WEDNESDAY 08 December 2004: NEW WINDOWS ON THE WORLD

Dr Andrew Collard High spectral resolution infrared sounders in NWP – ECMWF
The launch of the experimental Atmospheric Infrared Sounder (AIRS) on the NASA Aqua satellite in May 2002 marked the start of a new class of high spectral resolution infrared sounders that will continue with the operational IASI and CrIS instruments to be launched by Europe and the USA in the coming years. This new breed of instruments boasts line resolving spectral resolution and thousands of channels which together allow the atmosphere to be sounded with greatly improved accuracy and spectral resolution. The biggest challenges are efficient use of the large data volumes produced and the treatment of clouds. Nevertheless, AIRS is already providing positive impacts to operational NWP.

Dr Johannes Schmetz The Seviri imager on Metosat second generation – results from Meteostat 8 – EUMETSAT
The paper provides first a short overview of the second generation of European geostationary meteorological satellites that started their operational phase on 29 January 2004 with Meteosat-8.

The new satellite series combines multispectral imaging in twelve spectral channels with an unprecedented imaging repeat cycle of 15 minutes for the Earth's 'full disk'. With four channels in the solar spectrum and eight channels in the thermal infrared, it provides remote sensing capabilities previously only possible with imaging instruments in a polar orbit. In addition the high imaging repeat cycle in time allows to observe the temporal change of rapidly changing weather phenomena.

The following results from Meteosat-8 will be presented:
- Atmospheric motion vectors (AMVs) derived from feature tracking in the thermal IR window, the water vapour bands and in the solar bands are more numerous and of superior quality to similar AMV products from Meteosat-7. The data have a beneficial impact on the analysis for numerical weather prediction.
- Multispectral radiance measurements in the clear atmosphere depict unstable air in terms of instability indices, and thus provide lead-time before the onset of convection. The observations can be utilised for nowcasting.
- Multispectral radiance measurements of aerosol plumes provide an estimate of the aerosol load over land as well as over oceans. The data hold promise for new aerosol products.
- Multispectral radiance measurements of cloud provide a clear distinction between ice and water and also depict the presence of super-cooled water cloud droplets and the phase change in time.

- Multispectral radiance measurements provide an estimate of cloud effective radii and, for the first time, the evolution of cloud microphysical parameters in time.

Prof John Harries Measurements at high time resolution of the earth's radiation budget from GERB- Imperial College

This talk will introduce the Geostationary Earth Radiation Budget experiment, and briefly describe the instrument and the GERB/MSG programme. Results will be illustrated from studies of tropical convective cloud systems, the diurnal cycle, and measurements of Saharan dust over the tropical Atlantic. This talk will conclude with some comments on future EO research on the planetary energy balance.

Dr Chris Kidd The global precipitation mission – University of Birmingham

Water is vital for all the life on Earth. The measurement of precipitation, both in amount and distribution, is therefore a key requirement for human well-being as well as meteorological and climatological requirements. Current global gauge networks are unevenly distributed and consequently there are vast regions of the globe that have few or no measurements of precipitation. Since the first meteorological satellites were launched in 1960 the distribution of clouds over the Earth have been monitoring and techniques developed for the estimation of rainfall and snowfall. However, it was not until 1997 that a satellite mission dedicated to the study of rainfall was launched; the Tropical Rainfall Measurement Mission, or TRMM. The success of this mission, now entering its 8th year of operation, has led to the organisation of the Global Precipitation Measurement (GPM) study. This aims to co-ordinate the activities of various international organisations to provide satellites, ground validation and operational support in a concerted effort to accurately measure precipitation over the entire globe. Key to the GPM concept is a constellation of accurate passive microwave radiometers and a 'mother ship' with satellite-based precipitation radars for calibration.

The cloudsat mission and the A-train – Prof Graeme Stephens, Colorado State University (stephens@atmos.colostate.edu)

This talk will describe the CloudSat mission which is designed to measure the vertical structure of clouds from space. The launch of CloudSat is May 2005 and, once launched, CloudSat will orbit in formation as part of a constellation of satellites (the A-train) that includes other NASA satellites as well as a CNES satellite carrying a polarimeter (PARASOL).

A unique feature that CloudSat brings to this constellation is the ability to fly a precise orbit enabling the fields of view of the CloudSat radar to be overlapped with other instruments of the constellation. The precision and near simultaneity of this overlap creates a unique multi-satellite observing system for studying the atmospheric processes essential to the hydrological cycle. Some aspects of the science addressed by the A-Train will be described.

Radio occultation measurements for NWP and atmospheric research – Dr Christian Marquardt (christian.marquardt@metoffice.gov.uk)

The use of radio signals originating from the satellites of the Global Positioning System (GPS) constallation provides a new and promising technique for remote sensing of the Earth's atmosphere. A particular interesting use of GPS data in meteorology are the space-based "radio occultation" measurements. In this talk, the measurement principle and some unique properties of this new observation type will be discussed, and some results from assimilating radio occultation data into present day Numerical Weather Prediction systems will be presented. Apart from its use in NWP, however, radio occultation are also proving valuable in a number of more research oriented applications - like monitoring lower stratospheric gravity wave activity or properties of the thermal tropopause. A number of examples will be shown.