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three-dimensional fog forecast with COSMO-FOG

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The presence of fog and low clouds in the lower atmosphere can have a critical impact on both airborne and ground transports and is often connected with serious accidents. However, reliable fog and visibility forecasts stay challenging issue. Fog is generally a small scale phenomenon which is mostly affected by local advective transport, radiation, topography, vegetation, turbulent mixing at the surface as well as its microphysical structure. In order to consider these intertwined processes, the three-dimensional fog forecast model, COSMO-FOG, with a high vertical resolution with different microphysical complexity has been developed. This model includes a microphysical parameterisation based on the one-dimensional fog forecast model. The implementation of the cloud water droplets as a new prognostic variable allows a detailed definition of the sedimentation processes and the variations in visibility. Moreover, the turbulence scheme, based on a Mellor-Yamada 2.5 order and a closure of a 2nd order has been modified to improve the model behaviour in case of a stable atmosphere structure, occurring typically during night radiative fog episodes.
The potential of COSMO-FOG will be presented in some realistic fog situations (flat, bumpy and complex terrain). The fog spatial extension will be compared with MSG satellite products for fog and low cloud. The interplays between dynamical, thermodynamical patterns and the soil-atmosphere interactions will be presented.