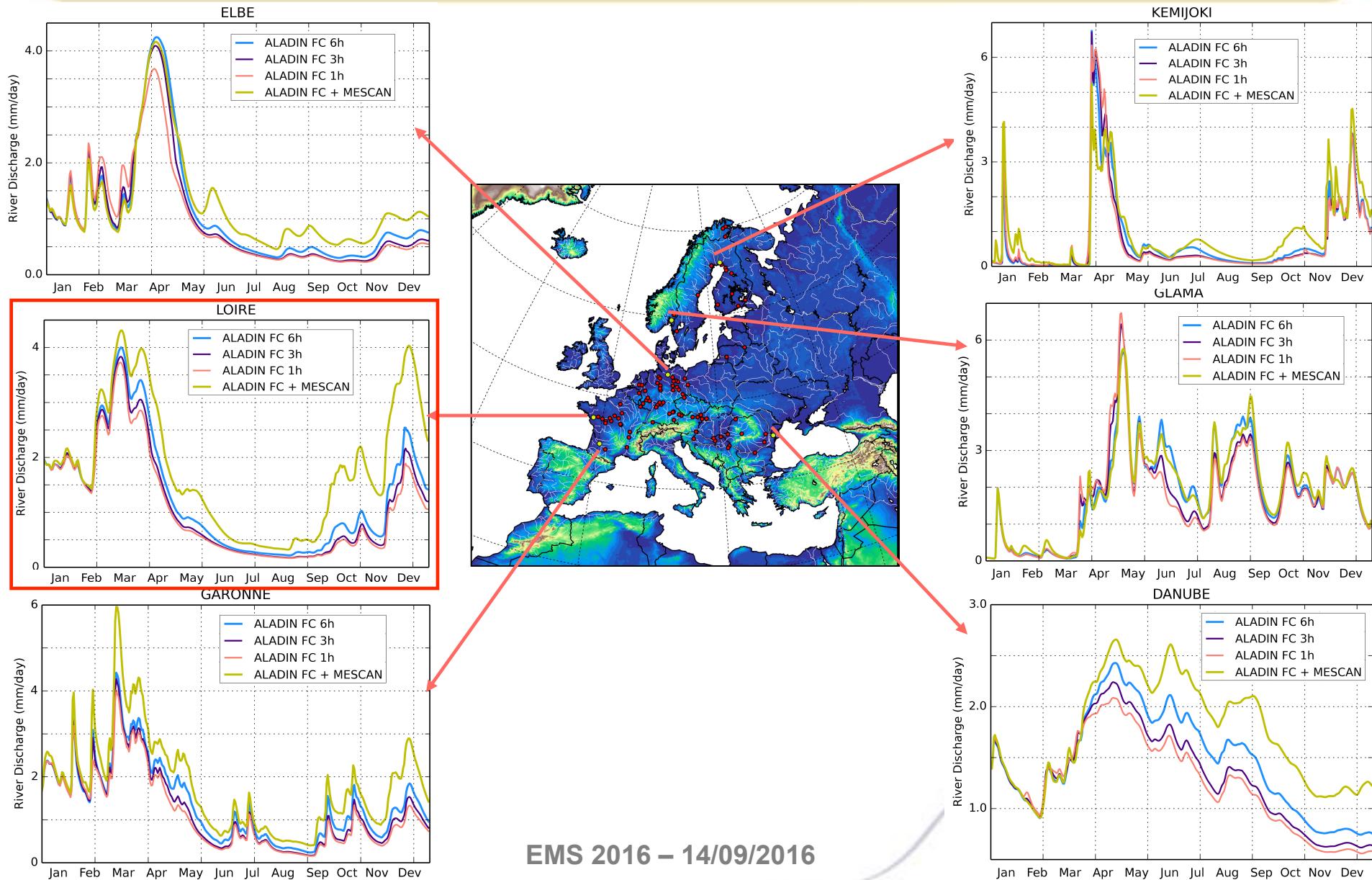
For the 2006-2010 period

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

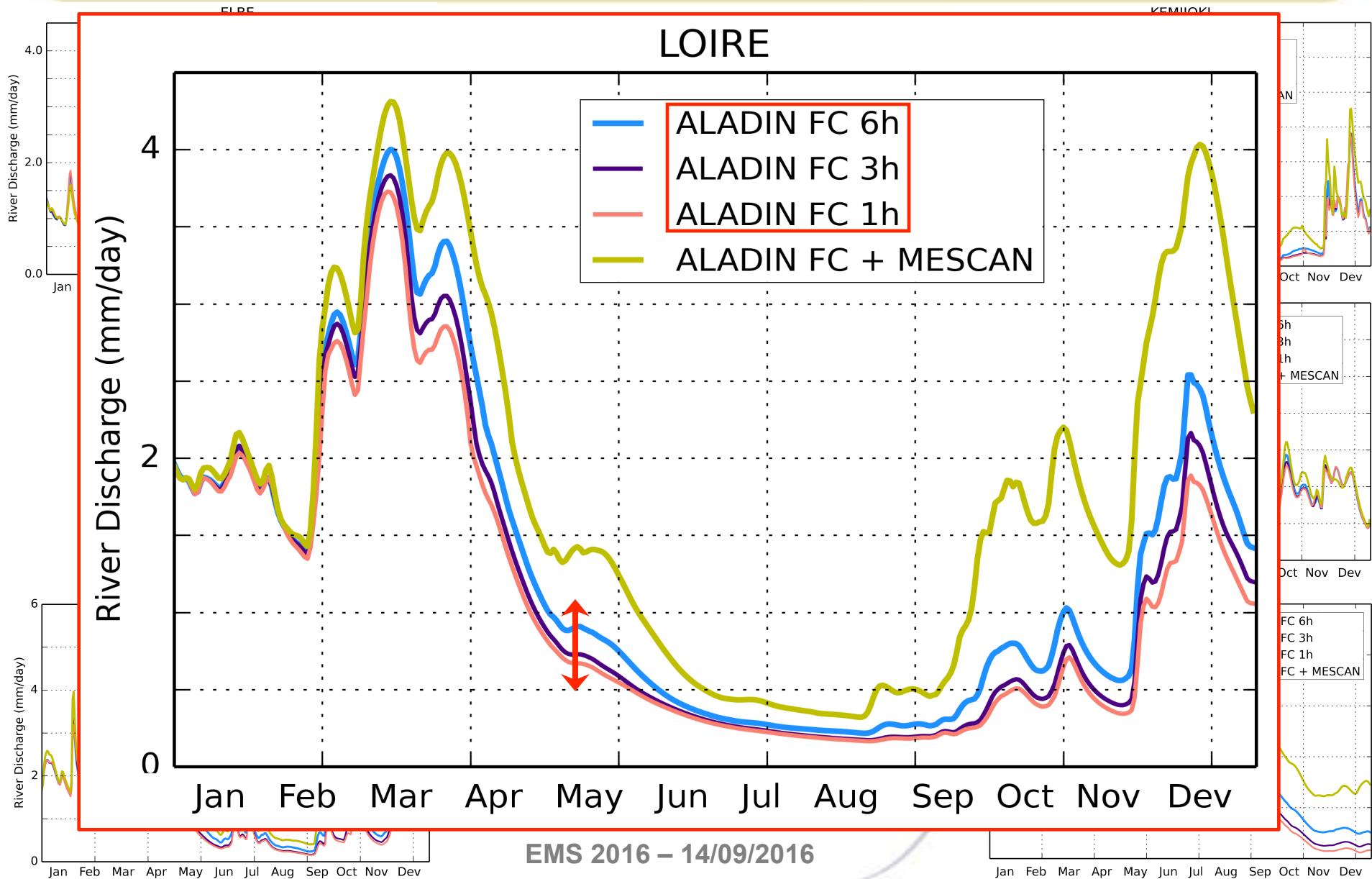
Impact of forcing on the TRIP river discharge



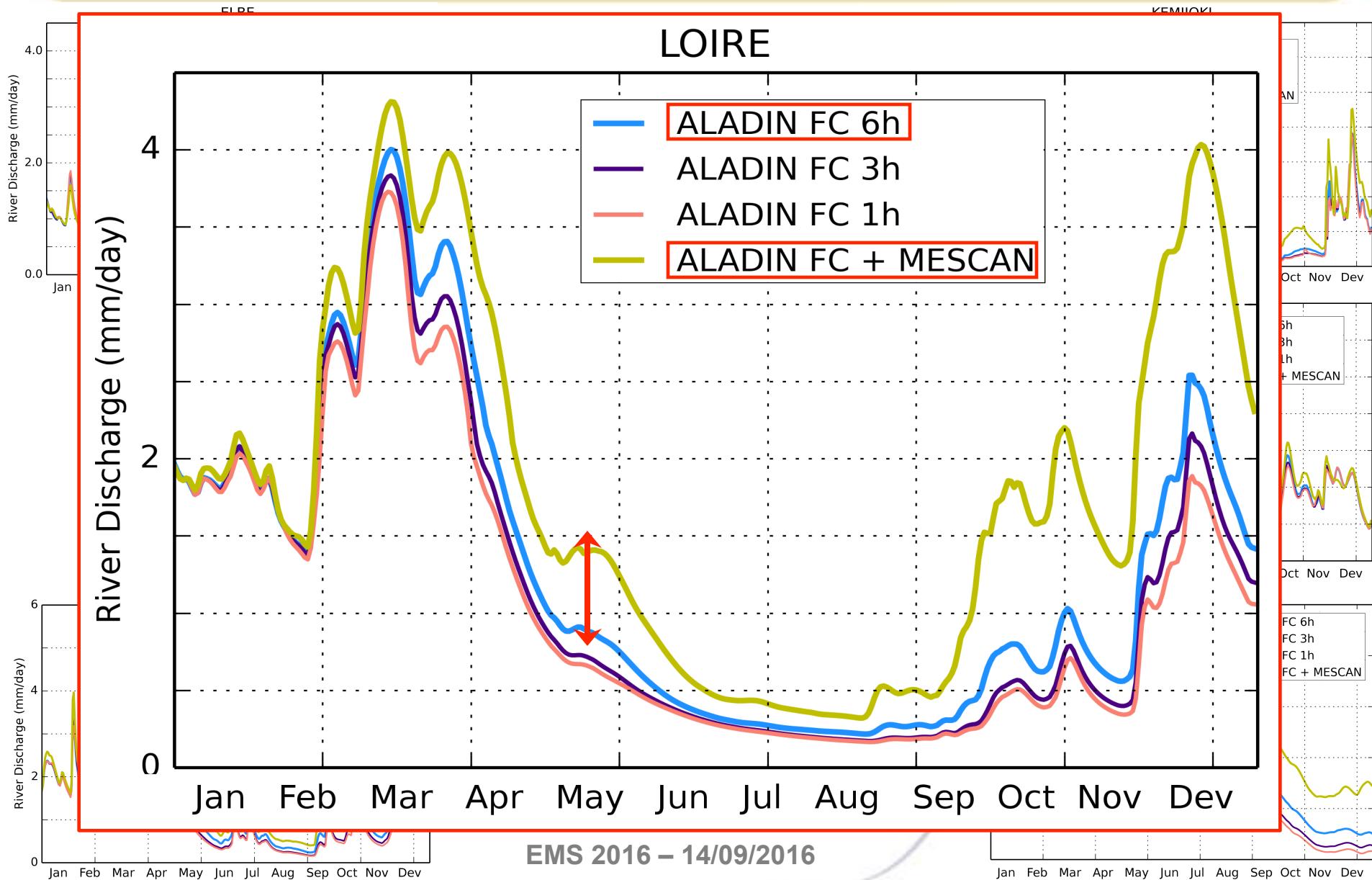
Impact of forcing on the TRIP river discharge



Impact of forcing on the TRIP river discharge



Impact of forcing on the TRIP river discharge



Perspectives

- Production of an ensemble of land surface variables with the coupled hydro-meteorological modelling system
- Evaluation of the different simulation data sets
 - simulated snow depth vs. observation network
 - TRIP river discharge vs. the GRDC data
 - the latent and sensible heat fluxes vs. the fluxnet product
- Quantification of uncertainties
- Improvement of the TRIP resolution from 0.5° to 0.1°
- Impact study on the river discharge simulations

Thank you for your attention !

The research leading to these results have received funding from the European Union, Seventh Framework Program (FP7-SPACE-2013-1) under grant agreement n°607193