

## ***Long-term application and evaluation of IAPP using global radiosonde and CHAMP measurements***

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The major objective of the Satellite Application Facility on Climate Monitoring (CM-SAF) is the exploitation of satellite observations to derive information on key climate variables of the Earth system. The CM-SAF focuses on the atmospheric part of the Essential Climate Variables defined within the framework of the Global Climate Observing System (GCOS). Among other methods the CM-SAF operationally applies the International ATOVS Processing Package (IAPP) to retrieve humidity and temperature profiles from ATOVS observations onboard NOAA-15, -16, and -18. A kriging routine is applied to the swath based retrievals in order to determine daily and monthly averages on a global grid. Furthermore, the profiles are vertically integrated and averaged to provide column integrated water vapour as well as humidity and temperature values for 5 layers and at 6 layer boundaries. Currently the years 2004-2007 had been processed, and a reprocessing event will go back to 1998 in the near future. The evaluation of temperature and humidity Climate Data Records (CDRs) for the period 2004-2007 is carried out using global radiosonde observations that meet the quality standards of the GCOS Upper Air Network (GUAN). The evaluation is extended by utilising CHALLENGING Minisatellite Payload (CHAMP) observations for the years 2004 and 2005. The evaluation considers biases, RMSE, and mean absolute deviations and separates between global and zonal values. The maximum average bias of column integrated and layer integrated water vapour between ATOVS and GUAN radiosondes is 0.5 kg/m<sup>2</sup> and 0.8 kg/m<sup>2</sup> (850-700 hPa), respectively. For the layer averaged temperatures we find a maximum bias of -1.1 K (300-200 hPa). The RMSE of water vapour exhibits an annual cycle with a maximum in summer months and a maximum of zonal RMSE around the equator with some variation depending on the month. The exemplary comparison of ATOVS and CHAMP data confirms above findings. When future progress in inter-calibration efforts leads to improved homogenised radiances, reprocessing of ATOVS observations can be carried out easily and will lead to CDRs with at least the accuracy as presented above. Currently CM-SAF is working on an automated evaluation of temperature and humidity products with radiosonde profiles from reference stations.

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