Algorithm Inventory – AMSR-E L2 global rain rates
Updated 11 November 2008

1. Description/Theory

References:

Kummerow, C., Y. Hong, W.S. Olson, S. Yang, R.F. Adler, J. McCollum, R. Ferraro, G. Petty, D.-B. Shin, and T.T. Wilheit. 2001. The evolution of the Goddard Profiling Algorithm (GPROF) for rainfall estimation from passive microwave sensors. *Journal of Applied Meteorology* **40,** 1801-1820.

McCollum, J.R. and R.R. Ferraro, 2003: The next generation of NOAA/NESDIS SSM/I, TMI and AMSR-E microwave land rainfall algorithms, *J. Geophys. Res.* **108,** 8382-8404.

McCollum, J.R. and R.R. Ferraro, 2005: Microwave Rainfall Estimation along coasts. *J. Atmos. Ocean. Technol.***, 22,** 497-512.

Wilheit, T., C. Kummerow, and R. Ferraro. 2003. Rainfall algorithms for AMSR-E. *IEEE Transactions on Geosciences and Remote Sensing,* **41,** 204-214.

The AMSR-E orbital rain rate algorithm utilizes the Goddard Profiling Algorithm (GPROF). At present (November 2008), it is using GPROF "2004". GRPOF is a physically based algorithm that is utilizes a Bayesian inversion scheme to match actual satellite radiances with those in a database to produce surface rain rates (as well as hydrometeor profiles, confined to ocean regions). The database is developed from cloud resolving model (CRM) simulations of various storm systems (primarily from field campaigns), that are then used to do forward calculations on the emerging radiances which are specified for a particular sensor.

2. Strengths and Weaknesses

Strengths:

- Perhaps the most advanced passive microwave retrieval algorithm ever developed.
- Close comparison with TRMM radar measurements (within 10% on zonal mean)
- Adaptable to any passive microwave sensor
- Prototype community consensus approach

Weaknesses:

- CRM simulations are predominantly from ocean, warm season regions
- Large/complex code
- Positive biases of tropical land regions when compared to TRMM PR and other data sets

3. Algorithm Inputs

A. Satellite Data

1. Geostationary - None

2. Low Earth Orbit

A. EOS Aqua Advanced Scanning Microwave Radiometer (AMSR-E) radiances at 10.7, 18.7, 23.8, 36.5 and 89.0 GHz. Data latency 1-6 hours.

B. Ancillary Data - None

1. Other (i.e. topography data base)

A. Static Land/Sea/Coast databases are used
B. Cloud Profile databases

4. Processing (i.e. Level 2 processing ingests Level 1 products as input)

A. Product Development Level 1 - Generate AMSR-E orbital/swath files

1. Input AMSR-E L2a radiances.
2. Access ancillary data
3. Generate FOV specific AMSR-E derived rain rates via GPROF.
4. Output files in HDF-EOF format.

5. Output Products

A. AMSR-E Swath rain rates

1. **Temporal/Spatial Resolution:** Instantaneous; 5 km.

2. **Spatial Coverage:** 1600 km swath width

3. **Dedicated Product Web Page Location:**
http://www.star.nesdis.noaa.gov/corp/scsb/wchen/AMSR-E/
http://nsidc.org/data/amsre/

4. **Processing Specifics**
   - **Latency –** 0 to 6 hours (NESDIS) and 24 hrs or greater (NSIDC)
   - **Update Frequency –** Whenever new orbit is received (orbits are approximately 100 minutes in length) at NESDIS; 24 hours at NSIDC

5. **Operational Availability of Product**

- **Source –** Available on NESDIS FTP; contact Limin.Zhao@noaa.gov for registration form and data access.
- **Latency –** 0 to 6 hours
- **Update Frequency -** Whenever new orbit is received (orbits are approximately 100 minutes in length)
- **Available Record Length –** last 48 hours

Note: NESDIS generates operational swath products for AMSR-E but does not archive it (see item 6 below)

6. **Historical Availability of Product**
   - **Source –** National Snow and Ice Data Center (NSIDC). http://nsidc.org/data/amsre/
   - **Update Frequency -** Daily
   - **Available Record Length –** May 2002 to present

6. Planned Modifications/Improvements

- Updated versions of GPROF will be implemented as they are developed. Most recently, this was in 2004.
- AMSR-E project will reprocess the data whenever there is an algorithm change or a change to the input data stream. At this writing (November 2008), the AMSR-E L2 rain product is running Version 10 (see http://nsidc.org/data/amsre/versions.html for details on version history).

7. Capability of Producing Retrospective Data

- The archive products are generated by NASA/MSFC and are reprocessed 1 or 2 times/year whenever new versions of the L2a input or GPROF are delivered by the AMSR-E science team.

8. Contact Personnel

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9. Additional Comments

The near real time AMSR-E data are generated by NOAA/NESDIS, but are not archived. The AMSR-E science team generates the archive version of the product, but at a 24-hour data latency, and these are archived at NSIDC. The NESDIS algorithm version typically lags the AMSR-E science team version by 3-6 months.

There is also a L3 5 degree gridded product; the point of contact for this is Tom Wilheit (tom_wilheit@yahoo.com).