



# **Météo-France seasonal forecast system 5 versus system 4**

## **Robust scores**

June 2015

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## 1. Introduction

Météo-France system 4 has been introduced in the EUROSIP multimodel in January 2013, based on the CNRM-CM5 coupled model (Voltaire et al., 2013), but GELATO sea-ice model (Salas y Méliá, 2002) being replaced by a climatological sea-ice and SURFEX model replaced by ISBA. These modifications were made to improve the memory management and computing distribution on the IBM computer at ECMWF. Their impact on the scores (except the sea-ice extent) was negligible. In early 2015, a new system was introduced with an increased resolution (t1255191 instead of t1127131), the latest version of SURFEX (Masson et al., 2013) and GELATO, a new cycle of ARPEGE-IFS (cy37t1 instead of cy32t0), and a stochastic perturbation method (Batté and Déqué, 2012). The new system is 24 times more expensive in computation time.

A set of hindcasts is available, but the homogeneous period starts in 1993 with PSI2G2 ocean reanalyses from Mercator-Ocean. These hindcasts consist of 15 members, and cover the 12 calendar months.

In order to evaluate with more accuracy the quality of the two systems, a new series of hindcasts has been produced with a longer period (1979-2012) and NEMOVAR ocean reanalyses. Only 4 start dates are considered (as in SPECS European project). These dates are the 1<sup>st</sup> of February, May, August and November. From month 1 to 4 of the forecast, 51 members have been generated (as in the real-time forecasts). For month 5, 6 and 7, most scores are close to zero, except for ENSO<sup>1</sup>, so only 15 members have been produced, because the Nino3.4 correlation is little sensitive to ensemble size beyond 10 members.

## 2. ENSO Scores

Figure 1 shows for the 4 starting dates the time correlation base on 34 years of the SST in the Nino 3.4 box ( 5°S-5°N by 170°W-120°W). There is no doubt that system 5 is an improvement.

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<sup>1</sup> This is also true for the tropical stratospheric wind and the sea ice extent, but this is not applicable here because system 4 does not include sea-ice and stratosphere modeling

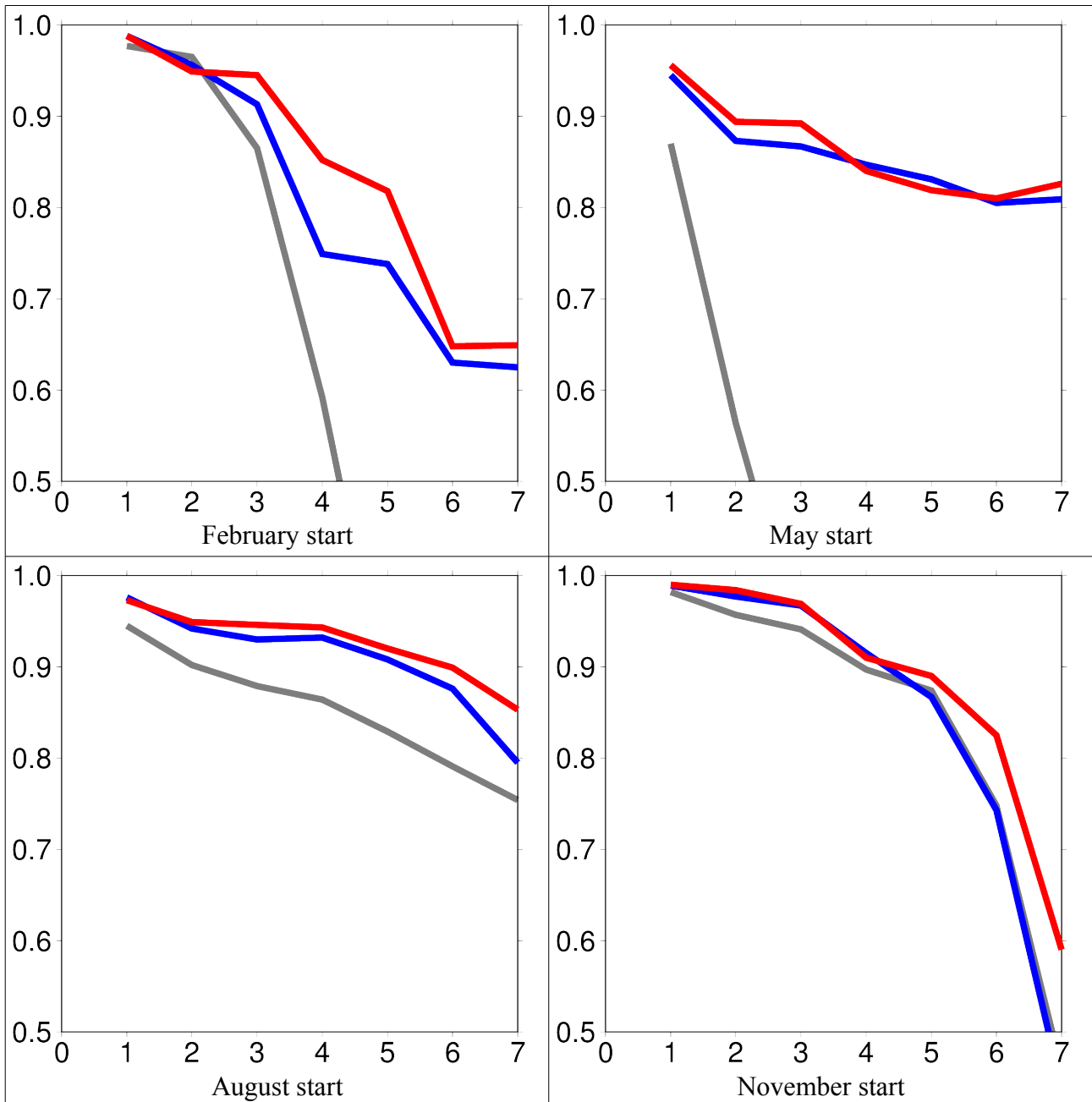


Figure 1: Nino 3.4 monthly correlation for the 4 starting dates: persistence of the mean previous month (grey), system 4 (blue) and system 5 (red)

### 3. Anomaly correlations

Table 1 shows the mean Anomaly correlation for precipitation (PREC), 500 hPa height (Z500) and surface temperature (TSUR) in 3 large domains: North Hemisphere (NH, 90°N-30°N), Inter-Tropics (IT, 30°N-30°S) and southern hemisphere (SH, 30°S-90°S). The four starting dates are considered, and the seasonal mean month 2 to 4 is calculated before applying the scores. It is not possible to claim that one system is superior to the other, based on these scores.

		MAM		JJA		SON		DJF	
		S4	S5	S4	S5	S4	S5	S4	S5
NH	PREC	0.17	0.18	0.06	0.08	0.08	0.09	0.21	0.21
	Z500	0.27	0.26	0.18	0.20	0.18	0.17	0.32	0.33
	TSUR	0.36	0.39	0.31	0.32	0.34	0.40	0.28	0.32
IT	PREC	0.47	0.50	0.46	0.43	0.49	0.49	0.57	0.56
	Z500	0.63	0.66	0.55	0.56	0.52	0.52	0.66	0.68
	TSUR	0.49	0.50	0.52	0.53	0.54	0.55	0.52	0.54
SH	PREC	0.18	0.20	0.16	0.18	0.20	0.23	0.18	0.21
	Z500	0.31	0.29	0.29	0.29	0.41	0.43	0.35	0.34
	TSUR	0.33	0.33	0.23	0.24	0.28	0.28	0.32	0.29

Table 1: mean anomaly correlation: system 4 (S4) vs system 5 (S5)

## 4. Circulation indices

We restrict here to DJF hindcasts, and consider 3 indices:

- NAO: spatial average 90°W-60°W/20°N-55°N minus 90°W-60°E/55°N-90°N
- NAM: spatial average 34°N-36°N minus 64°N-66°N
- SAM: spatial average 39°S-41°S minus 64°S-66°S

These indices are calculated for both 500 hPa height and mean sea level pressure, as the indices convey a different information when one field is used or the other. Traditionally, NAO is calculated by projecting Z500 on the first EOF of this field restricted to the North Atlantic-Europe domain, the EOF being calculated with low-pass filtered daily reanalyses. Block averages as used here are more convenient for model inter comparison.

	Z500		PMSL	
	S4	S5	S4	S5
NAO	0.43	0.50	0.33	0.38
NAM	0.52	0.41	0.28	0.46
SAM	0.33	0.51	0.50	0.44

Table 2: correlation coefficients for DJF circulation indices

## 5. References

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