

VALIDATION OF CHAMP TEMPERATURE AND HUMIDITY OBSERVATIONS IN THE ARCTIC BY RADIOSONDE, LIDAR, AND REGIONAL MODEL

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GPS radio occultation soundings of atmospheric refractivity e.g. by the satellite CHAMP can be used to derive stratospheric temperatures and tropospheric humidity. The high inclined orbit of CHAMP and the calibration free observation technique recommend CHAMP for climate applications in the remote and data sparse Arctic region. We will present results of our validation efforts and demonstrate the accuracy of CHAMP temperature and humidity data under the cold and dry polar conditions. Only a small number of instruments can provide stratospheric temperature data at high polar latitudes for validation. We have used Alfred Wegener Institute's Koldewey Station lidar at Ny-Aalesund, Spitsbergen (79°N, 12°E) for temperature intercomparison. Simultaneous soundings during the winter 2001/2002 have been used for single-profile validation. For humidity data validation about 70 radiosonde stations northern of 60°N latitude provide regular water vapor profiles. Well-known limitations of individual radiosonde humidity sensors under polar conditions affect also the CHAMP validation, but still the radiosonde data set is the most extensive and valuable in the Arctic. However the limited reliability of radiosonde humidity observations for long-term trends make additional data sets even more worthwhile for climate applications. We will present monthly averaged water vapor profiles from radiosondes and CHAMP soundings as well as correlation results from individual profile intercomparison. To regard the different surface conditions, we examine regional mean profiles separated by land, open water (ocean) and ice-cover conditions. The discussed data span both summer and winter conditions (of year 2001 and 2002, respectively). Results from the regional climate model HIRHAM complement the measurements. Independent from season and region, CHAMP data in general provide the lowest and radiosonde data the highest water vapor concentrations, with differences of up to 50%. Possible reasons for the disagreement will be discussed.