PREFACE Milestone Report

Milestone#: MS26

Milestone name: Remote biases in existing simulations and proposed sensitivity experiments

WP#: WP8

Lead beneficiary: UNN

Delivery date from annex I: 31.10.2014

Milestone achieved: YES (list of proposed experiments provided in Jan 2015)

Comments:

We took advantage of the Nansen Tutu summer school in Cape Town, December 2014 to better discuss the milestone. Below is a short description of work performed and/or results achieved.

WP8 is dedicated to assess to what extent Tropical Atlantic model systematic errors can be understood in isolation of remotes errors, including land interaction. Special attention will be given for the Atlantic-Pacific Niños connection.

To this aim, the problem is tackled from a global perspective, trying to infer the role of the different variability patterns on the Atlantic bias but also how the Atlantic can act on remote regions.

Different analysis has been done to infer the role of the Multidecadal SST modes in the Atlantic and in its connection to the Pacific. CMIP5 simulations from CMIP5 have been also analysed.

1. On the one hand, different background states in the ocean produce different interannual variability patterns. In this way, in the tropical Atlantic, it has been demonstrated how during negative phases of the AMO, two modes of variability, with anomalies in the equatorial Atlantic emerge (Figure 1). This has been demonstrated using observations, CMIP5 simulations and ocean models. The reliability found under negative AMO phase indicates how CMIP5 models can have some skill in reproducing Atlantic interannual variability.
2. Also, under negative phases of the AMO, the Atlantic Niño is connected to the Pacific La Niña and vice-versa, showing a strong anticorrelation. Some CMIP5 models also reproduce this connection (Figure 2). It can be inferred how, under a warming of the southern hemisphere ocean in comparison with the northern one, the global teleconnection changes: the Atlantic Niño has a different impact in the Atlantic. This is represented in the CMIP5 modes.

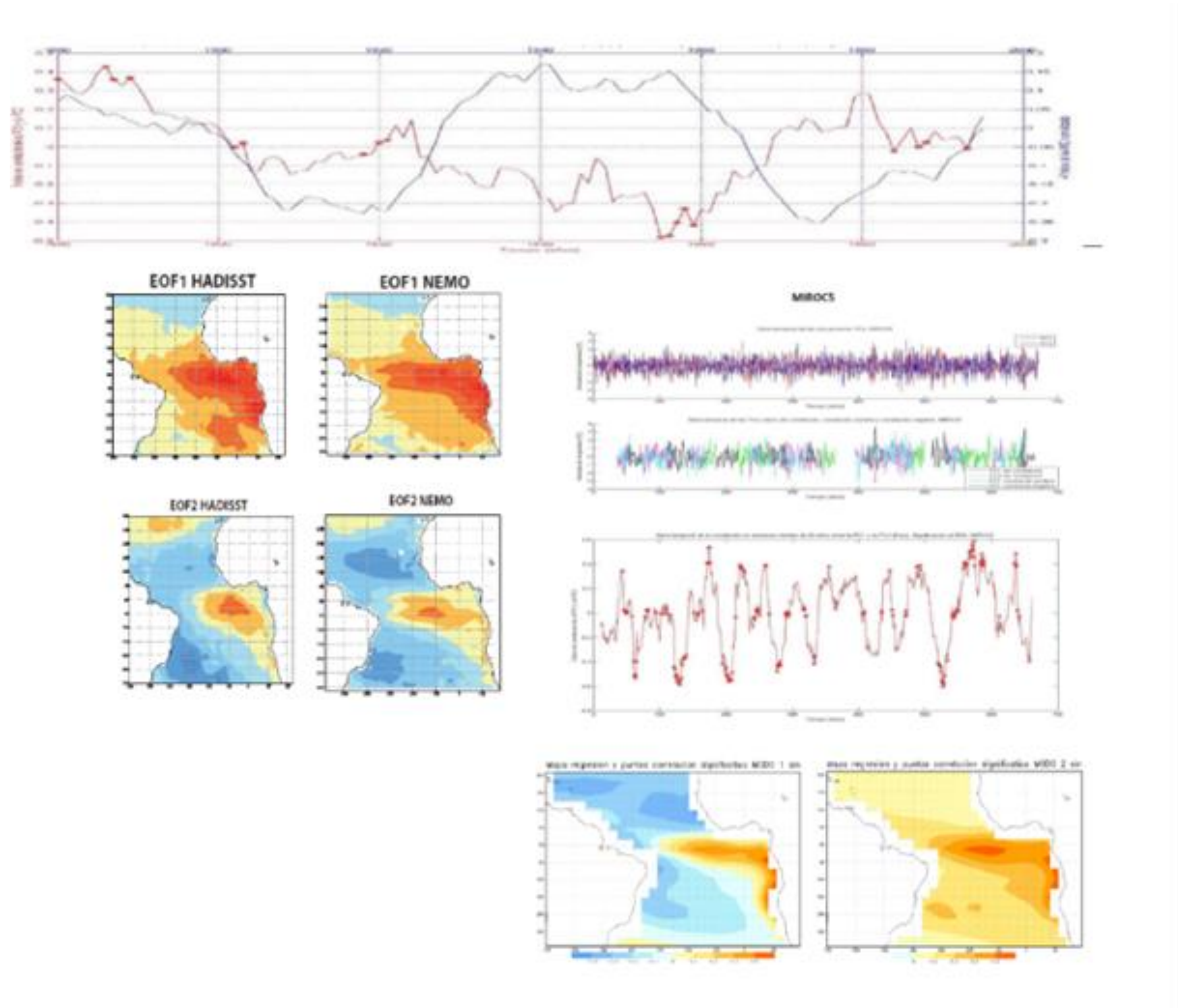

Figure 1: moving correlation between the leading and second EOF of the interannual Atlantic SSTs (top), Spatial pattern of each EOF in the periods in which they are well separated (central, left) for observations (HADSST) and model (NEMO) simulation with interannual winds) and an example of a CMIP5 model that reproduces these two modes (bottom).

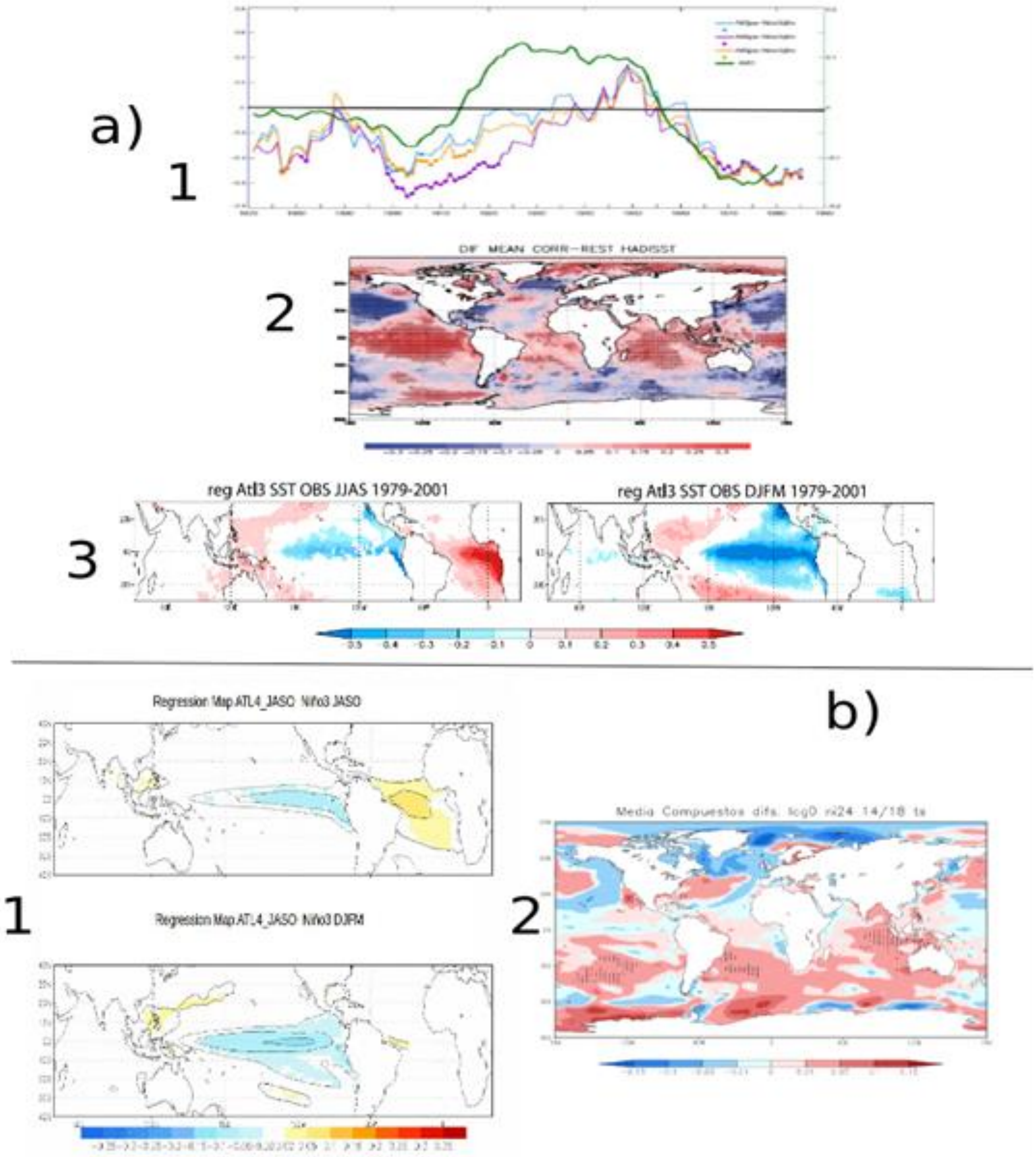

Figure 2: a) Moving correlation between the Atl3(cyan) ,Atl4 (magenta) and Atl5 (yellow) index in JAS and the Niño3 index in DJF, together with the Atlantic Multidecadal Oscillation (AMO) index. The correlation map between the correlation curve in the top and the anomalous SSTs is shown below and also the SST maps in JJAS during Atlantic Niños years in AMO negative periods and in the next winter. **b.1)** same as **a.3)** but for the CMIP5 multimodel ensemble**. b.2)** same as **a.2)** but for the CMIP5 multimodel ensemble.

The influence of the Atlantic on the Pacific is going to be analysed using partially coupled simulations. Most of the studies put forward that a great part of the bias come from the atmosphere so, in PREFACE, coordinated experiments are going to be done in this way:

1. Define sensitivity experiments in which the background in the Atlantic and in the other basins is controlled by flux correction. This will allow the variability to be simulated. Two possibilities exist for the experimental configuration:
    a. To apply corrections to momentum and perhaps also wind speeds used to compute the turbulent fluxes
    b. To apply a full corrections to heat and momentum.

The flux correction will have a fixed seasonal cycle.

2. Perform experiments in which the flux corrections are switched off in different regions to assess the impact of the mean state changes on the other regions. Locally we will also be able to study the impact of the corrections on the variability.

The models to be used will be NorESM and UCLA.

This milestone contributes to WP8.