



Use of UERRA reanalysis for seasonal hydrological forecasts

DCSC/AVH

francois.besson@meteo.fr

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Context

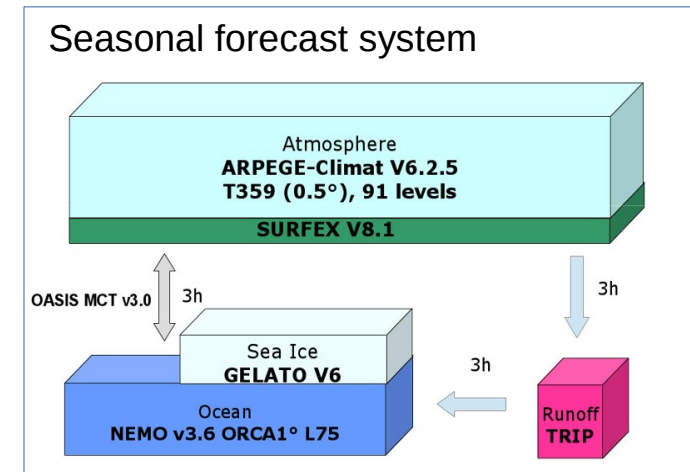
- A climate service based on seasonal hydrological forecast had been developed (FP7 – EUPORIAS project) and is now operated over France in real time
- In the framework of the H2020 – MEDSCOPE project, this climate service will be extended to other area in the mediterranean region

Plan

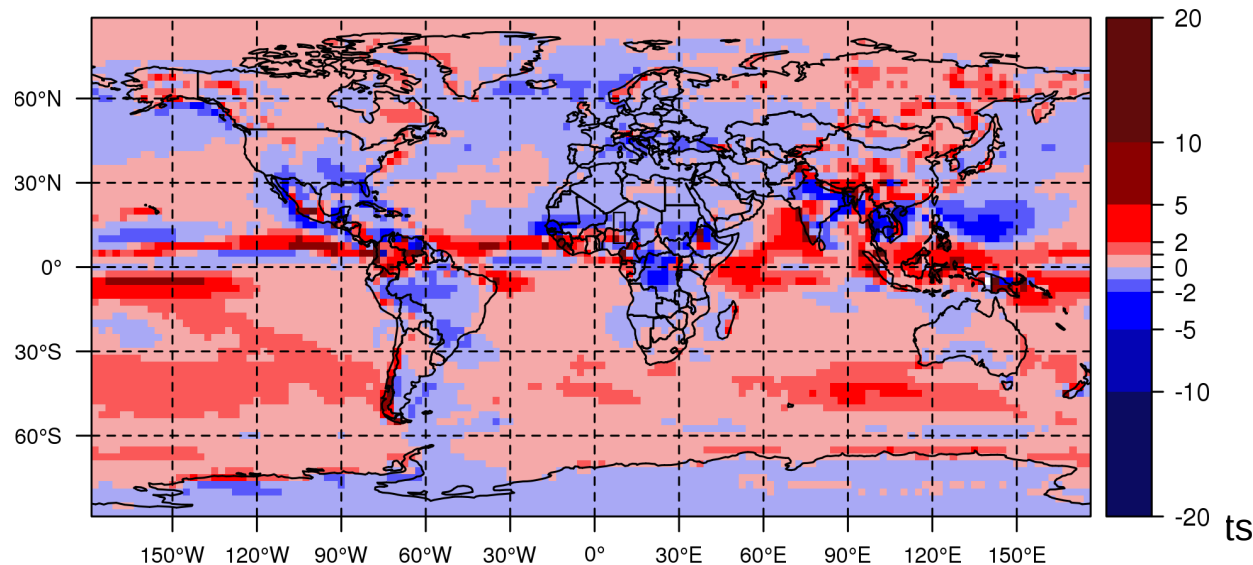
- 1) Seasonal hydrological forecast application over France
- 2) How we plan to use UERRA data

1) Seasonal hydrological forecast application over France

- First component : Atmospheric forecasts from SF systems
 - Available each month – Lead-time: 7months
 - 51 members
 - Resolution @ 0.5°
 - Re-forecast (hindcast): Period 1993-2016
 - Need to be corrected to force impact models



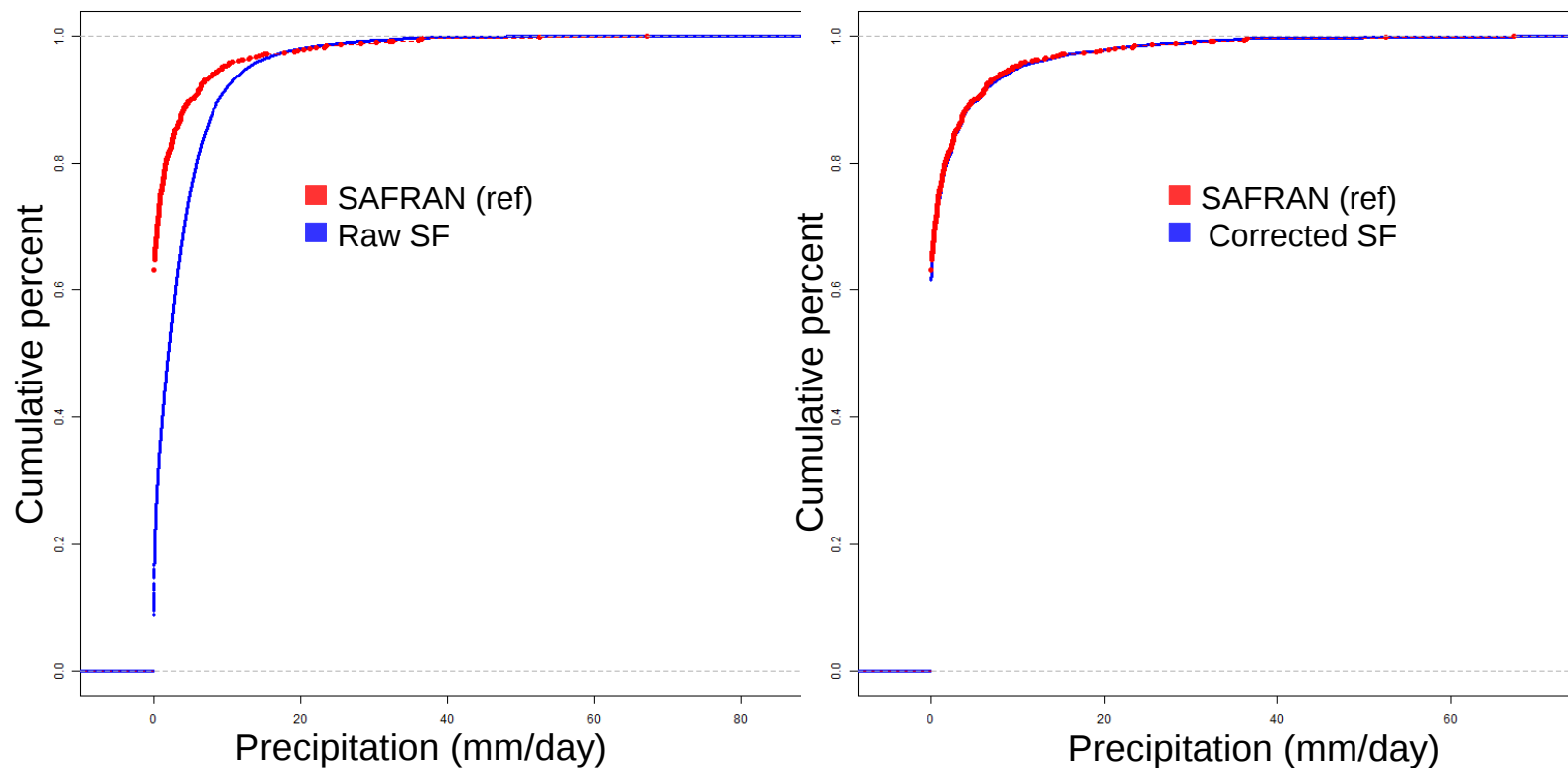
Meteo-France system 6 - RR - Bias (mm/day)
Init. : 5 (MAY) - Lead Time : 1 (JJA)
reference GPCP 1993-2016



1) Seasonal hydrological forecast application over France

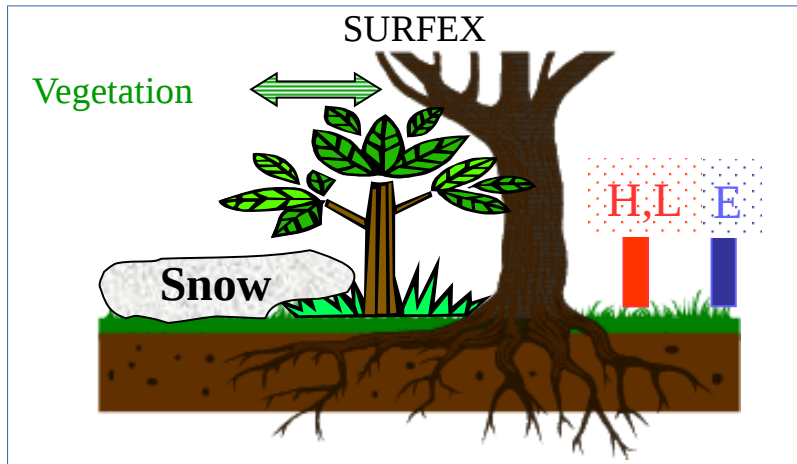
- Correction of daily precipitation & 6h-temperature with quantile mapping
- Data used to compute quantiles:
 - Hindcast of the SF system: 1993-2016 period – 25 members
 - SAFRAN reanalysis (atmospheric parameters at surface level - 8km resolution) available over the hindcast period
- Improvement of daily precipitation:

Cumulative distribution function of daily precipitation (month of June)

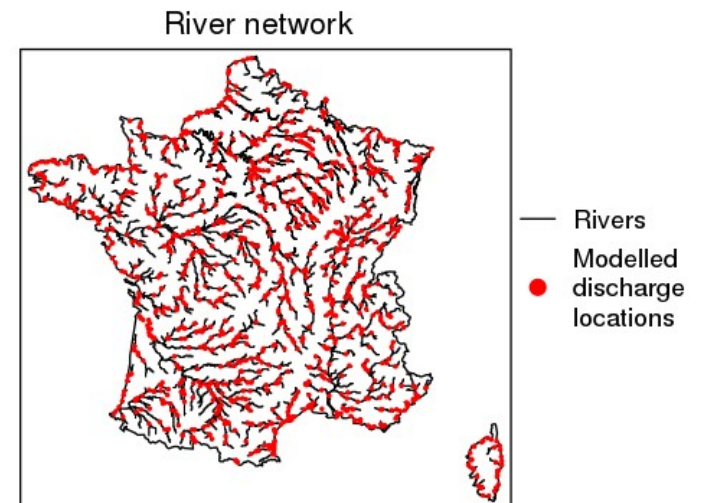
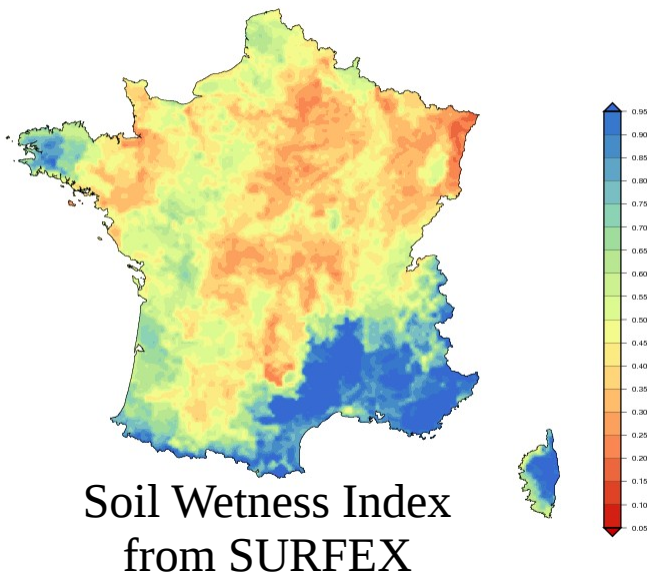
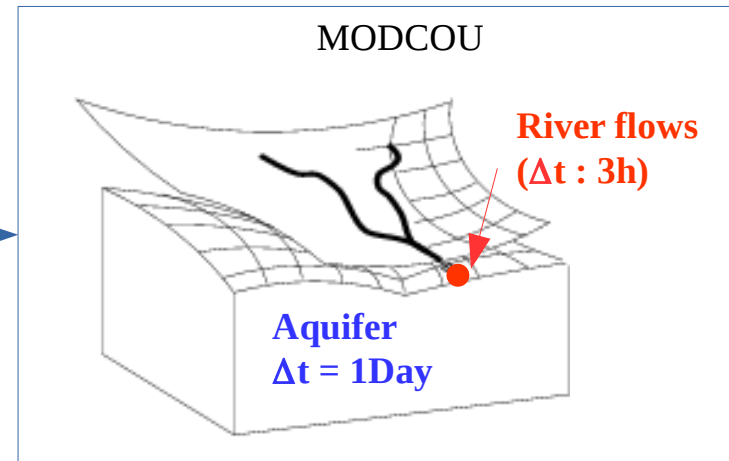


1) Seasonal hydrological forecast application over France

- Second component: Hydrological model chain
 - SURFEX (soil water & energy budgets) + MODCOU (river routing)
 - Runs @ 8km over France

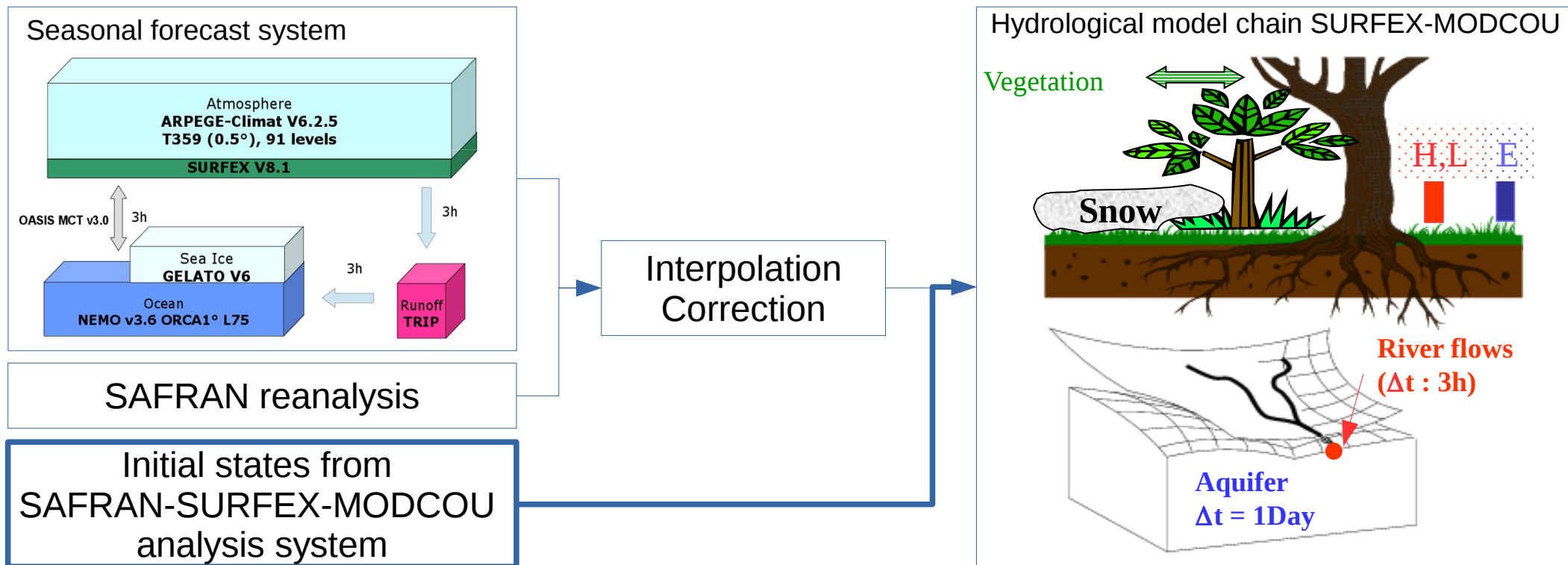


Drainage
+
Runoff



1) Seasonal hydrological forecasts application over France

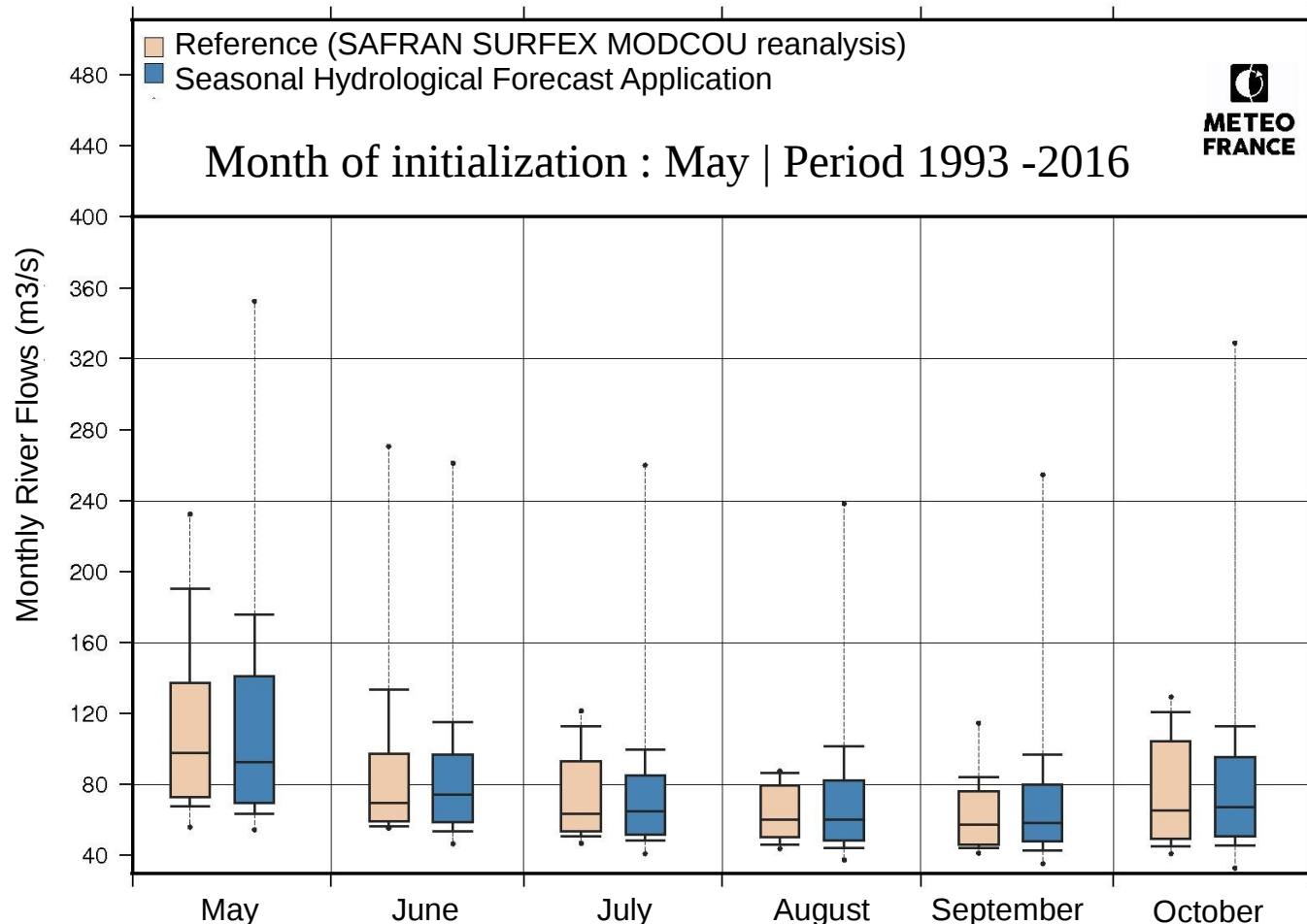
- For each forecast, the hydrological chain needs to be initialized with realistic values
 - SAFRAN-SURFEX-MODCOU reanalysis available since 1958 provide initial states **to run the system over the hindcast period**
 - SAFRAN-SURFEX-MODCOU real-time analysis (runs every daily) provide initial states for **real-time forecasts**



1) Seasonal hydrological forecast application over France

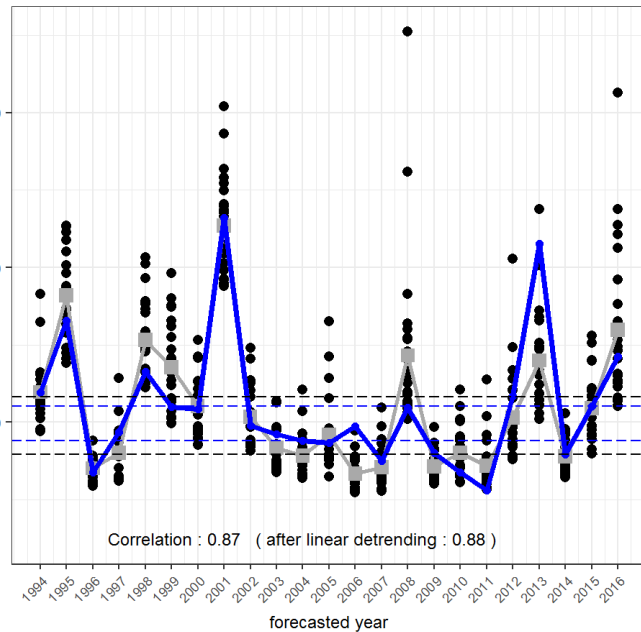
■ Performance:

- Comparison over the hindcast period between the reference and the seasonal hydrological forecast application

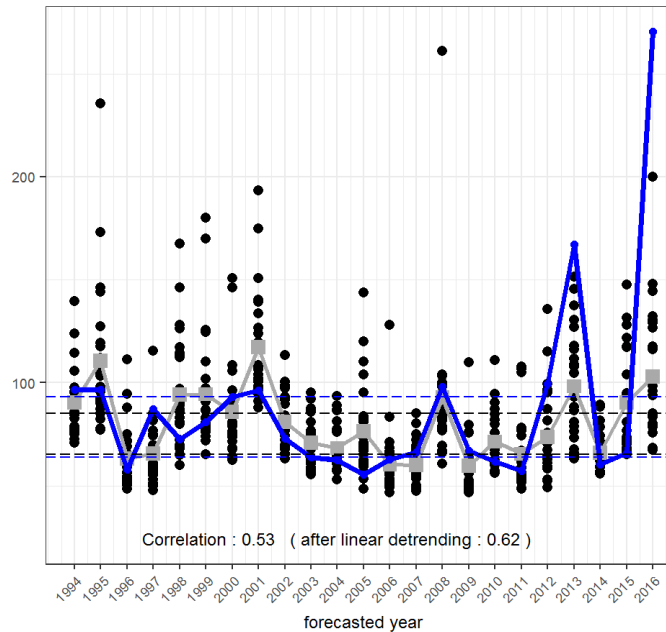


1) Seasonal hydrological forecast application over France

METEO-FRANCE Sys. 6 - DEB
Init. : 5 - Lead Time : 0 (MAY)
reference SIM2 1994-2016



METEO-FRANCE Sys. 6 - DEB
Init. : 5 - Lead Time : 1 (JUN)
reference SIM2 1994-2016



| Correlation | Init 09 | Init 10 | Init 11 |
|-------------|---------|---------|---------|
| September | 0,6 | | |
| October | 0,69 | 0,68 | |
| November | 0,18 | 0,47 | 0,8 |
| December | 0,26 | 0,55 | 0,4 |
| January | 0,31 | 0,48 | 0,5 |
| February | 0,3 | 0,39 | 0,6 |
| March | | 0,43 | 0,3 |
| April | | | 0,3 |

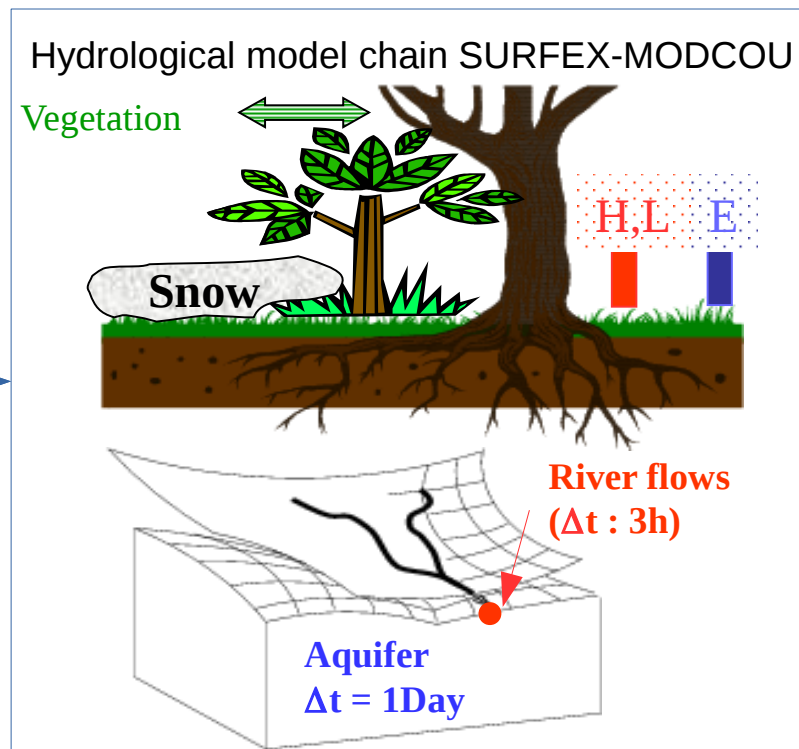
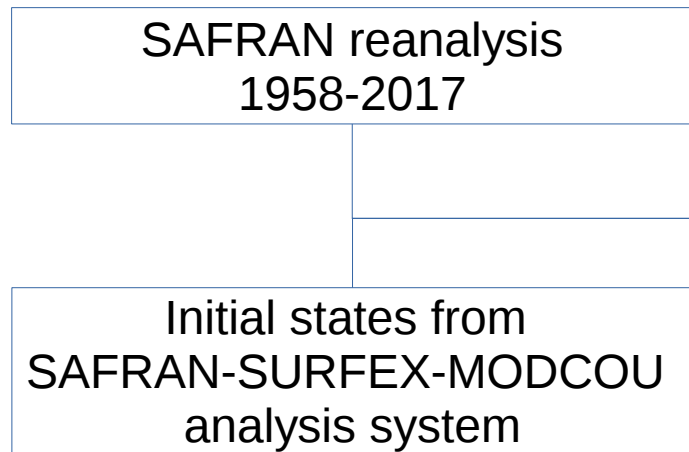
- Quality depends on the month of initialization and the lead-time
- => Before using a real time forecast it's worth analyzing the quality of the re-forecast experiment for this specific initialization month

1) Seasonal hydrological forecast application over France

Real-time production:

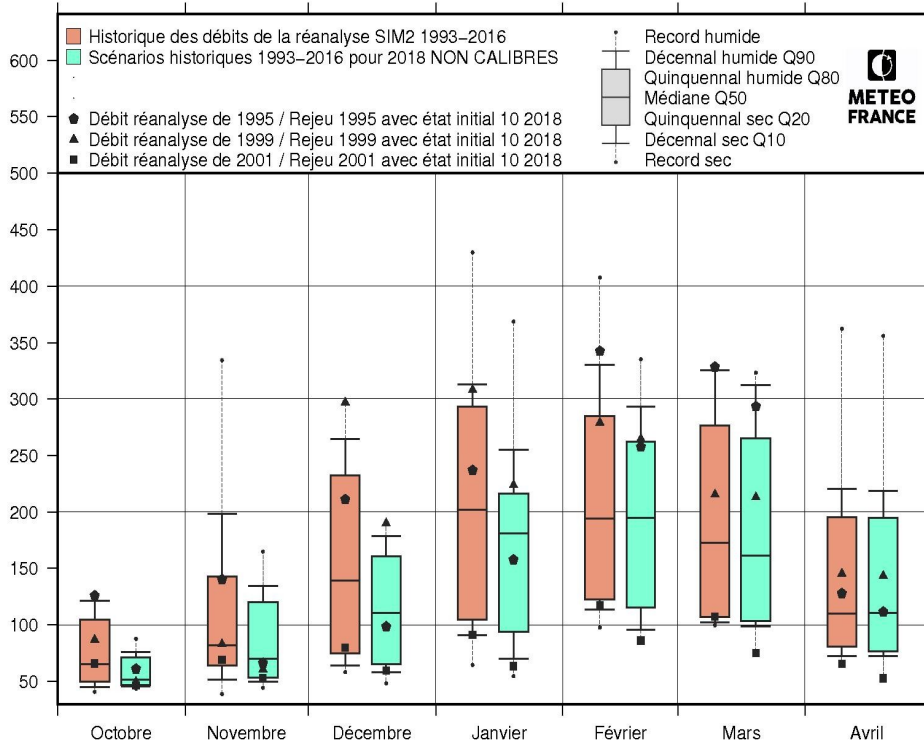
- Monthly briefing with end-user: authority which manages lakes over the Seine basin. Aim: Fill lakes during winter in order to reduce winter-floods + ensure river flow during low flow period
- Comparison with climatological forecast, i.e. hydrological model chain forced by past year meteorological conditions

Climatological Hydrological Forecast Application

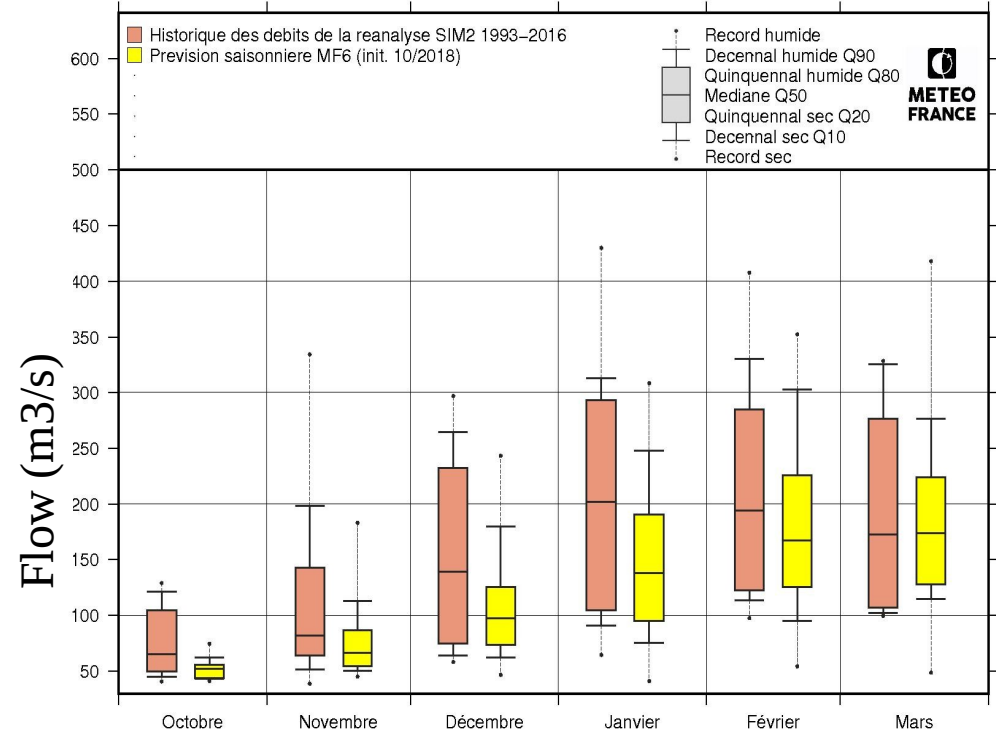


1) Seasonal hydrological forecast application over France

Example of Products



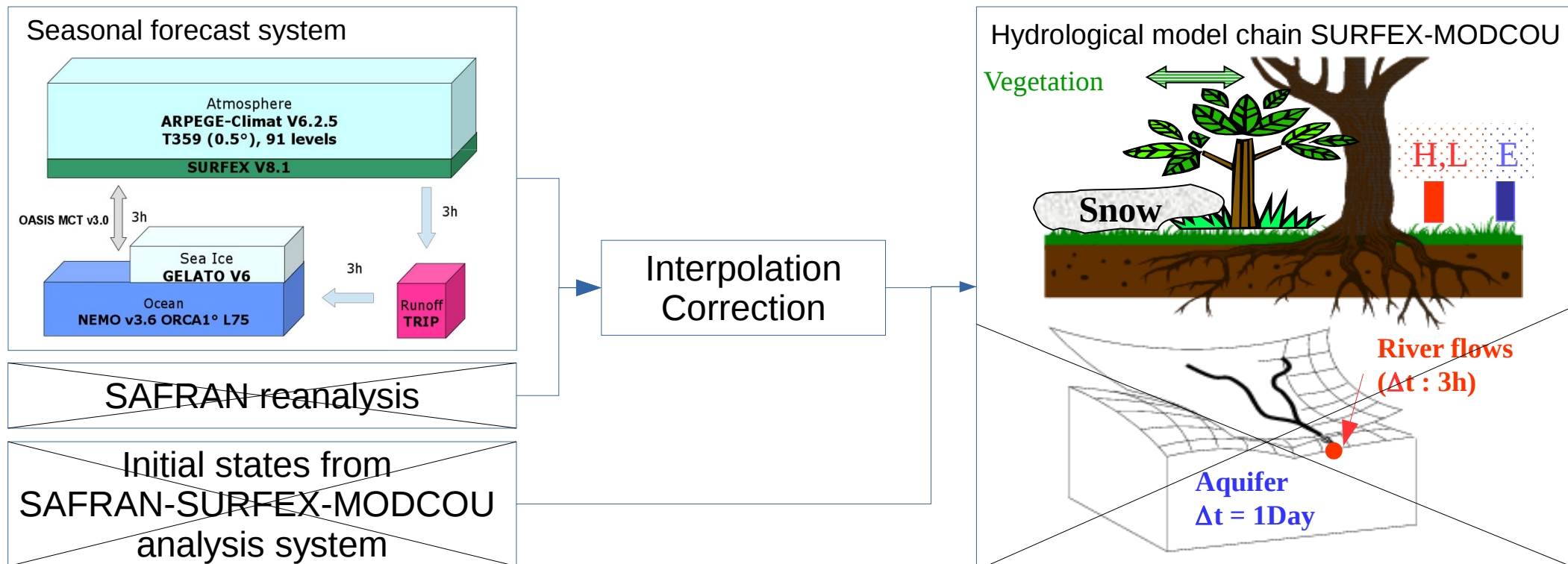
Climatological forecast



Seasonal forecast

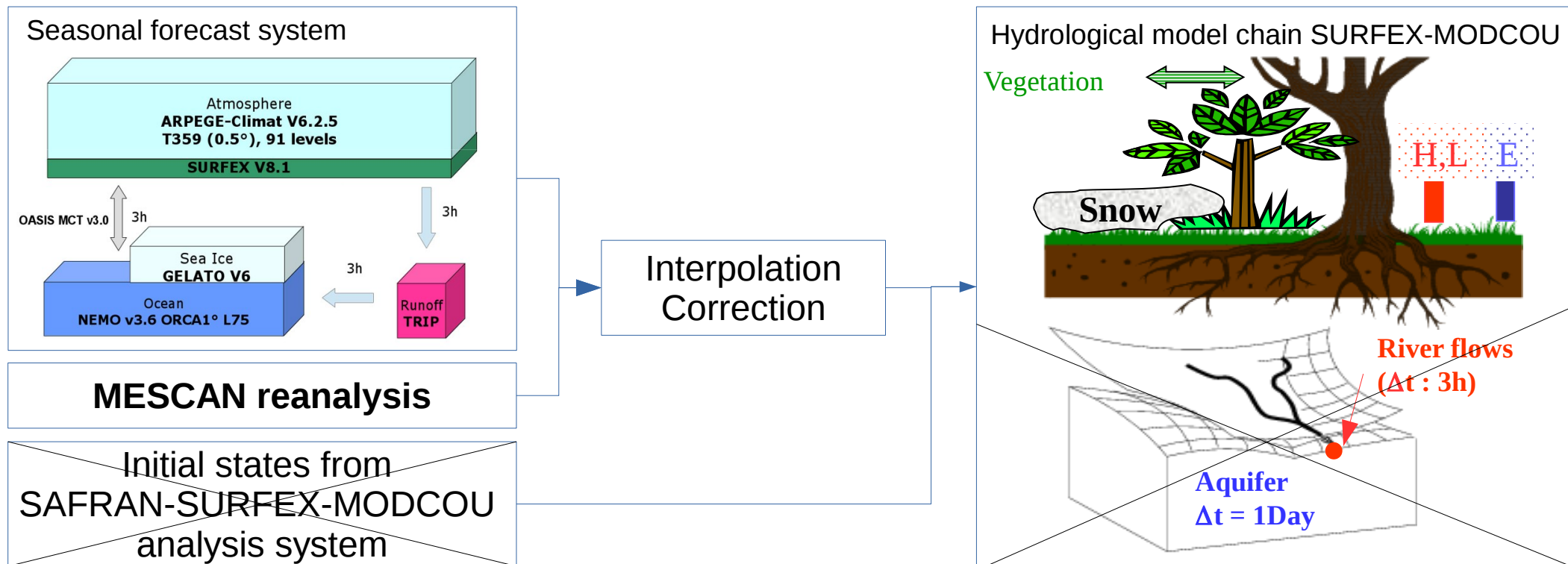
2) How we plan to use UERRA data

- MEDSCOPE: Extension of the seasonal hydrological forecast system over the mediterranean basin (Proof of concept)



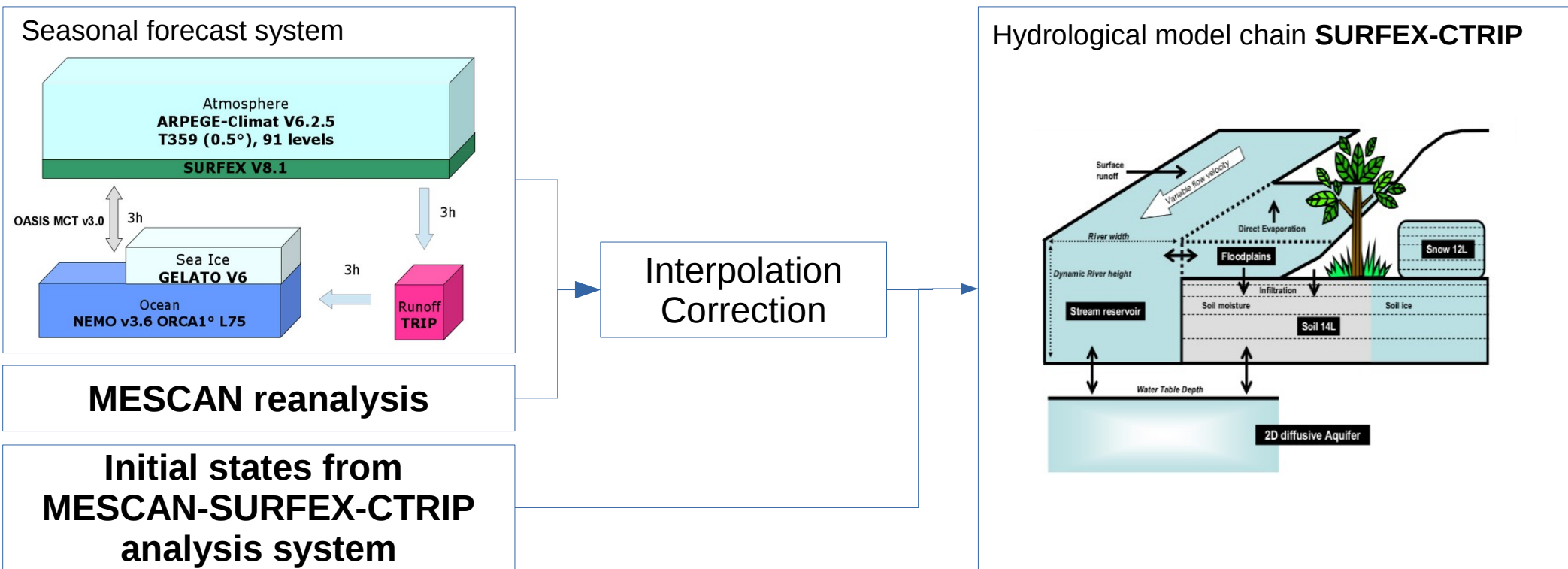
2) How we plan to use UERRA data

- Replace SAFRAN data by MESCAN data



2) How we plan to use UERRA data

- Replace SURFEX-MODCOU by SURFEX-CTRIP
- Use initial states from MESCOAN-SURFEX-CTRIP reanalysis



Conclusion

- Using data from UERRA we plan to adapt a national climate service at european scale. Area of interest: probably some large watershed over the mediterranean basin such as Rhône / Po / Ebre
- Use of UERRA data:
 - in order to correct seasonal forecast outputs (MESCAN reanalysis: daily precipitation + 6H values for other parameters)
 - in order to initialize seasonal hydrological forecast with initial states from SURFEX-CTRIP reanalysis



Thank you for your attention
