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Offline validation of a multi-layer snow scheme for a new land surface model in the operational regional NWP Model at JMA

H. Kusabiraki

Japan Meteorological Agency, Japan (hiro.kusabiraki@met.kishou.go.jp)

While importance of parameterization of land surface processes and consideration of surface heterogeneities is well recognized in longer-term weather or climate forecasts, they also strongly affect performance of mesoscale models because it drives development of mixed layer, sometimes leading to initiation of convection which is one of the main targets in the mesoscale models.
The Japan Meteorological Agency (JMA) operates the Meso-Scale Model (MSM) with a horizontal grid size of 5 km with a very simple surface scheme. Especially, treatment of snow cover is very simplified: referring to snow coverage given by initial conditions, parameters related to the surface temperature forecast (e.g. heat conductivity) are replaced with prescribed ones typical to new snow, and they stay unchanged until the end of the MSM forecasts because the current surface scheme does not deal with snow accumulation or ablation. However, the simple scheme could degrade the model performance because existence of snow can dramatically change energy balance and fluxes at the surface.
With the aim of offering more realistic surface fluxes to the atmospheric model by simulating better land state, a new land surface scheme has been developed. Multi layer snowpack model is employed for the snow process in this scheme. Originally snow albed was supposed to depend on temperature and time, but snow melting was too delayed compared to observation, which can be confirmed through a test case given by SnowMIP2 (the Snow Models Intercomparison Project-2). To reduce the bias, an alternative scheme depending on a snow grain size was attempted and it has been revealed that the newly simulated albedo is in better agreement with observation, and time series of snow amount in its melting stage is better predicted.
We will show description and performance of this new land surface scheme as well as a tiling strategy, and discuss future plans.