Title: A Recalibration of the AVHRR data record to provide an accurate and well parameterized FCDR

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As is becoming more and more apparent, the current calibration of the AVHRR sensor has introduced biases and errors which must be removed if we are to produce an accurate FCDR from the more than 25 years of AVHRR data. Recent work by us (Mittaz, Harris & Sullivan 2009) has shown that the observed biases and errors can be removed by using a completely new calibration methodology which has been derived using a physical calibration model to understand the complex issues in both the pre-launch and in-orbit data. This new methodology has been shown to be more accurate than the current operational calibration and is also able to remove the large and systematic biases found both in the pre-launch data as well as seen in in-orbit comparisons with other well calibrated sensors such as the AATSR and IASI.
In order to get the best FCDR we therefore propose to re-calibrate the historic AVHRR data using this new calibration to provide the most accurate AVHRR FCDR possible. Perhaps equally importantly, the new calibration method is also capable of predicting instrument gain during times when the on-board calibration data are affected by solar and/or Earthshine contamination and during times when there are thermal gradient problems over the internal calibration target (ICT). Solar contamination has been a significant problem for many NOAA platforms as their equator crossing times drift and our work on the in-orbit behavior of the AVHRR instrument also shows that the daytime segments of morning satellites at least may be affected by strong thermal gradients. The presence of such effects in the current data record will have lead to inconsistencies in the time series, for example, but our ability to predict the calibration over bad times should lead to a more consistent FCDR than is currently available. Further, we will be able to cope with changes in the AVHRRs thermal environment over time, something that has not been possible before.
We therefore propose to derive a new calibration by re-analyzing all the pre-launch data for all AVHRR sensors pre AVHRR/3, compare the AVHRR calibration will other accurate TOA radiance sources and derive a corrected in-orbit calibration, study long term calibration trends and remove them and use the predictive power of the new calibration to remove times when the AVHRR calibration system has been contaminated or corrupted. By doing this we will then obtain an accurate and consistent calibration to be used in the creation of the best AVHRR FCDR possible.