Dynamical and thermodynamical impacts of the AMV on European climate

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Motivation : Link between AMV and European climate in observations

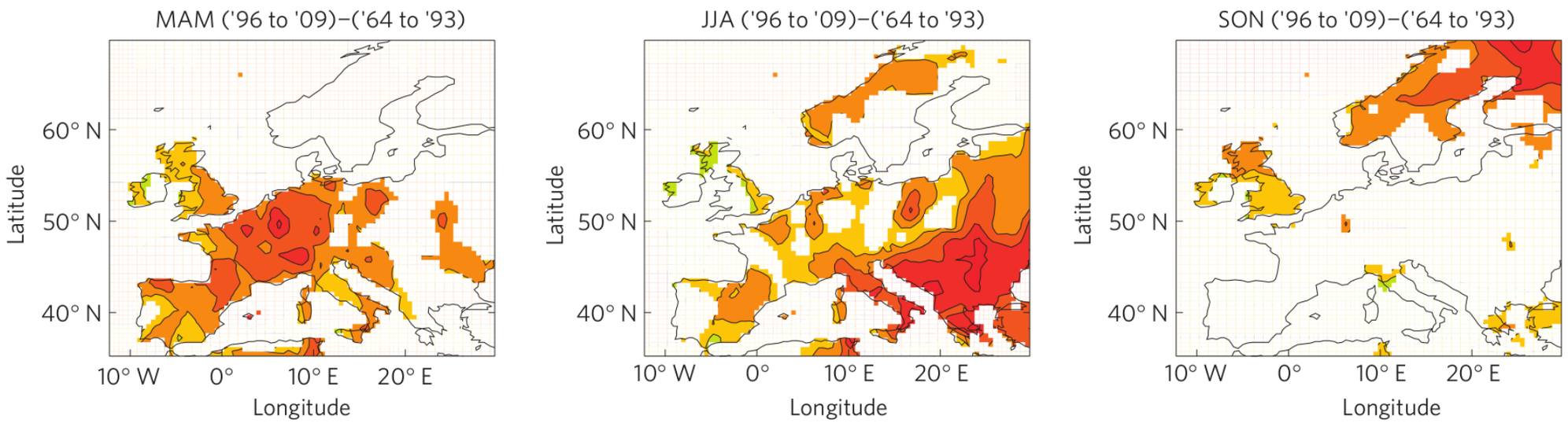
AMV+ minus AMV -

Spring

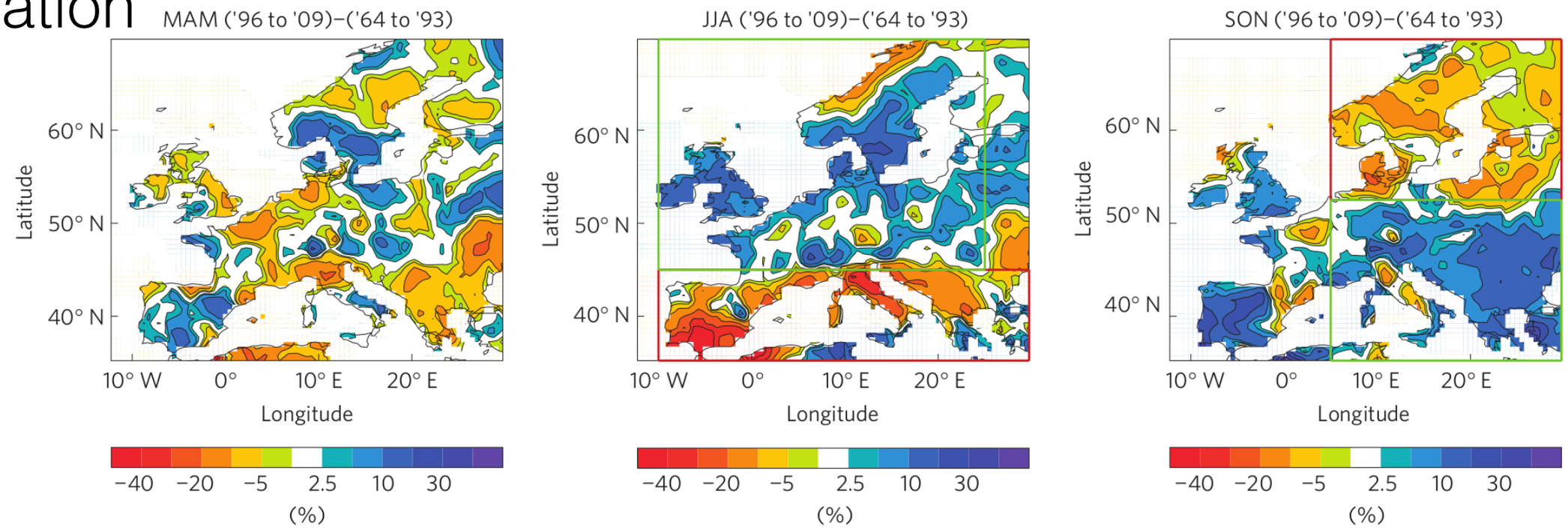
Summer

Fall

T2m



Precipitation



Sutton and Dong (2012)

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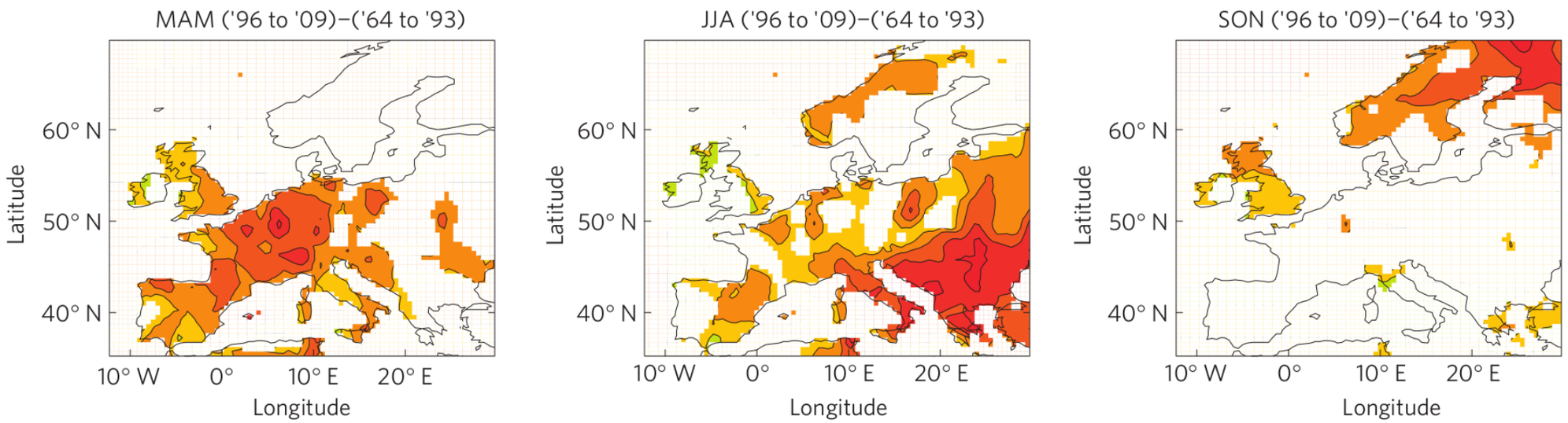

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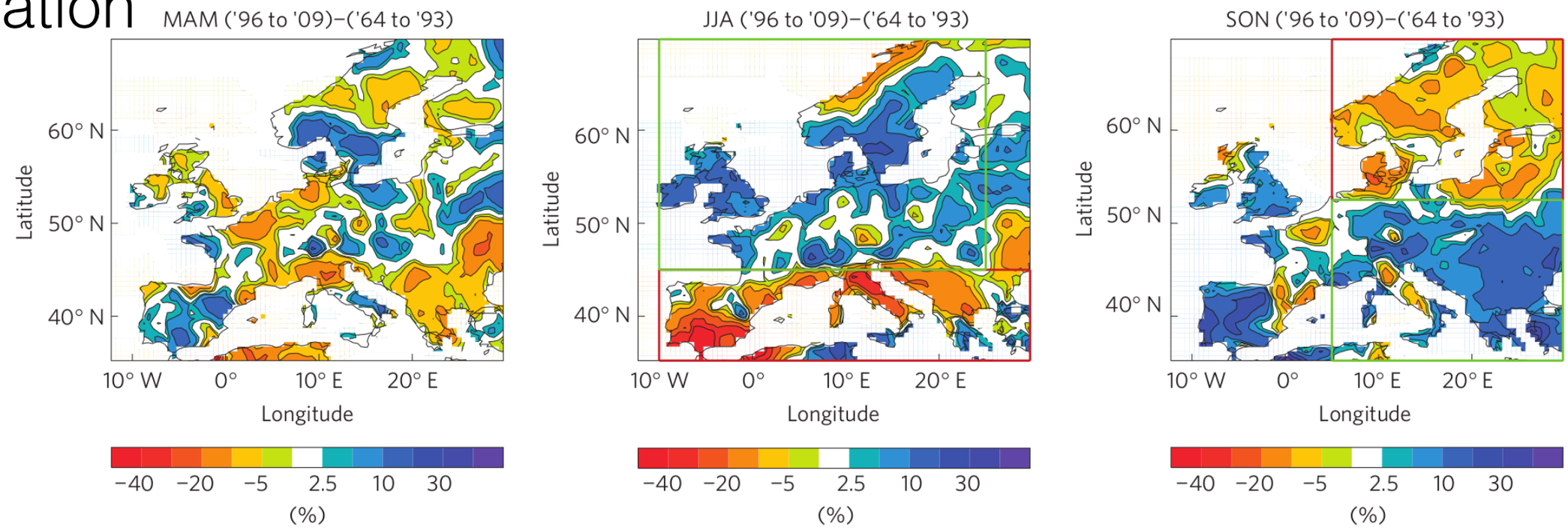


What about winter ?

Sutton and Dong (2012)

Results from previous recent studies

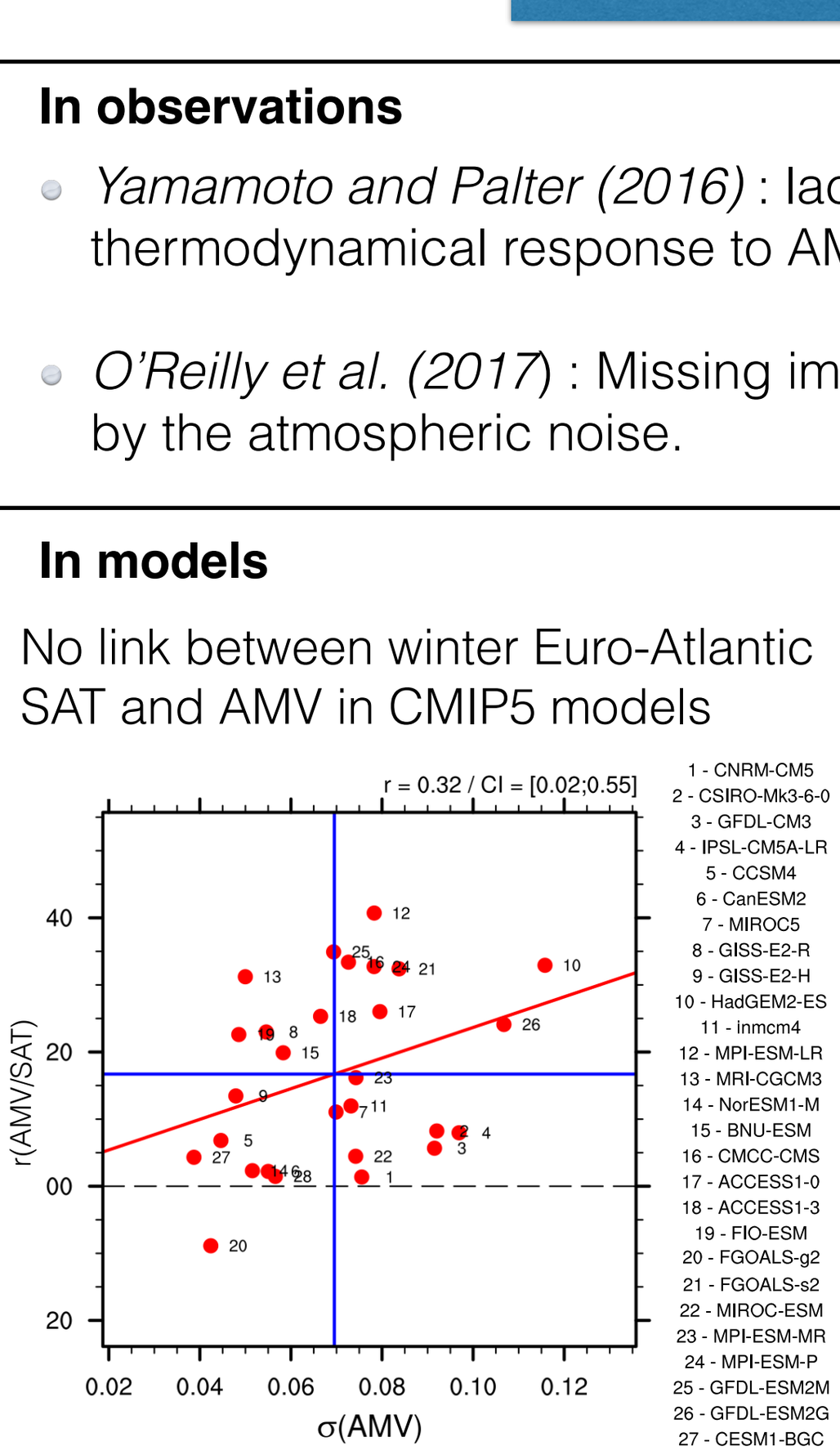
In observations

- *Yamamoto and Palter (2016)* : lack of teleconnection in winter because the thermodynamical response to AMV is masked by large atmospheric dynamics.

- *O'Reilly et al. (2017*) : Missing imprint of the ocean atmosphere coupling, suppressed by the atmospheric noise.

In models

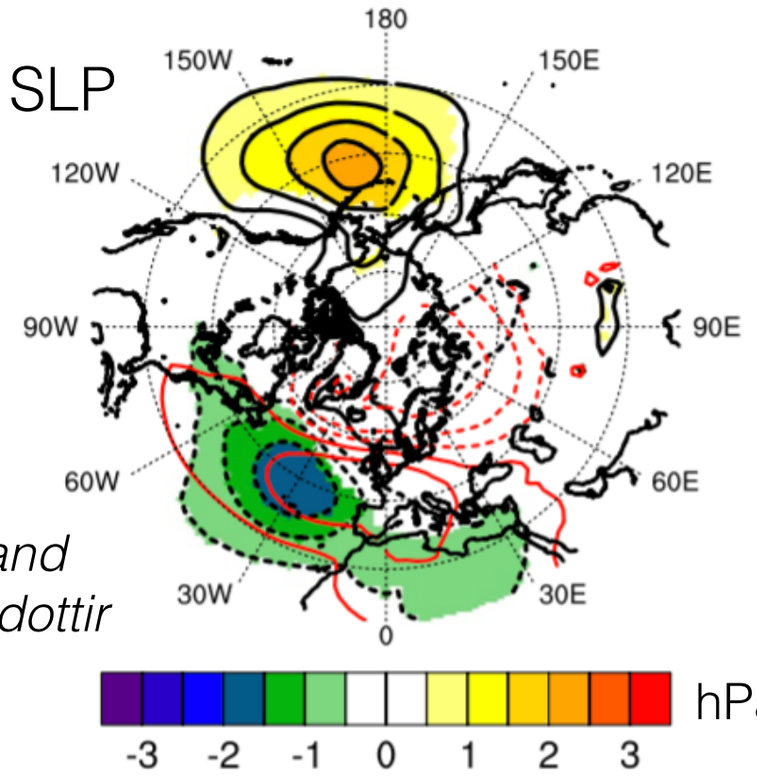
No link between winter Euro-Atlantic SAT and AMV in CMIP5 models



Adapted from Qasmi et al. (2017)

Weak NAO- when the AMV is prescribed

DJFM SLP



Peings and Magnusdottir (2016)

See also Gastineau and Frankignoul (2015), Davini et al. (2015), Ruprich-Robert et al. (2017)

Outline

Objective : Characterize the winter climate response to the AMV in the Euro-Atlantic sector in the CNRM-CM5 coupled model

1. Description of the coupled model experiments

2. Winter climate response to the AMV over the Euro-Atlantic region

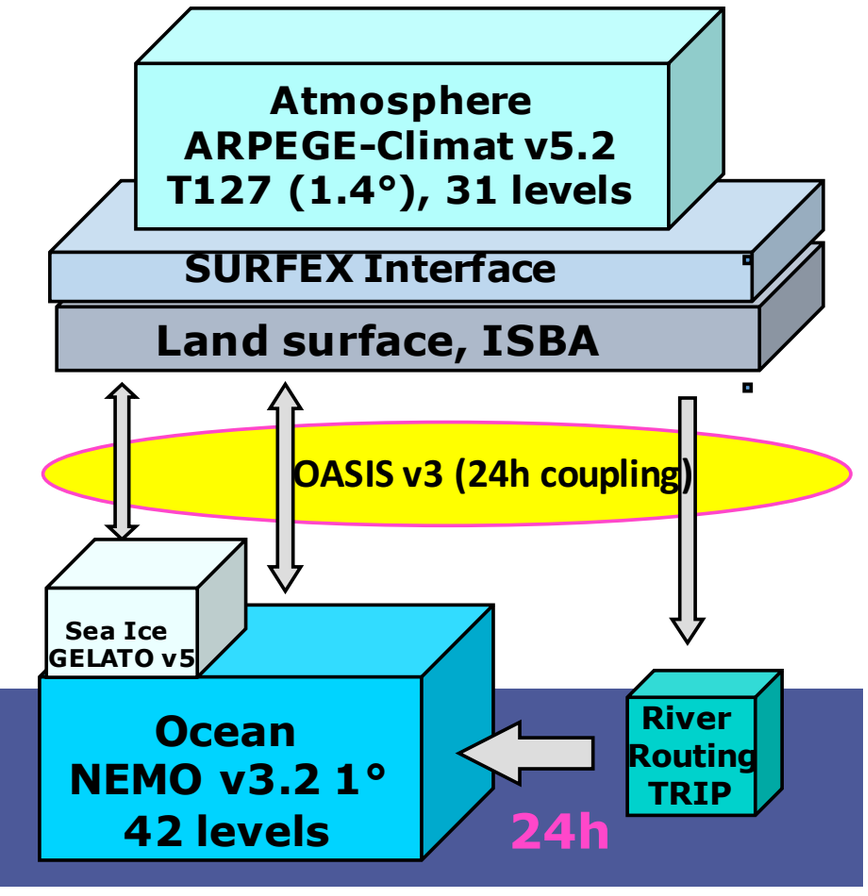
- **Description : T2m and precipitation anomalies**
- **Mechanisms : decomposition into a dynamical and thermodynamical response**

3. Conclusions

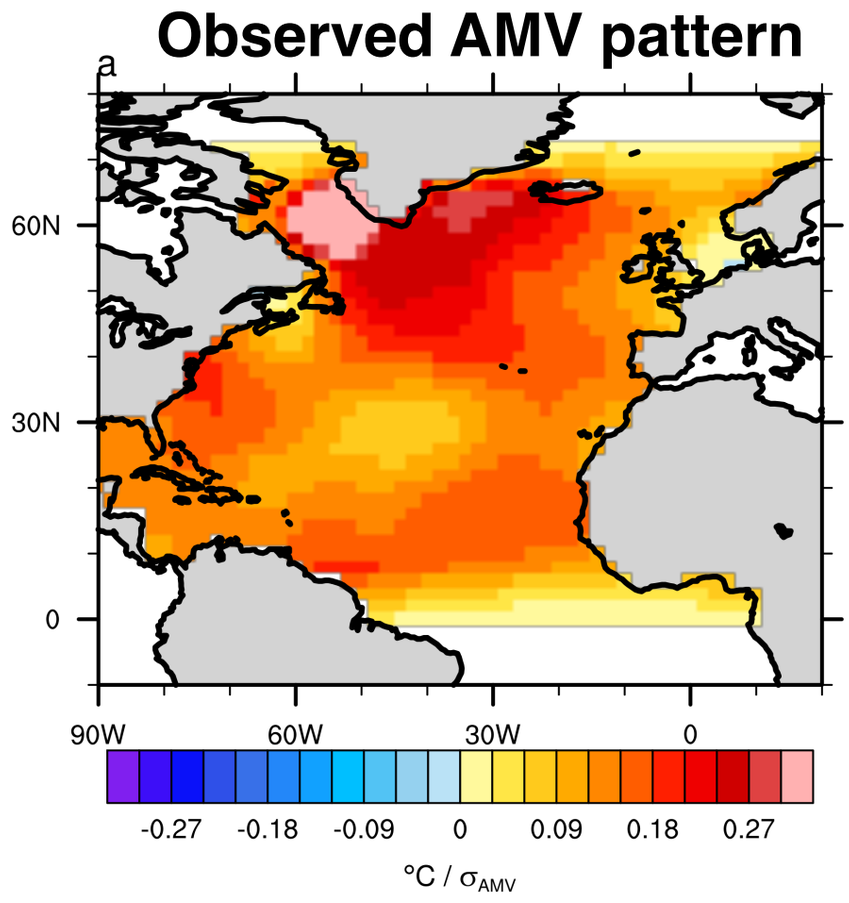
Experimental protocole

CNRM-CM5 coupled model

(Voldoire et al. 2013)



SST restored in the North Atlantic following the CMIP6 DCPP-C protocole *(Boer et al. 2016)*



- Observed AMV+ (AMV-) pattern added (subtracted) to the model climatology (preindustrial control run)
- 40 members of 10 yrs

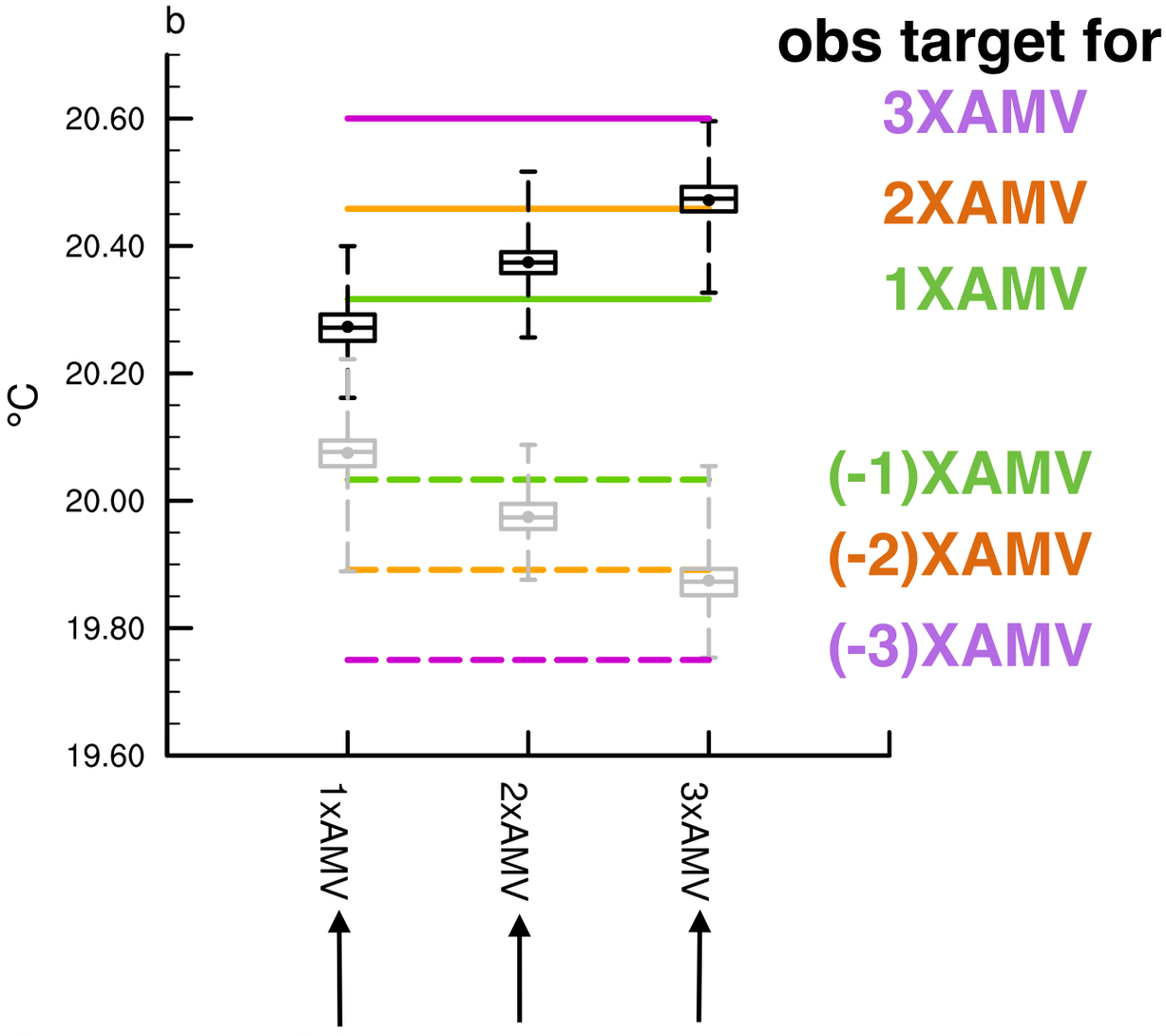
3 sets of experiments : **1 X AMV**, **2 X AMV, 3 X AMV :** AMV+ and AMV- in each set

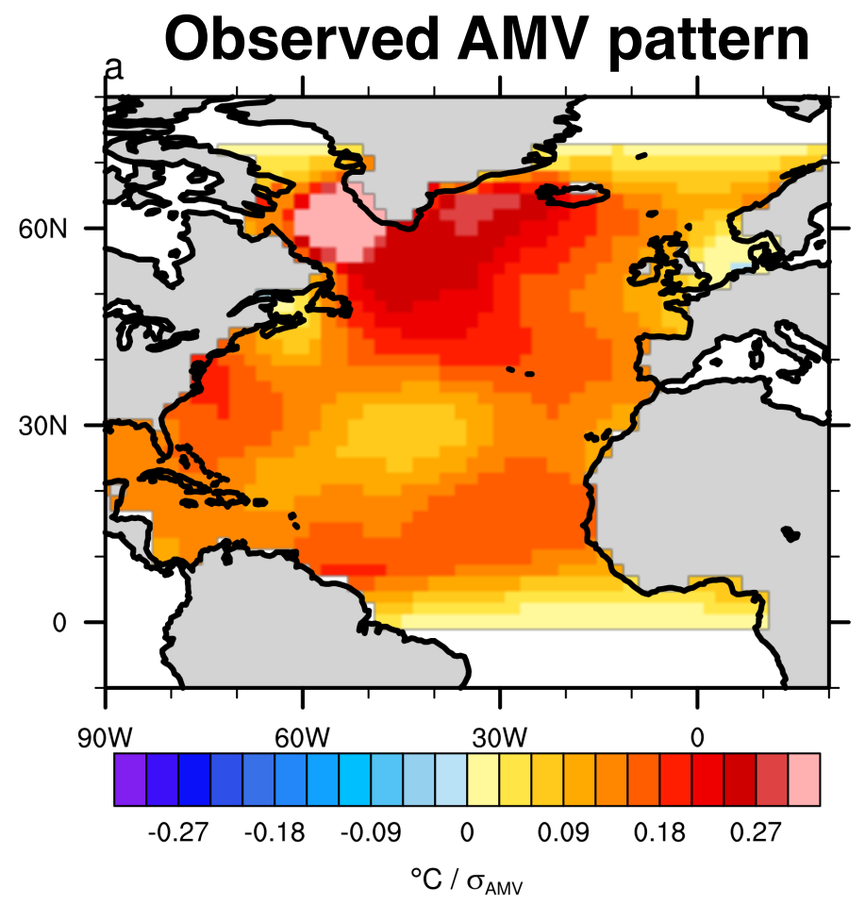
We call "response" = AMV+ minus AMV- averaged over the 40 members and 10 yrs

Experimental protocole

Weak restoring of 40 W/m2/K
(~ 2 months for a 50 m MLD)

SST restored in the North Atlantic following the CMIP6 DCPP-C protocole *(Boer et al. 2016)*





Simulated SST after restoring to the AMV pattern weaker than the observational target

How does the winter climate response over the Euro-Atlantic region change with the strength of the AMV? Is it linear? What are the respective weight of the thermodynamical and dynamical components as the AMV forcing gets stronger?