HighNoon Delivery Report

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To complete by the Coordinator

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This report relates to the provision of an 'updated dataset of climate projections' to the HighNoon consortium, The updated data refers to climate simulations performed with an improved version of the Hadley RCM and the bias correction of data for the ECHAM5 and ERA-Interim climate runs. These data have been made available on the ftp site at various times up until July 2011.

Updated Hadley Centre RCM:

The Hadley Centre RCM was updated with the MOSES 2.2 land surface scheme. The MOSES 2.2 scheme represents sub-grid heterogeneity. Therefore, a 25km gridbox includes a fraction of 9 new different surface types (Table 1). The inclusion of the updated scheme also requires new soil and land-cover ancillaries. Therefore any change in model performance may not just be a function of improved physics.

Surface Types
Needle leaf trees
Broadleaf trees
C3 (temperate) grass
C4 (tropical) grass
Shrubs
Urban
Inland water
Bare soil
Ice

Table 1 Surface types in MOSES2

The MOSES 2.2 scheme not only affects the simulated climate by changing the surface exchange but provides more detailed information for impacts assessments. A particular improvement is the inclusion of subgrid heterogeneity in infiltration, this gives a better representation of the processes relating to fast and slow runoff in a more physically realistic way than is included in many

hydrological impacts models. Other improvements include the ability to look at changes in plant productivity that may be used as a measure of potential changes in agricultural productivity.

As the improved scheme better represents the surface exchange there is an expected change in the simulated climate (Figure 1). MOSES 2 reduces the annual precipitation and the mean annual temperature. The MOSES 2 in general simulates an improved climate over MOSES I.

Mean difference in annual total precipitation
moses 2 − moses 1

Mean difference in annual temperature
moses 2 − moses 1

−10 −5 −2 −1 −0.5 0 0.5 1 2 5 10

−6 −4 −2 −1 0 1 2 4

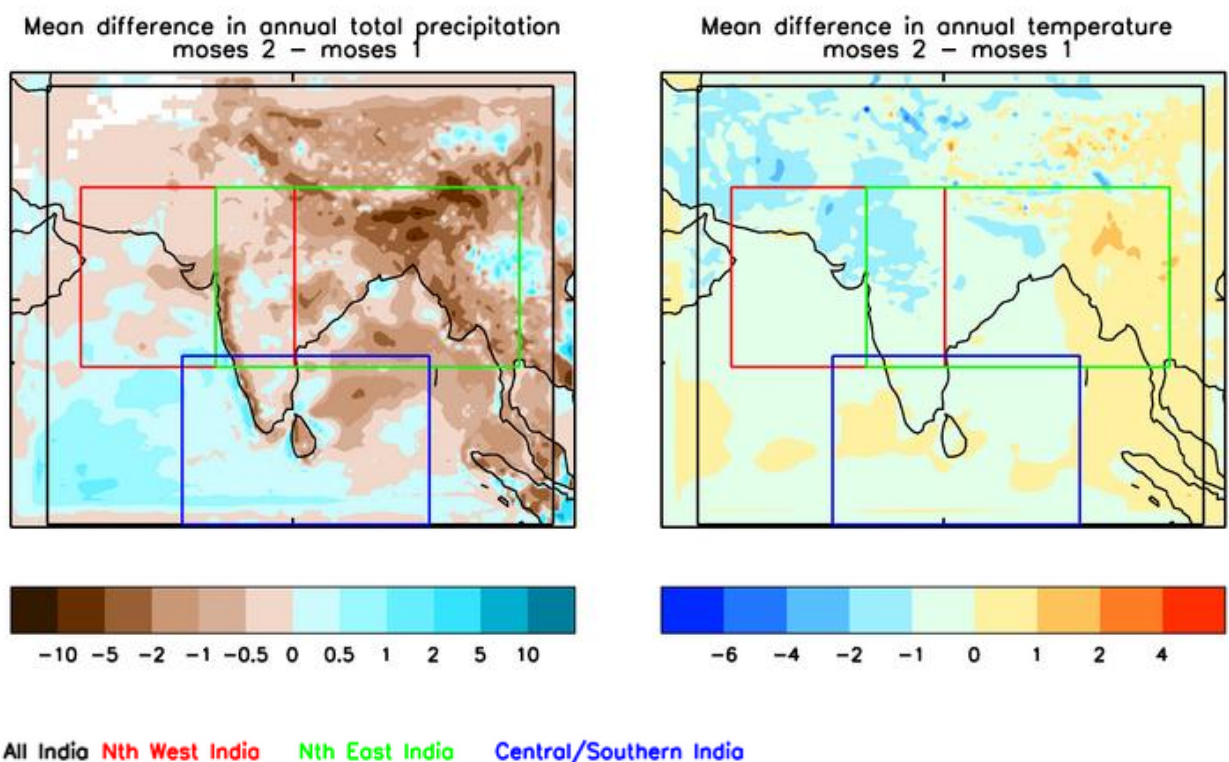All India Nth West India   Nth East India   Central/Southern India

Figure 1 shows the mean difference between MOSES1 and MOSES2 in annual precipitation (left) and temperature (right). In the analysis (Section 5) India is divided into subregions, the different coloured boxes show the subregions used.

The improvement to the Hadley RCM was made at the start of the project (and is partly responsible for the initial delays) and therefore all data made available to the project has included the updated scheme.

Bias Correction:

As requested from WP2 bias correction of daily temperature and precipitation variables have been made for the ECHAM5 and ERA-Interim simulations. It has not been possibly to bias correct the HadCM3 data due to the 360-day calendar. The datasets used for the bias corrections are shown in Table 2. It should be noted that there is considerable uncertainty in these data which should be taken into account when using these data. The bias corrected data are available on the ftp site.

Table 2: Bias Correction

Model	Forcing	Observation data		Period
		Precipitation	2m Temperature	
REMO (0.25x0.25)	ERA-Int	APHRODITE (0.25x0.25)	-	1989-2004
REMO (0.25x0.25)	ECHAM	APHRODITE (0.25x0.25)	WATCH (0.5x0.5)	1970-2100
HadRM3	ECHAM	APHRODITE (0.25x0.25)	WATCH (0.5x0.5)	1970-2100

The methodology applied is able to remove a significant amount of the spatial bias in precipitation (Figure 2) as well as the seasonal bias (Figure 3).
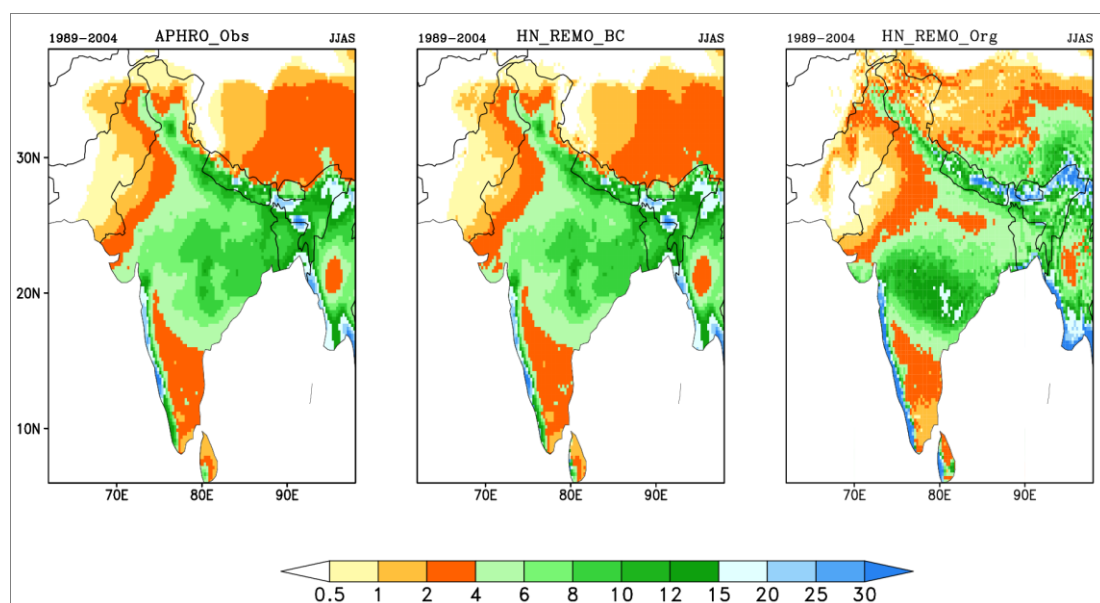

Figure-2: Spatial pattern of mean JJAS monsoon precipitation over HighNoon domain (i) Left panel depict the observed data (APHRODITE, Japan), (ii) middle panel depicts the REMO bias corrected

data and (iiii) right panel depicts the original REMO simulated data, for the period 1989-2004.
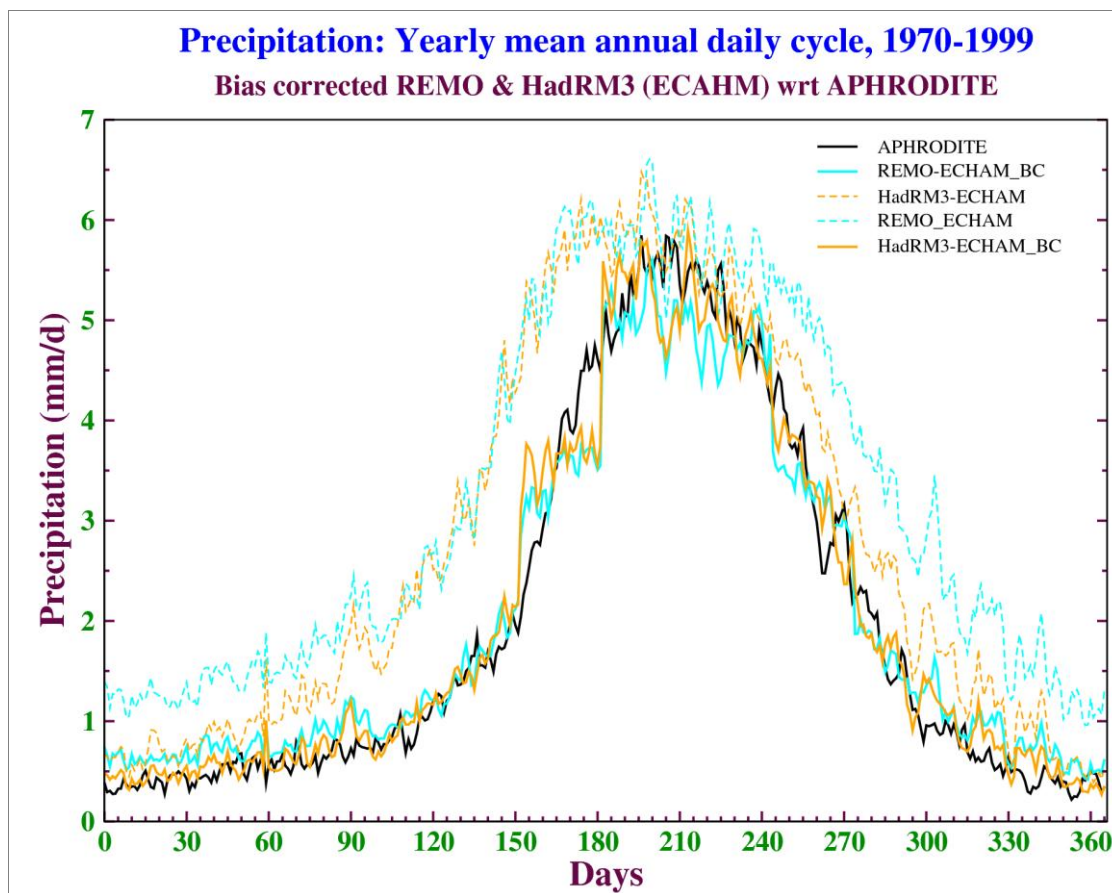

Figure-3: Annual mean daily cycle of precipitation (mm/d) for RCM bias corrected data (solid line) w.r.t. APHRODITE and original RCM data (dash line), for the period 1970-1999.

Similar improvements are seen for the bias corrected Temperature data (Figure 4).
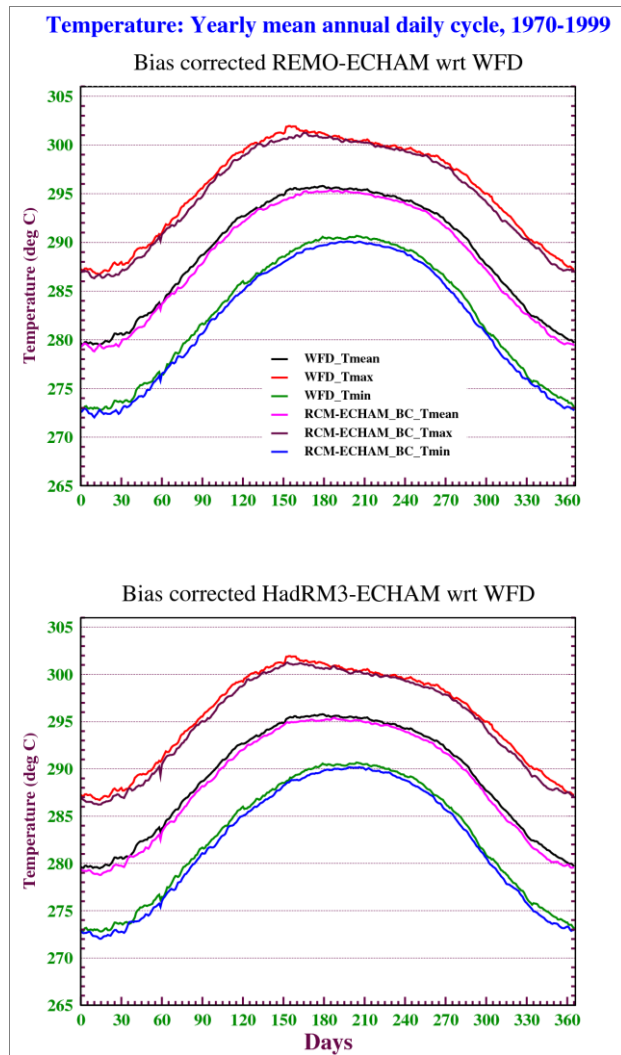
Figure-4: Annual mean daily cycle of temperature (^{0}C) for RCM bias corrected data (solid line) w.r.t. WFD and original RCM data (dash line), for the period 1970-1999.

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