

Homogenization of IR Sounders

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Infra-red Sounders have flown on meteorological satellites and been observing the global atmosphere routinely since 1972 with a commitment to continue until at least 2018. The infra-red radiances are sensitive to changes in atmospheric temperature, humidity, clouds, and greenhouse gases and have proven themselves as a valuable resource for climate research and in the development of stable reanalyses. However, changes in spectral response of individual instruments along with orbit drift and other factors have introduced time-dependent systematic biases into the historical record.

This talk outlines plans at the UK Met Office to undertake reprocessing of the High Resolution Infra-Red Sounder (HIRS) and Vertical Temperature Profiling Radiometer (VTPR) archives to generate a homogeneous assessment of IR radiance in order to quantify and reduce uncertainty in changes in the atmospheric state since 1972, and as a contribution to next-generation reanalysis projects.

Climate signals are small, and in order to adequately span structural uncertainty it is important that homogenization of data sets is a continually evolving process. Therefore this work will complement and build upon existing and planned datasets developed elsewhere, and will necessarily require close collaboration internationally.

Sources of systematic bias in radiances include (a non-exhaustive list):

- Changes in the spectral response function
- Changes in the radiometric response (gain)
- Changes in the orbit characteristics
- Changes in the field-of-view characteristics
- Stability of calibration post-launch

Where possible known biases will be determined analytically (e.g. spectral response change and orbit drift) and as a function of the atmospheric state, and viewing geometry. Unknown biases (e.g. poorly defined spectral response functions) will be determined separately through empirically based methods utilizing the periods of satellite overlap.

The homogenization will be conducted on the IR radiances, and it is argued that interpretation of these radiances in the context of climate change should be conducted making appropriate use of models and reanalyses rather than through geophysical retrievals and cloud-clearing which may introduce significant biases.

