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Recalibrating hyperspectral satellite data from the early 1970s

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Global measurements of infrared spectral radiance were collected by the Infra-Red Interferometer Spectrometer (IRIS) on board the Nimbus-4 satellite in 1970-71. With 862 spectral channels, these measurements provide the opportunity to derive a high quality, global sea surface temperature (SST) product for 1970-71. However, the data suffer from a systematic cold bias of 1-2 K in many channels relevant to SST retrieval. It is thought that this bias is due to incorrect calibration when IRIS was in operation. This poster presents our work on developing a model of this bias. Visible imagery of cloud cover from 1970 is used to select a set of clear-sky IRIS spectra. With input from atmospheric reanalyses, the radiative transfer model RTTOV is used to simulate these spectra and comparisons with the observed spectra provide an estimate of the average spectral bias. Our bias estimate agrees well with independent estimates derived from comparisons of IRIS with other instruments. The bias is also found to vary with scene temperature and time, so these dependences are quantified. Our bias model is used to recalibrate all of the IRIS measurements, enabling the retrieval of high quality SST estimates.