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An investigation of the bias in the median track of Monsoon Low Pressure Systems over the Indian subcontinent in CESM1.2.2 simulations

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Monsoon low pressure systems (LPS) are synoptic scale tropical disturbances that form in the Indian subcontinent over the quasi-stationary monsoon trough axis during the monsoon period (June to September). In a recent study, we showed that 60-70% of monsoon rainfall and 78% of extreme precipitation events in India are associated with LPS. Global circulation models (GCMs) have been used to understand the behavior of tropical disturbances in the past. It has been found that model resolution plays a key role in simulating the climatology of tropical storms, with finer resolution (of the order of 20-100km) required to better represent the genesis and propagation of these storms. As GCMs can be run at these finer resolutions today, various characteristics of LPS in the Indian subcontinent can be studied. It has been found that most CMIP5 GCMs show a southward latitudinal shift in the monsoon trough location and hence in the LPS tracks and associated characteristics. This shift has been attributed to a weaker simulated meridional tropospheric temperature gradient (MTG) in the models. However, the cause of weaker MTG in models is not known. In this study, we investigate the reason for the weaker MTG and hence the southward latitudinal shift of LPS tracks in the Climate Earth System Model (CESM1.2.2). A present-day control simulation is performed at 0.9°×1.25° horizontal resolution, and output is saved at 6-hourly intervals for LPS track analysis. We find that CESM is capable of simulating the general behavior of monsoon over the Indian subcontinent in terms of seasonality, propagation of monsoon rainfall, and mean monsoon winds. LPS are tracked in the CESM outputs by our recently proposed Automated Tracking Algorithm using Geopotential Criteria (ATAGC). A southward latitudinal shift is observed in the median track of LPS in CESM present-day simulations. The value of MTG is also significantly smaller compared to the observed MTG. The results from investigations on the likely causes for the weaker MTG in CESM will be presented at the meeting.