COSMIC Radio Occultation technique for measurement of the tropopause during Tropical cyclones

Riccardo Biondi¹, Torsten Neubert¹, Stig Syndergaard² and Johannes Nielsen²
¹DTU Space, Danish Space Institute, ²Danish Meteorological Institute

Goal & Methods

Water vapour transport to the upper troposphere (UT) and lower stratosphere (LS) by deep convective storms affects the radiation balance of the atmosphere and has been proposed as an important component of climate change. The aim of the work presented here is to understand if the GPS Radio Occultation (RO) technique will be useful for characterisation of this process.

Case selection

All the TC tracks were compared with GPS/MET, CHAMP, SAC-C and COSMIC ROs. More than 70% of coincidences are coming from COSMIC project. We finally selected two different TCs, Bertha 2008 and Hondo 2008, with completely different characteristics.

Comparisons

The temperature profiles show the TCs warm core and the cold peak reached in the UT/LS. This behaviour is confirmed from ECMWF, AIRS and MLS temperature profile.

In the UT/LS the water vapour comparisons with ECMWF show that the model largely influences the mixing ratio profile but the MLS mixing ratio anomaly has a behaviour in agreement with the bending angle anomaly.

Conclusions

- Bending angle profile shows a clear TC signature in the UT/LS
- Temperature and refractivity profiles from the COSMIC mission often show a variation at the same altitudes as the bending angle, but the signature is less pronounced and sometimes not evident
- The water vapour anomalies from COSMIC agree largely with those of ECMWF, which can be explained by the fact that the ECMWF model is used in the derivation of the water vapour profiles.

Contacts

Riccardo Biondi  DTU Space  email: rbi@space.dtu.dk