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# Monitoring the atmospheric temperature and humidity of the tropopause region using GPS radio occultation data and high spectral resolution infrared measurements

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In this paper, GPS/RO measurements of the tropopause region from the CHAMP and SAC-C satellites are used to improve tropospheric profile retrievals derived from high spectral resolution radiometric measurements under clear sky conditions. Previously simulated GPS/RO data and passive infrared and microwave (IR/MW) measurements were combined to study the effect on profile retrievals. These results were confirmed with real data using broadband radiometric ATOVS (Advance TIROS Operational Vertical Sounder instrument on NOAA polar orbiting satellite) and CHAMP data. Now, efforts are being made to combine high spectral resolution Atmospheric Infrared Sounder (AIRS) measurements with GPS data for regression based profile retrievals. AIRS is flying on a NASA weather and climate research satellite called Aqua together with the Advanced Microwave Sounding Unit (AMSU); these instruments have been providing measurements of atmosphere, clouds, land and ocean surface properties with high accuracy.

This paper presents results using two regression algorithms applied to AIRS, AMSU and GPS data: a linear statistical regression algorithm and a principal component regression. For calculating the regression coefficients, calculated AMSU and AIRS brightness temperatures for a fixed number of optimal channels and calculated GPS refractivity profiles were regressed against radiosonde temperature and humidity profiles. These regression coefficients were then applied to the collocated real AIRS, AMSU and GPS data. The results were validated with globally distributed radiosonde measurements and with the AIRS validation dataset called "best estimates of the atmospheric state" over the Southern Great Plans ARM CART site at Oklahoma, USA.

GPS is found to provide valuable upper tropospheric information that improves the profile retrieval from AIRS and AMSU.