Improving surface representation and consequences in NWP forecast

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The fields that describe surface properties, from terrain height to vegetation types can have substantial impact on NWP model forecast, especially on the model variables close to the surface. These fields can be computed from different databases. Higher resolution of the terrain height database and higher quality of input data leads to a better representation of the terrain height and other surface fields, especially as NWP models move to a higher resolution. Here we use ALARO configuration of the ALADIN System with TOUCANS turbulence scheme (prognostic TKE) with nonhydrostatic dynamics in 2km resolution over Croatia. The model domain contains Dinaric Alps mountains and Adriatic sea. The existing operational NWP application uses fields from an old database that is insufficient to properly describe the surface in 2km grid spacing. The fields describing topography, such as terrain height, land sea mask, subgrid terrain variability including surface roughness are computed from a new database in substantially higher resolution. The new fields describing the surface characteristics are more realistic, but also substantially different from the fields used before. However, the model, including the turbulence parametrisation, was tuned using the old database. Therefore, the subsequent model forecast was not automatically improved when the fields from the new database were used. Tuning only one parameter in a scheme is substantial work, but tuning the whole model with a large number of tuning parameters is daunting. Therefore, the computation of surface roughness and other parameters was tuned in order to improve the 10m wind forecast. Decreased surface roughness does not always lead to higher surface wind speeds and vice versa.