Regression models of atmospheric relative humidity as observed by AIRS

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We consider the possibilities and limits of applying simple linear regression models to atmospheric data sets. Specifically we analyse the daily tropospheric relative humidity data from the Atmospheric Infrared Sounder (AIRS), at a spatial resolution of 1x1 degree longitude/latitude.

Atmospheric water vapour plays a key role in the climate and numerical model calculations suggest that global mean relative humidity stays approximately constant. We show that this is due to factors present in our simple model and are able to correctly predict large scale (global mean) variability from a model that considers only the small scales. In addition we get results on the relevant spatial/temporal scales required for different statistical approaches and, by paying attention to model errors, show the limits of simple regression modelling.

For atmospheric data, linear regression modelling can be a very powerful tool which is perhaps surprising given its simplicity and the turbulent nature of the atmosphere.