# JPL (MLS Team) Scientific Publication

*Scientific Themes: Atmospheric Measurement Science*

## Cross-validation of MIPAS/ENVISAT and GPS-RO/CHAMP temperature profiles

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### Summary

This paper presents results from a cross-validation of the temperature measurements from the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) onboard the ENVISAT satellite and the Global Positioning System (GPS) receiver onboard the CHAMP satellite. Comparisons of temperature profiles are made among three data sets: one is the MIPAS temperature retrieved at Germany's Institut für Meteorologie und Klimaforschung (IMK), others are the GPS/CHAMP temperatures retrieved at the Jet propulsion Laboratory (JPL) and at Germany's GeoForschungsZentrum (GFZ) Potsdam. The three data sets show generally good agreement, with the global mean differences, averaged between 8 and 30 km, less than 0.45 K, and maximum differences of ~1.5 K above 25 km near both poles and equator. After investigating possible causes we conclude that observed differences are due to: (1) effect of enhanced gravity wave activity; (2) a negative bias in GPS/CHAMP temperatures in regions of increased humidity; (3) a mapping of initialization temperature profiles on GPS/CHAMP retrievals at altitudes where low refraction contains no information on air density; and (4) measurement errors due to insufficient knowledge of the instrument line shape and spectroscopy in current MIPAS retrievals.

This work by an international collaboration on atmospheric science research benefits global society as it bears upon shared environmental problems facing humankind, such as stratospheric ozone depletion, changes in greenhouse-gas levels, and radiative forcing of climate change. The methods and software tools that were developed during this project are currently being used by many scientists for the cross-comparison of temperature, water vapor and ozone measurements among a number of satellite instruments currently in orbit, including the Microwave Limb Sounder (MLS) onboard Aura, the Atmospheric Infrared Sounder (AIRS) onboard Aqua, the HALogen Occultation Experiment (HALOE) on board UARS, GPS/CHAMP and MIPAS.

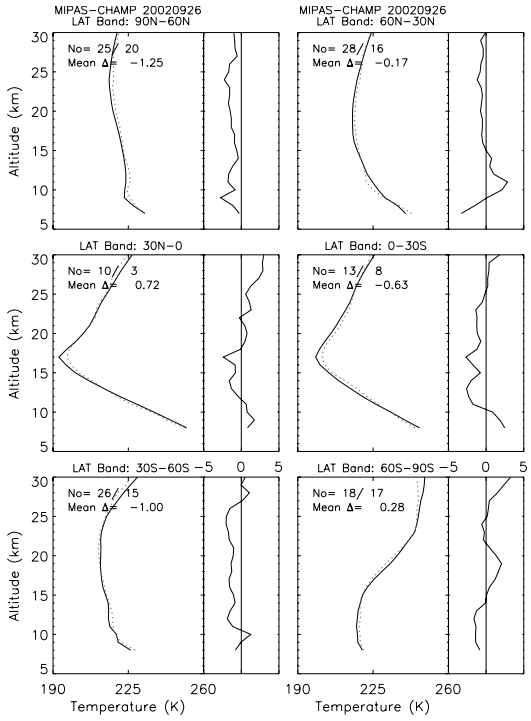


**Figure 3:** Comparisons of MIPAS (solid) and JPL's GPS/CHAMP (dotted) temperatures (K) on 26 Sep 2002. The temperature profiles (left subpanel) and their differences (right subpanel) are averaged over available correlative measurements within the specified latitude bands.

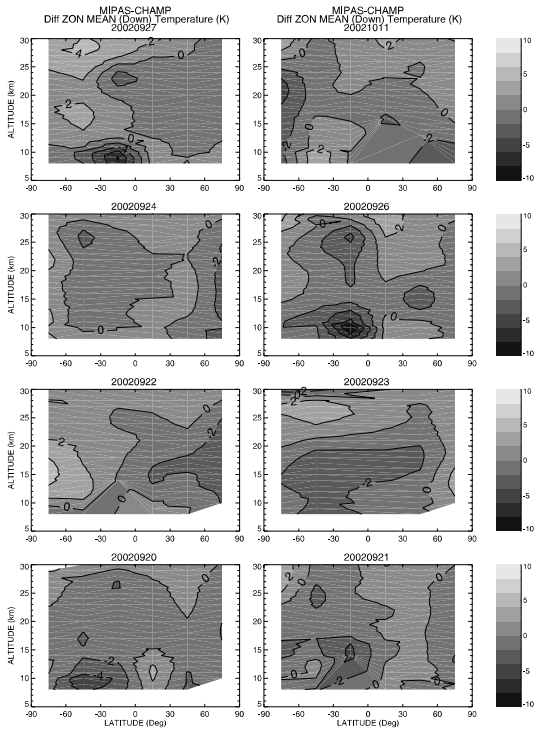


**Figure 5:** Daily and zonal mean daytime temperature differences (K) of correlative MIPAS and JPL's GPS retrievals, with adjustment of altitude resolution and a priori information applied.