

2024_68_RAL_RS: Use of Satellite Observations to identify and attribute Decadal Climate Change

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Snapshot comparisons of the Earth's outgoing radiation spectrum from space made over 20 years ago at Imperial College provided the first observationally based evidence of an increase in Earth's Greenhouse forcing. However, the study was limited by both the quality and duration of the available data. Now we have global observations of spectrally-resolved outgoing longwave radiation from the Earth-atmosphere system that have been made continually since 2007 from the MetOp series of satellites. These observations are used by RAL Space to produce self-consistent daily distributions of atmospheric temperature, water vapour, methane and tropospheric ozone along with surface temperature and a suite of other geophysical variables (see <http://rsg.rl.ac.uk/vistool>). Putting these variables together with the spectrally-resolved measurements themselves provides a unique opportunity to first identify, and then attribute signatures of decadal scale changes in greenhouse forcing and, potentially, key climate feedbacks.

Moreover, we can compare the data with well-established climate indices which track natural oscillations in the climate system such as El Nino Southern Oscillation, and also with simulations by state-of-the-art Earth system models, used to project future climate change to inform policy makers. Self-consistently produced global records of key trace gases, temperature and their finger-prints in outgoing longwave radiation will allow a critical test of these models, allowing potential improvements to the models to be identified.

The project will involve close interaction with the satellite data providers and access to both satellite and climate model data on the Jasmin computer infrastructure at RAL Space.

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