The Assimilation of Cloudy Infrared Radiances in the HIRLAM Model: Initial Experiences

Martin Stengel, Per Dahlgren, Magnus Lindskog, Per Unden, and Nils Gustafsson

Efforts have been made at SMHI to examine the utilisation of measured infrared radiances in the presence of clouds in the limited-area numerical weather prediction model HIRLAM. Since a certain portion of observations are located in cloudy areas, many observations are rejected in the first place. We have started to investigate under which circumstances observations in cloudy conditions could be used. A first strategy focuses on low level clouds. Here, the assimilation of infrared sounding channels seems to be less problematic, as far as their sensitivity to the cloud layers is negligible. Nevertheless, the filtering of those cases relies on the information about the vertical location of the clouds. This can possible be optimized when providing more accurate information to keep as many useful observations as possible. Next to a fixed cloud top pressure (CTP) limit, the comparison of the derived CTP and the local Jacobians at observation point could be more effective as criteria in this context to identify such not-radiance-affecting clouds. Additionally, we consider clouds, whose effect on the radiance is small, which can possibly be parameterized properly in the observation operator by a simple cloud assumption. First assimilation experiments, using SEVIRI's water vapour channels, have been carried out and initial results will be shown. Furthermore, we investigate the feasibility to extend the observation operator to include a simplified moist physics scheme. This framework can also be used to determine the sensitivity of modelled clouds (and subsequent simulated cloudy radiances) to the model variables. Under certain conditions, this could then be used to assimilate cloud-affected infrared radiances. Statistics of these modelled clouds in NWP model space and in observation space, as well as the sensitivity of simulated cloudy radiances will be discussed. Preliminary 1D-Var studies are currently being conducted and will be presented.

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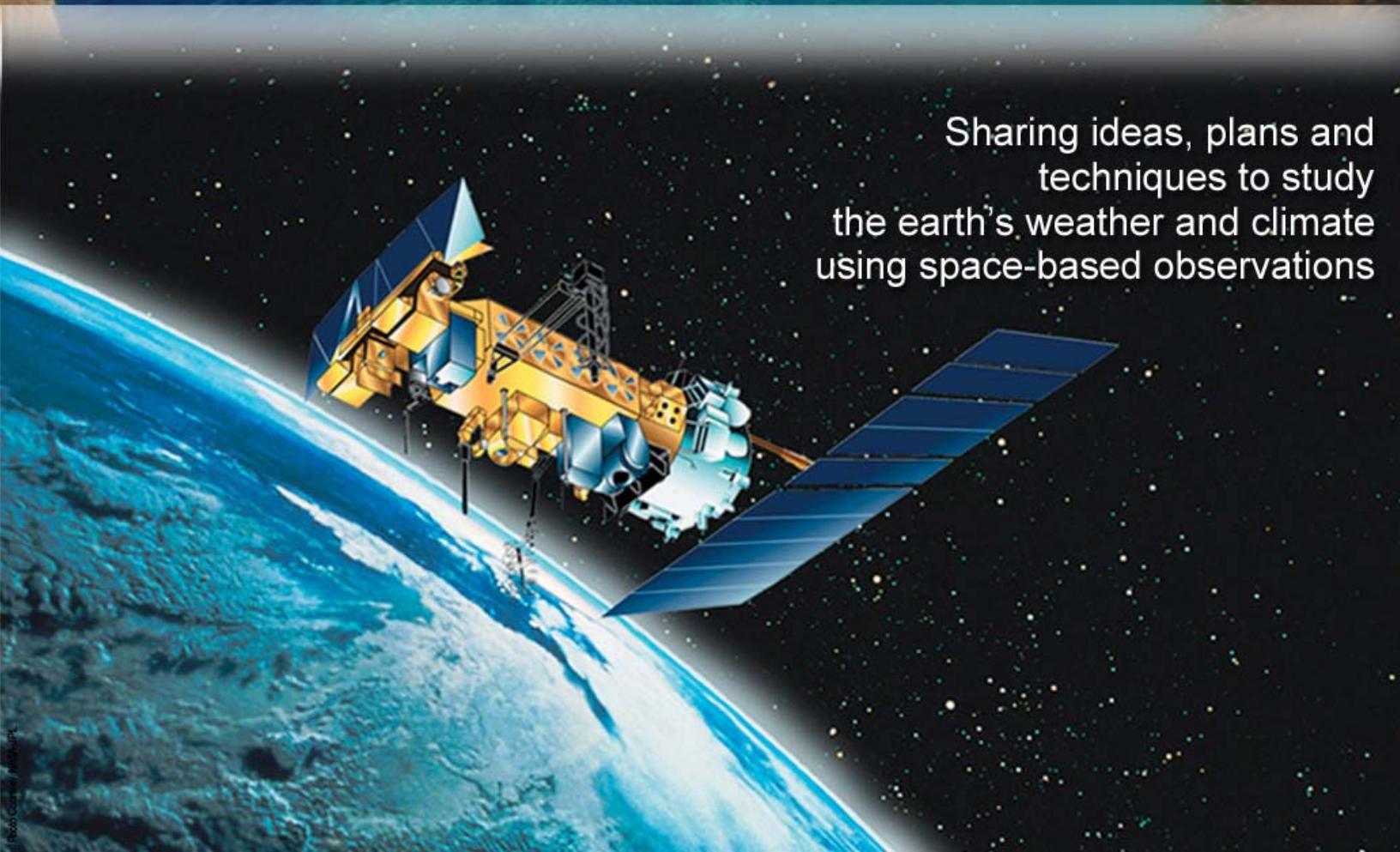

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