

Improvements in snow processes in research and operational models

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Snow is one of the most crucial land surface processes over mid- and high latitudes. A widely-known deficiency of the Noah land model as used in the NCEP operational models and the WRF at the NCAR is that snowmelt occurs much too early. Six deficiencies in Noah model physics are identified along with improved formulations. These revisions significantly improve all snow processes in Noah offline model, such as snow water equivalent, snow depth and sensible and latent heat fluxes over these two forest sites. The revisions were also evaluated (without any tunings) with an independent forest site and a grassland site, further confirming the robust and positive impacts of these revisions on Noah snow simulations. These modifications have also been implemented into NCAR WRF and NCEP Global Forecast System (GFS). The impacts of the improvements on snow simulations will also be presented using extensive in situ and remote sensing data.