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## **EOS Microwave Limb Sounder**

### **A short guide to the use and interpretation of v4.2x Level 1 data**

#### **Introduction**

This document is a brief guide for those wishing to use EOS MLS Level 1 data (calibrated radiances corresponding to individual limb data integrations). The Instrument Overview and Level 1 Algorithm Theoretical Basis documents are required reading for those wishing to make full use of the instrument Level 1 data sets, and are available from the EOS MLS instrument scientist by request. At the time of writing the data set may be considered validated processing algorithms driven by in-flight calibrations and Level 2 data validation results.

Users are encouraged to look at the MLS instrument operations calendar to see such things as when the THz module was put in standby mode (since Dec 2009, there are no THz data available from the Level 1 processor). Feedback on any aspect of these data is encouraged.

#### **Data files**

MLS Level 1 data are processed in daily chunks (midnight to midnight UT), and the daily outputs presented in 8 files, **MLS-Aura\_L1type\_version\_date.suffix**. In these filenames **type** is **OA** or **RAD**, corresponding to orbit/attitude and calibrated radiance data. Additional modifiers appended to type for the radiance files include **G**, **D** and **T** corresponding to GHz module filter data, GHz module Digital AutoCorrelator data, and THz module data. Data files have suffix ending in **.h5** for HDF5 format, and metadata are in the XML formatted files with **.xml** suffixes.

#### **Radiance data files**

Each GHz calibrated radiance in the radiance files has an estimate of spectrally-varying and spectrally-averaged uncertainty (precision), as well as estimates of spectrally-varying and spectrally-averaged baseline corrections. These baseline corrections are necessary because the 'cold space' reference is not measured through the primary antenna. No noise covariance information is included in these data files, nor is there any estimate of systematic error levels, although we believe that systematic errors are generally less than 3% in calibrated radiances. Further discussion of systematic errors is provided in the data validation papers (see publications at <http://mls.jpl.nasa.gov>). Radiances that have negative precision estimates should be discarded. All Level 1 data files are fully described in the EOS MLS Level 1 File Description with Data Dictionary, available on request.

Effective use of EOS MLS Level 1 requires detailed knowledge of the instrument and its inner workings, and the Level 1 data should not be used prior to consulting with relevant members of the MLS Science Team in order to obtain the requisite information.

Note: Two GHz bands have been turned off due to accelerated signal decline and increasing noise that affected science quality. Band 12 (N<sub>2</sub>O) was turned off August 6, 2013 and Band 3 (N<sub>2</sub>O) has been configured to be the standard N<sub>2</sub>O product. Band 13 (HCl) was turned off January 28, 2010; there is no alternate band to take this measurement.

#### **Reading the data files**

**.xml** are XML files requiring no special software for reading; however style sheets are available through ESDIS Toolkit. The calibrated radiance files are in HDF (v5) format, and the data has been compressed using HDF provided gzip. These files are readable with any HDF- (v5)-capable file reader.

Instrument calibrations are described in the EOS MLS Instrument Calibration Report, available from the author on request.

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