S2S Activities at CNRM/Météo-France
System set-up and some case studies

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**S2S predictions at CNRM**

**Coupled AOGCM:**

1993-2014 fix re-forecast (2 start dates per month, 15 members) + real-time forecasts issued every Thursday (51 members)

The ensemble uses the so-called Dynamique Stochastique method (Batté and Déqué, 2012). Initial conditions:

<table>
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<th>Re-forecast</th>
<th>Forecast</th>
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<td>Atmosphere and land surface</td>
<td>Era-Interim (Dee et al., 2011)</td>
<td>IFS operational Analyses at 00:00 UTC</td>
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<tr>
<td>Ocean and Sea-Ice</td>
<td>Mercator-Ocean GLORYS (Ferry et al., 2010)</td>
<td>Mercator-Ocean operational Analyses</td>
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Forecast horizon: 32 days

Forecast and re-forecast feed the S2S database (Vitart et al. 2017). Research purpose only. No operations
I) Work related to land surface initialization

- S2S prediction case study: the July 2015 heat wave over France (Ardilouze et al. 2017a)

  ![ERA-Interim Tmax anomaly (period 1 to 6th July 2015)]

  Daily Tmax departure from climatology over France (ERA-Interim)

- Target event defined as the anomaly of the mean 1-to-6 July daily Tmax over France w.r.t. the 1993-2014 period

  ![Forecast probability density functions for the target event (forecasts issued between June 1st and July 1st 2015)]
I) Work related to land surface initialization

- Forecasts re-computed with modified land surface initial conditions

- Earlier forecasts no longer capture the event and upper distribution tails markedly reduced
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II) Seasonal forecasting: impact of soil moisture initialization

- GLACE2 (Koster et al. 2011): Multi-AGCM S2S experiment on the impact of soil moisture initialization
  - T2m prediction skill improved up to 60 days ahead over N. America

- Here, update of GLACE2 with 5 AOGCM, extended to the seasonal timescale (Ardilouze et al, 2017b)

- Experimental setup
  - 5 coupled models x 10 members = 50-member multi-model ensembles
  - 2 sets of re-forecasts with either climatological (CLIM) or realistic (INIT) soil moisture initialization.
  - MJJA re-forecasts initialized on May 1st (1992 to 2010)
II) Seasonal forecasting : Results

- Realistic soil moisture initialization in May → increased summer temperature prediction skill over South-East Europe but not over the US Great Plains

- Both regions are hot spots of land-atmosphere coupling. What could explain such poor results over the US?
II) Seasonal forecasting: Bias could be the culprit

- All the models have a warm and dry summer bias over the US Great Plains.
- Consequence: soil dries out fast and inter-annual information brought by land-surface initial conditions is rapidly lost.
- Perspective: on-going experiments to confirm this link between bias and prediction skill over the US.

Multi-model JJA 2m temperature (left) and precipitation (right) bias. Reference: CRUTS and GPCC.

Individual model ensemble mean daily climatologies for cumulated precipitation from May 1st to August 31st over the US Great Plains. OBS= GPCC.
Perspectives for ILSTSS2S:

- Within the framework of ILSTSS2S, we can run S2S experiments with CNRM CMIP6-configured climate model:
  - Refined land surface soil scheme with 14L (ISBA-Dif) and 12L explicit snow scheme
  - But at a coarser horizontal resolution T127 (~150 km)
References

