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Fast Retrieval of Cloud Parameter from IR-Limb observations: The MIPAS Cloud Processor, First Results and Product Validation

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The Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) on the ENVISAT satellite measures limb IR spectra in the 4 to 15 micron range. The ESA operational level 1 and 2 products include so far no direct information on clouds and aerosols. This is not a surprising fact, because the analysis and retrieval of cloud parameter from limb IR spectra are still challenging tasks for radiative transport applications. As part of an ESA funded study MIPclouds improvements and new algorithm developments have been investigated under the specific condition of a near-real-time processing capability.
Results on detection methods and classification of cloudy spectra (PSC types, liquid/ice), the retrieval of micro-physical and macro-physical parameters from the spectra, such as cloud top heights, extinction and temperature, and estimates of particle sizes and ice water path of the cloud will be presented together with an overview of the validation activities.
The sensitivity in detection of different cloud types is excellent and similar to space and ground based lidars. The high cloud amount (<440 hPa) is on global scales significantly larger compared to passive nadir viewers like (A)ATSR, AIRS, SEVIRI or the ISCCP dataset.
For a better representation of the limb geometry in the validation activity a blind test retrieval set-up has been generated based on radiative transport calculation including multiple scattering and realistic 2D/3D cloud structures from ECMWF data. Cloud detection sensitivity and restrictions on the retrieval of micro-physical parameter (e. g. limb ice water path and effective radius) have been investigated. The new limb path integrated quantity area density path (ADP) is introduced, retrieved and validated in conjunction with the blind test retrieval. ADP turns out to be extremely valuable for future comparison with model data of ice water content when the limb integration is applied through the model fields.