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Retrieval of Fog/Low Stratus Microphysical Properties at Night with MSG/SEVIRI – A Comparison of Two Radiative Transport Models: Streamer and libRadtran

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Fog and low stratus (FLS) impact on traffic safety and air quality; knowledge of the FLS distribution in time and space therefore is of great value. A new algorithm is developed to detect fog and low stratus with MSG/SEVIRI data at night.
An essential component of this study needed for the discrimination between elevated and ground fog is the derivation of microphysical properties of low clouds. A radiative transfer model is used to model optical and microphysical properties (optical thickness, effective droplet radius and liquid water path) to create a lookup table for the operational algorithm.
To find a suitable radiative transfer model for this study, two models are compared: Streamer and libRadtran.
Streamer is a radiative transfer model that can be used for a wide variety of atmospheric and surface conditions. The computing time is relatively short and it is easy to handle, but the MSG/SEVIRI channels are represented only coarsely by the radiative transfer codeś bands. Absorption effects may lead to inaccuracies in infrared channels. Streamer has got two radiative transfer solvers. LibRadtran is a library of radiative transfer routines and programs. The central program can be used as a tool for the simulation of instrument signals. It has got eight radiative transfer solvers. There are four different methods given for the spectral calculations, depending on the time and the purpose of the calculation is used for.
For both radiative transfer models, all infrared channels except the water vapour channels are used and the optical thickness, effective droplet radius, surface temperature and the satellite zenith angle are varied.
The aim of this study is to find out which radiative transfer model is most useful for the retrieval of FLS microphysics. Output from both radiative transfer models is presented and compared. The implementation in FLS property retrieval is shown and discussed.