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An Intercomparison of AVHRR , MERIS, AATSR and MODIS radiances using a SNO approach

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To be able to create climate data sets containing data from several satellite instruments, the measurements from the different sensors have to be homogeneous. For measurements in the infrared part of the spectrum this is normally accomplished by using on-board reference targets (blackbodies). As a contrast, calibration techniques applied to visible channels have often been using reference measurements from the ground, a ground truth. This technique is often called Vicarious calibration since no on-board reference is available. It also means that potential calibration errors can only be adjusted in delayed mode after having collected enough reference data (often limited by availability of cloud-free reference surfaces).

In this presentation the radiances of the common channels at 0.67, 0.87, 1.6, 3.7, 11 and 12 micron for the Advanced Very High Resolution Radiometer (AVHRR), the Advanced Along-Track Scanning Radiometer (AATSR) and the Medium-spectral Resolution, Imaging Spectrometer (MERIS) are compared with corresponding radiances from the Moderate Resolution Imaging Spectroradiometer (MODIS). MODIS is using an advanced on-board calibrating system making it ideal to be used as a reference sensor. The studied AVHRR sensor is carried by NOAA18, the AATSR and MERIS sensors are carried by ENVISAT and the selected MODIS sensor is carried by the Aqua satellite. MERIS is missing the channels at 1.6, 3.7, 11 and 12 micron while AVHRR on NOAA18 is missing the channel 1.6 micron.

The technique used is based on simultaneous nadir observations (SNO). Here, different satellite measurements made over the same area within a time window of less than 10 minutes enables to estimate the sensor to sensor bias. This together with the fact that only the nadir pixels from each instrument are used enable the viewing geometries to be nearly identical.

In the presentation the bias between the sensors for the time period 2007 – 2009 will be shown for both visible and infrared channels. The three year time period is long enough to indicate seasonal variations and bias changes over time. The long time period resulted in a total of 6200 globally distributed SNO points for each instrument ensuring statistical significance of the results. Since the AVHRR channel at 0.87 micron has a wider response function than the corresponding MODIS channel, a straight forward comparison between these two channels will not be correct. An attempt to correct for this difference, using the ratio between MODIS channel 17 (0.905 micron) and channel 18 (0.935 micron), will also be shown.

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