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Development of an analysis tool for cloud base height and visibility

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The meteorological variables cloud base height (CBH) and horizontal atmospheric visibility (VIS) at surface level are of vital importance for safety and effectiveness in aviation. Around 20% of all civil aviation accidents in the USA from 2003 to 2007 were due to weather related causes, around 18% of which were owing to decreased visibility or ceiling (main CBH). The aim of this study is to develop a system generating quality-controlled gridded analyses of the two parameters based on the integration of various kinds of observational data. Upon completion, the tool is planned to provide guidance for nowcasting during take-off and landing as well as for flights operated under visual flight rules.

Primary input data consists of manual as well as instrumental observation of CBH and VIS. In Austria, re-structuring of part of the standard meteorological stations from human observation to automatic measurement of VIS and CBH is currently in progress. As ancillary data, satellite derived products can add 2-dimensional information, e.g. Cloud Type by NWC SAF (Nowcasting Satellite Application Facilities) MSG (Meteosat Second Generation). Other useful available data are meteorological surface measurements (in particular of temperature, humidity, wind and precipitation), radiosonde, radar and high resolution topography data. A one-year data set is used to study the spatial and weather-dependent representativeness of the CBH and VIS measurements.

The VERA (Vienna Enhanced Resolution Analysis) system of the Institute of Meteorology and Geophysics of the University of Vienna provides the framework for the analysis development. Its integrated “Fingerprint” technique allows the insertion of empirical prior knowledge and ancillary information in the form of spatial patterns. Prior to the analysis, a quality control of input data is performed. For CBH and VIS, quality control can consist of internal consistency checks between different data sources. The possibility of two-dimensional consistency checks has to be explored. First results in the development of quality control features and fingerprints will be shown.