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Nocturnal surface thermal inversions in the Pannonian Basin

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The nocturnal boundary layer over land in clear nights is usually characterized by the formation of a surface-rooted thermal inversion, growing in height with time and conditioned by the presence of low-level jets, typically of baroclinic origin, mostly topographic. Very often, if the surface cooling is intense and the winds are not too strong, there is a first strong inversion in the first meters above the surface with a weaker inversion above it.

The study of several episodes of surface thermal inversions is made here for an extended observational period during two summer months of 2015 at the aerodrome of Szeged, very close to the special Upper Air Observatory of the Hungarian Meteorological Service. Extended measurements of the atmosphere-surface interface were made, and advantage is taken of the operational radiosonde and of troposferic wind and temperature profiles. Besides, during two weeks in July extra soundings with tethered balloons and multicopter drones were made, that allow for detailed observation of the evolution of the temperature profile in the first 150 m above the surface.

In this talk three intensive observation periods (IOPs) are described. IOP2 describes the evolution of a weak surface inversion in presence of broken clouds, IOP3 had clear skies and moderate winds, allowing for a good case of growing inversion along the night, with a calm morning transition. Finally IOP4 shows a very well defined case of almost clear-skies calm evening transition and a good development of a two-layer inversion, strong and shallow close to the ground and weaker above.

These three IOPs allow for a good experimental study of three typical cases, focusing on the evolution near the surface by means of the surface energy budget and a refined temperature profile near the ground, supplemented by the outputs of the ECMWF model for these cases for assessment of the model performance.