A Preliminary Analysis of the NPP CrIS Spectral Noise

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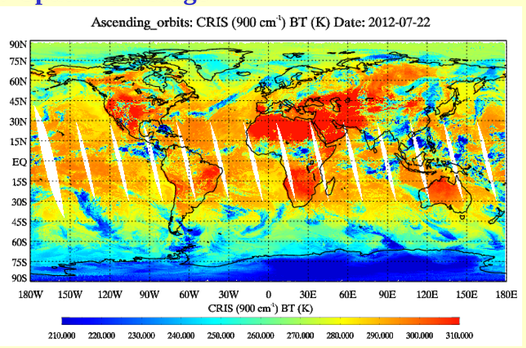
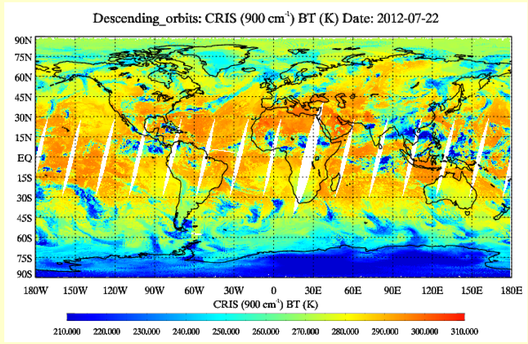
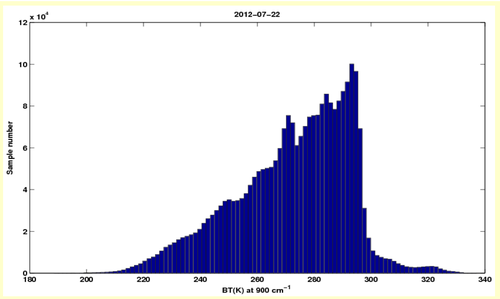
Abstract

The analysis of the instrumental noise (NEDN) of the Cross-track Infrared Sounder (CrIS) is presented. The standard deviation of internal target radiance in sliding window (including 30 scans, i.e. about 4 minutes) is used as operational parameter. However, the signal drifting is not considered with this method. Here we presented another method based on the principle component analysis (PCA) of the earth scene radiance. With this method, the drifting of signal in each sliding window can be filtered out. We selected the data of a typical summer date, i.e. July 20, 2012, as the case. The data is divided into two groups to do PCA analysis based on the brightness temperature of 900 cm-1. Those pixels whose BT900>240K are 'hot scenes'; others are 'cold scenes'. The first 20 components are removed and the left are reconstructed as noise. We found with PCA method, the instrumental noise is actually better than expected.

1. Spatial coverage





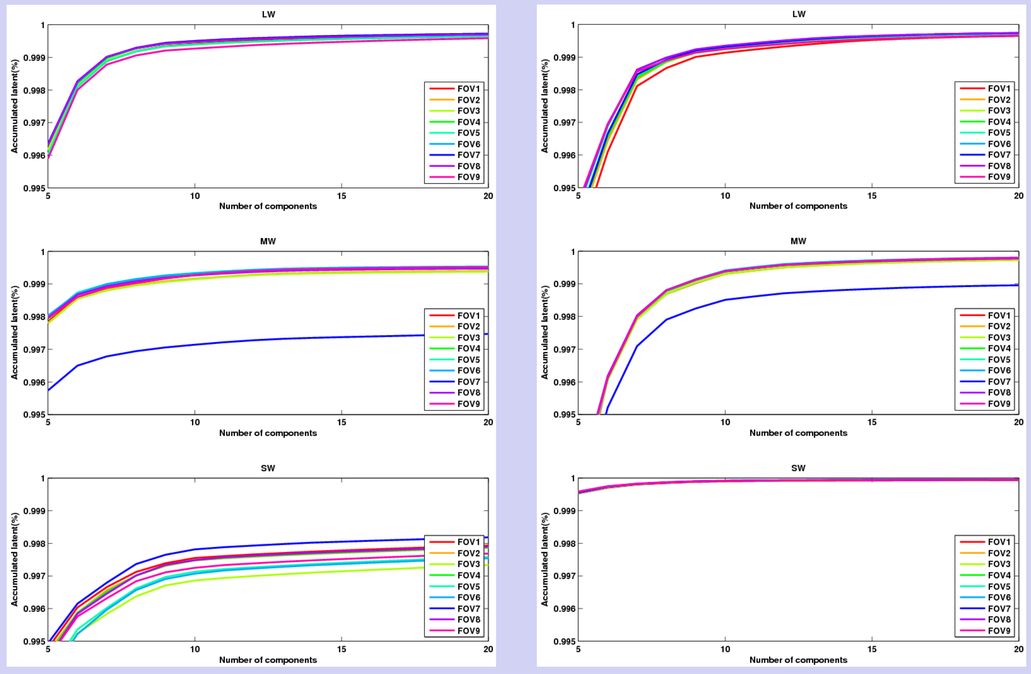


This is the histogram of the distribution of pixel against the brightness temperature of 900 cm^{-1} for July 20, 2012.

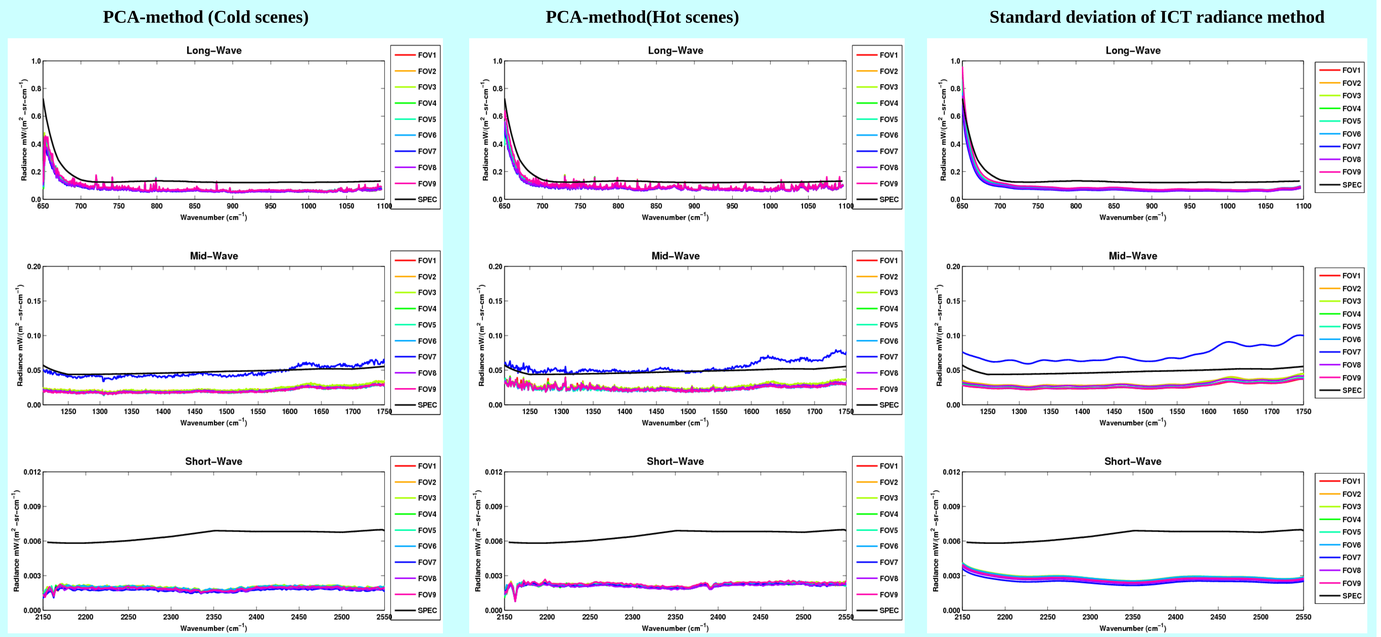
The characteristics of scene spectra is sensitive to the scene temperature. The PCA analysis requires different number of principal component to filter out signal as scene temperature changes. For most bands, except the noisy MW FOV 7 and SW cold scenes, the first 20 components explain more than 99.98% of the earth scene radiance.

240 K is the threshold to separate cold and hot scenes.

3. Accumulated latent vs. number of components



2. Spectral NEDN



4. Trending the noise at specific channels (http://www.star.nesdis.noaa.gov/smcd/spb/xjin/cris_rdr.php)