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# Impacts on the regional climate modeling and improvements of modern land surface model over the Tibet Plateau

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Three WRF dynamical downscaling simulations were designed and conducted with two different GCM forcings and two land-surface schemes (Noah versus Noah-MP). Two of them used the same forcing (ERA) and two of them shared the same land-surface model physics (Noah-MP). Simulated surface air temperature and precipitation were assessed in terms of seasonal and annual mean Climatology, and spatial characteristics and linear trends over the TP for the period 1980-2005. Major findings are summarized in the following: 1) A common cold and wet bias exists in all three simulations regardless the type of large-scale forcing or land-surface model being used. This is especially true in the western TP during the cold season, indicating that the WRF model is still deficient in capturing cold-season processes at high elevations. However, such biases in DDM were greatly constrained compared to these in forcing GCM. The land-surface model impacts the surface air temperature and precipitation climatology and spatial distribution significantly more than the large -scale forcing. Large-scale forcing has more influence on the trends rather than on the spatial characteristics in DDM. 2) The land-surface model affects precipitation over the TP through including the surface heating differential over the TP. The heating differential caused surface heat fluxes differences resulting in a stronger or weaker upward vertical motion and divergence (convergence) at upper (low) levels. This in turn brings different moist air from the ocean.