Regional climate simulations over Africa and India using the new Regional Climate Model RegCM4

Laura Mariotti (1), Filippo Giorgi (1)

(1)The Abdus Salam International Centre for Theoretical Physics, Earth System Physics, Trieste, Italy

Email: mariotti@ictp.it

ABSTRACT

We present the new regional climate simulations over Africa and India made with the latest version of the Regional Climate Model RegCM4 developed in ICTP of Trieste (Giorgi et al, 2011).
We completed two simulations at 50 km of resolution and the ERA- Interim boundary conditions were used from 1990 up to 2009. With this new version of the model it is possible to use different convection scheme over the ocean and over land, this combination has been used for the Africa domain, where we used Grell scheme over land and MIT-Emanuel over ocean, to be able to have a better representation of the ITCZ for its position and strength. We analyzed two seasons: April-May-June-July-August-September (A-S) and October-November-December-January-February (O-F). The rainy season over West Africa (Guinea coast and Sahel) shows a bigger improvement when the double scheme is used. For the India we used Grell scheme everywhere but with different convection parameters over land and over ocean to reduce the precipitation bias over the Indian Ocean.
The model shows a slightly cold bias for the African domain for all the two seasons. The precipitation spatial patters and intensity is reasonably represented for all the seasons with a wet bias over Sahel and Guinea coast and a dry bias over the Congo basin during A-S. The monsoon precipitation over the Indian continent is reasonably represented and a higher bias is observed over the coastline during A-S . The model shows a slightly cold bias for the JJA season always over the continent.

AFRICA

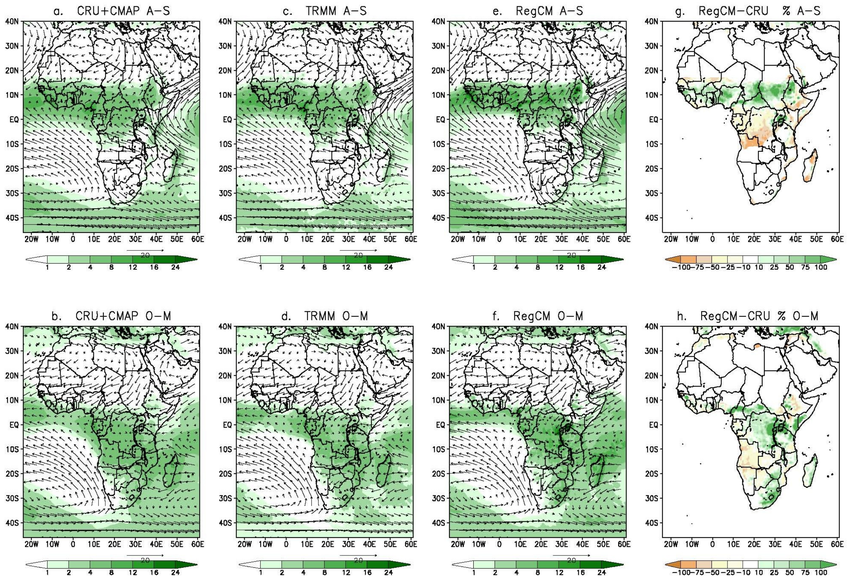

Figure 1. Mean precipitation (mm/day) and low level wind (m/s) over the African domain in the CRU+CMAP (**a**,**b**) and TRMM (**c**,**d**) observations, as well as RegCM4 simulation (**e**,**f**). Panels **g** and **h** show the mean bias between simulated and observed CRU precipitation. Top panels are for A-S, bottom panels are for O-M. In **a**,**b** CRU observations are used over land and CMAP observations over ocean. Observed winds are taken from the ERA-Interim reanalysis.

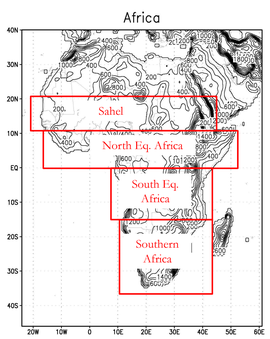

Figure 2. Domain and topography (m) for Africa, and definition of four sub-regions used for regional analysis.

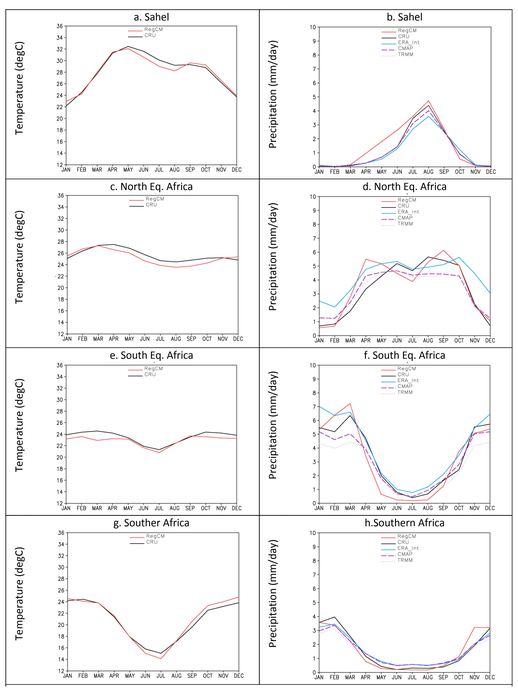

Figure 3. Annual cycles of observed and simulated temperature (°C) and precipitation (mm/day) over the four African sub-regions of Figure 2.

INDIA

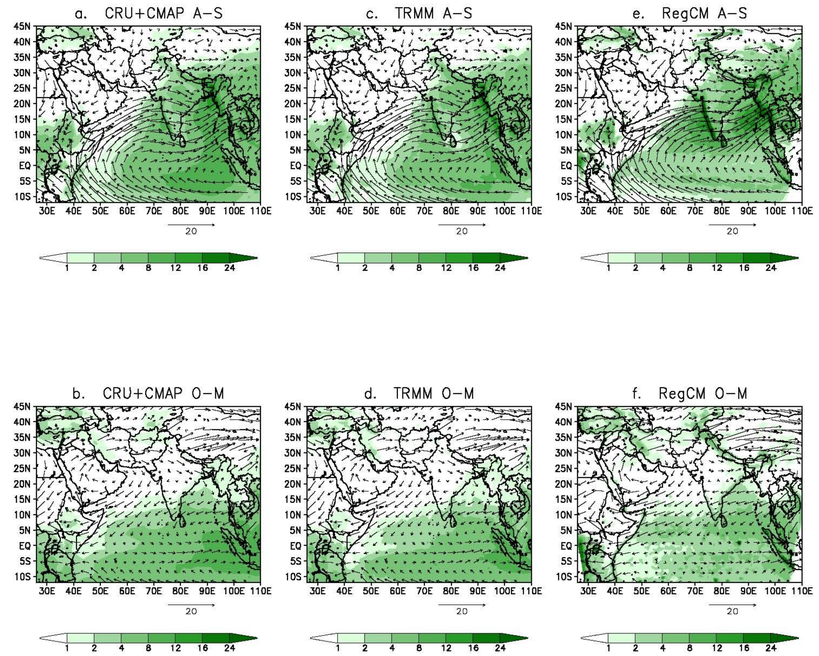

Figure 4. Mean precipitation (mm/day) and low level wind (m/s) over the India domain in the CRU+CMAP (**a**,**b**) and TRMM (**c**,**d**) observations, as well as RegCM4 simulation (**e**,**f**). Top panels are for A-S, bottom panels are for O-M. In **a**,**b** CRU observations are used over land and CMAP observations over ocean. Observed winds are taken from the ERA-Interim reanalysis.

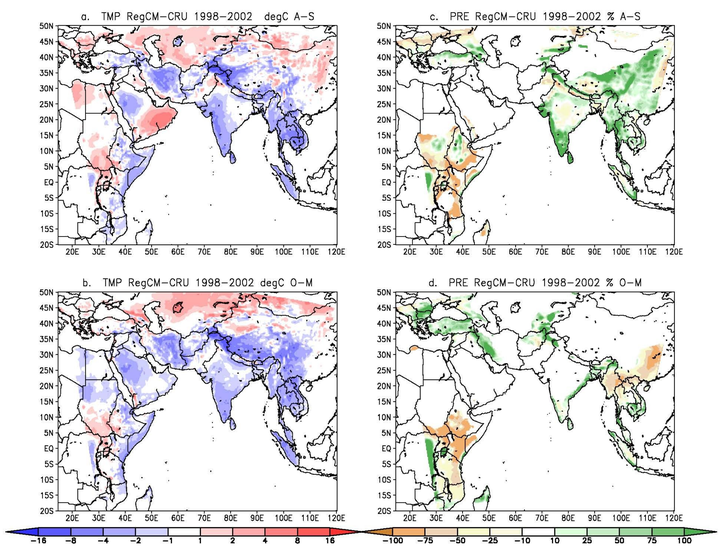

Figure 5. Bias of the Temperature (°C) (panels **a** and **b**) and bias of the Precipitation (%) (panels **c** and **d**) for the model RegCM4 compare with CRU for the two seasons A-S and O-M.