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Evaluating the Met Office Unified Model simulated land surface temperature (LST) in northwest India

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Surface temperature biases in northwest India in the Met Office Unified Model (UM) show significant heterogeneity with distinct regions of warm and cold biases. This work will show verification of model biases through ground-based, *in-situ* airborne and satellite observations during the Interaction of Convective Organisation and Monsoon Precipitation, Atmosphere, Surface and Sea (INCOMPASS) campaign in northern India between May - July 2016. The INCOMPASS project is part of the "Drivers of Variability" which is a programme funded jointly by Natural Environment Research Council (NERC), the Newton fund, Indian Ministry of Earth Sciences (MoES) National Monsoon Mission, and the Met Office.

MODIS climatological data and near-real time retrievals have been used to investigate the spatial biases in LST and how they correlate with model surface cover. The surface temperature biases (both warm and cold biases) in the INCOMPASS 4.4 km south Asia limited area domain are more dominant in June than May; the May MODIS climatology comparison showed the cold bias was most dominant between 72 and 75 ^{o}E, and in the June climatology comparison the cold bias had extended to almost 80 ^{o}E. The spatial distribution and magnitude of surface temperature biases and how they correlate with surface vegetation cover in the northwest region was investigated for a number of sub-regions. Region 1 (25 to 26 ^{o}N) was found to have the largest mean cold surface temperature bias and a strong correlation coefficients between the surface temperature biases and the IGBP vegetation fractional cover dataset with R^2 of 0.81 (bare soil) and 0.72 (grasses). This is further supported by the strong positive correlation coefficients between the bare soil cover fraction and the cold surface temperature bias between the INCOMPASS 4.4km model and MODIS climatology for both May and June.

It will be shown that regions with warm surface temperature bias in northwest India are not strongly correlated to surface cover fractions; two prominent regions of warm surface temperature biases have been identified i) arid regions between 27 and 29 ^{o}N associated with bare soil fractions greater than 85 % and ii) Ganges basin region between 29 and 30 ^{o}N.

Finally, the response of soil moisture to the land surface temperature biases will be investigated. The UM operationally uses satellite derived soil moisture in its NWP system; the ASCAT soil moisture product has been used to explore the representation of soil moisture in order to investigate how well the UM captures the seasonal dry down in soil moisture prior to the onset of the India monsoon season.