CLIMATE MONITORING AND MODELING: THE ROLE OF OCCULTATION DATA

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A fundamental problem in climate monitoring and prediction is to identify robust trends towards a background of natural chaotic variability. Global warming trends so far has been rather modest and not more than 0.7řC - 0.8řC at the surface of the Earth during the last 100 years. It is therefore difficult to identify the warming trend towards a background of considerable natural variability. The temperature change in the upper troposphere is a crucial issue. It is limited too shorter periods and furthermore it appears to be an inconsistency between model results and observations. This inconsistency has been one of the central areas of criticism of climate models. It is difficult to satisfactory clarify as most observing systems today contain biases that are not fully understood and NWP system today apply empirically based bias corrections in operational analyses as well as re-analyses.

GPS-based radio occultation data are here of considerable value as they do not require bias correction. Furthermore, the use of occultation data in the data-assimilation has lead to the identification of biases in other observing system. GPS-radio occultation data are consequently of great strategic importance for climate monitoring as they will provide reliable data in the upper troposphere and lower stratosphere where climate change are the largest and difficult to determine from other available observations.

As climate is warming water vapour increases rapidly as it according to theory follows Clausius-Clapeyron relation. Monitoring of the change of specific humidity is hence of great importance. An interesting area of climate monitoring that I will develop in my lecture is to combine occultation data with in situ measurements of the zenith path delays such as from the IGS network of ground based GPS-stations. Studies have shown that ground based GPS data can provide accurate and independent information of water vapour profiles.