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Effect of satellite soil moisture initialization on WRF simulated summer precipitation in Central Europe

Hajnalka Breuer and Júlia Göndöcs
Eötvös Loránd University, Department of Meteorology, Budapest, Hungary

Soil moisture is an integral part of the surface energy budget as it controls the latent heat release of surface into the boundary layer. The buoyancy from sensible flux and moisture from evapotranspiration can create favourable conditions for local convective precipitation and can fuel frontal and convergence line precipitation systems during summer. Also through sensible heat flux the near surface temperature is also affected. Thus the proper soil moisture initialization can be an important factor in summer weather forecast.

Since the soil moisture became an essential climate variable in 2010, the ESA also began to focus on its global monitoring and began compiling the previous satellite observed soil moisture. Nowadays, almost ready to use daily surface soil moisture observations are available.

In our study the GFS soil moisture initial data is replaced by the ESA soil moisture observations to assess its effect on WRF simulated near surface conditions and precipitation. Since the coupling between the land-surface and the atmosphere is stronger in summer, simulation were created between April 1 and September 30. Our region of interest is Central Europe (with 25 km resolution) and mainly the Carpathian Basin (with 5 km resolution). Both the lack of soil moisture and the surplus of it can create extreme conditions therefore two years were chosen for analysis: a) 2010, when the summer precipitation in Hungary was about twice as much as the climate norm, b) 2012, when in August the precipitation amounted to only the 15% of the norm and on average the other months lacked 10% of the precipitation.