Preparations for NOAA-N

Thomas J. Kleespies

NOAA / NESDIS / ORA

Camp Springs, MD USA

Introduction

NOAA-N is a continuation of the KLM series. However, there are significant differences in instrumentation and processing techniques that affect the users of the data. This paper will describe many of these changes. No discussion will be made here of level two processing, which is well described in Reale (2004).

Spacecraft

NOAA-K/L/M were all launched using Titan-IIs. NOAA-N will use a Delta-2 launch vehicle. This will permit a more precise orbital insertion and eliminate the need for an apogee kick motor. NOAA-N is expected to remain within one hour of the nominal equator crossing for up to eight years. The hydrazine propulsion system has been replaced by a gaseous nitrogen system. This simplifies spacecraft preparation and safety concerns on the launch pad. There are three solid state recorders on NOAA-N, whereas NOAA-M had one, and earlier satellites had none. The projected launch date at the time of this writing is September 15, 2004.

Instruments

There is no change to the AVHRR-3, SBUV-2 or the AMSU-A instruments. The infrared sounder is now a HIRS-4. The field of view has decreased to 10 km from 19 km for the HIRS-3. There is another Platinum Resistance Thermometer (PRT) in the black body. This is directly in the center and will give a better characterization of the temperature gradient as well as providing a better estimate of the black body temperature within the smaller angular field of view. There is also a new temperature sensor near the field stop.

The Microwave Humidity Sounder (MHS) is a new instrument, although it has considerable heritage with the AMSU-B. There are two frequency changes: the AMSU-B 150 and 183.31+-7 GHz channels are now 157 and 190.31 GHz on the MHS. Two of the channels now have horizontal polarization. The internal design is much different. There is greater redundancy in the MHS than in the AMSU-B. For example, the processor and interface electronics are completely redundant, including redundant PRTs.

Processing Changes

The AVHRR visible instrument counts to albedo transformation is now well documented and will be published soon. The non-linear term for the infrared has been increased in precision from six to seven digits. There is a scaling factor change that users must be aware of. There is no provision to account for lunar intrusion in the space look at this time, but this will be re-visited after launch.

There is no change to the HIRS-4 processing due to the change in field of view size. As noted above, there are now five PRTs which are averaged to produce the blackbody temperature. The PRT temperature conversion is now a 5^{th} order polynomial. While the effect of this change is small, it is more accurate. A new algorithm has been proposed to address the problem with the 24 hour average of calibration slope (Cao and Ciren, 2004). When this algorithm is implemented, a new lunar intrusion algorithm will also be implemented. The lunar intrusion detection is based upon Kigawa and Mo (2002). When lunar intrusion is detected, the intercept is computed from the blackbody, and the contaminated slope is removed from the running average of three calibration sequences.

The AMSU-A lunar intrusion is described in Kigawa and Mo (2002). This method calculates a bulk temperature of the moon. Offline testing works very well, with an accuracy of about 0.06K.

The MHS lunar intrusion algorithm is simpler since there are four independent space looks, and the FOV is smaller than that of the AMSU-A. The objective here is simply to find the one or two coldest spacelooks during a lunar intrusion event. The PRT temperature is computed differently from the AMSU-B in that the PRT and three precision resistors, or calibration channels are used.

Level 1B Format Changes

It is planned that all level 1B header records number one will have an identical preamble, which will comprise approximately the first one-hundred bytes. The HIRS header record will have some bytes offset to accommodate this preamble. The level 1B multiple header record option may be implemented on all instruments. The additional header records will contain ancillary dataset names and any metadata needed for reprocessing. With the exception of the MHS, all data record changes are supposed to be transparent to the user who does not need to make use of enhanced features such as lunar intrusion correction. It is intended that all of these changes will be made to all of the KLM level 1B data streams prior to the NOAA-N launch. The new 1B formats are available from ftp://metroweb.nesdis.noaa.gov/pub/noaa-n.
At this site there is a directory for each instrument, which contains the 1B format, the 1B format differences from NOAA-KLM, and sample NOAA-N level 1B data simulated from NOAA-16.

Documentation

The NOAA-KLM User's Guide will be amended to reflect NOAA-N specifics (http://www2.ncdc.noaa.gov/docs/klm/). A separate NOAA-N supplement page will have links to pertinent sections of the revised NOAA-KLM User's Guide. Ms. Kathy Kidwell will remain the editor of the User's Guide for the next few years.

Processing Environment

The primary processor for the 1B data will change from an Amdahl mainframe to an IBM-AIX-RS6000. Thus the native text will change from EBCDIC to ASCII, and the native MVS real numbers will change to IEEE floating point. The result is that the 1B scaled integers will be fed by a higher base precision floating point.

Direct Readout

There are some changes to the HRPT format, which will be reflected in the NOAA-KLM User's Guide. The point of contact for direct readout is now Darrell Robertson, Darrell.Robertson@noaa.gov.

Acknowledgements

The Author wishes to acknowledge the contributions to this paper of Changyong Cao, Kathy Kidwell, Tsan Mo, Dave Morel, Jerry Sullivan, Mike Weinreb and Fred Wu.

References

Cao, C. and P. Ciren, 2004. Operational High Resolution Infrared Radiation Sounder Calibration Algorithms and Their Effects on Calibration Accuracy, Proc 13th Int. TOVS Study Conf., 29 Oct- 4 Nov 2003, St. Adele, Quebec, Canada.

Kigawa, S. and T. Mo, 2002. An Algorithm for Correction of Lunar Contamination in AMSU-A Data. NOAA Tech. Rep. NESDIS 111.

Reale, A., 2004. NESDIS ATOVS Operational Sounding Products, Proc 13th Int. TOVS Study Conf., 29 Oct- 4 Nov 2003, St. Adele, Quebec, Canada.