



Geolocation Changes for TRMM V7 and GPM

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Precipitation Processing System

TRMM

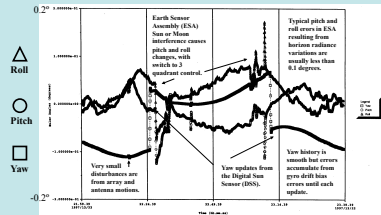
Spacecraft attitude control, and pointing accuracy notes:

Pre-boost:

Dec 1997 to August 2001

Horizon Sensors, Sun Sensors and Gyros

< ~ 0.2 degrees noisy errors from occasional sun interference in horizon, and radiance variation, often < 0.1 degree

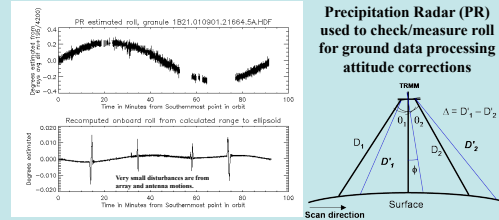


Post-boost:

August 2001 to Present

Magnetometers, Sun Sensors and Gyros

< 0.2 degrees orbit period systematic errors, generally < 0.1 degree



GPM

Star Trackers and Gyros

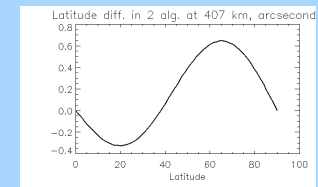
Onboard Global Positioning System (GPS) ephemeris (as opposed to ground definitive for TRMM)

Very high accuracy pointing is expected, with random errors much less than 0.1 degree, maybe as low as 0.01 degree.

Onboard target attitude is adjustable.

Ground Data Processing changes for GPM (besides different spacecraft data):

- Calculations done per-pixel avoiding some approximations.
- Calculations done in GPS Earth rotating coordinates (rather than inertial coordinates)
- New geodetic nadir vector calculation consistent with onboard algorithm (a very small difference, but just to show we are paying attention to details):

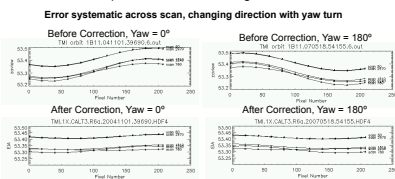


Ground Data Processing notes; V6 to V7 changes:

Flag Changes: Minor geo quality flags, such as small discontinuities in the attitude data, no longer flag whole scans of data

Sun angle calculations added for the TMI time-varying bias corrections

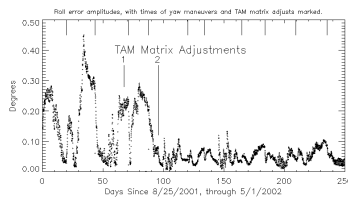
Bug fix: TMI Incidence Angle Correction for Spacecraft Motion During Scan



Incidence angles now calculated per-pixel (instead of every 20th pixel).

Extended span for Roll/Yaw sinusoidal orbit period attitude corrections

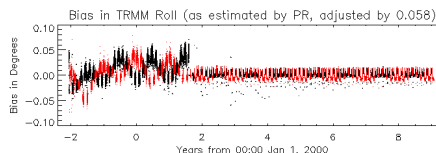
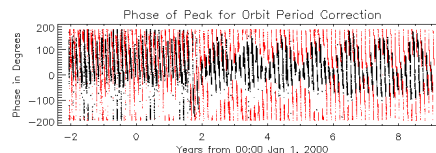
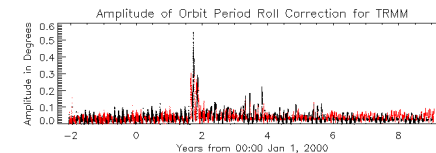
V6: applied for 5 months following boost V7: applied from launch through 2009



Discussion: The model for these corrections is more specifically applicable for the post-boost period, significantly reducing remaining errors.

They are applied in V7 to the prelaunch period as well, taking out some component of errors from horizon radiance variations, but leaving noise.

Note: largest remaining errors, V6 and V7, are expected to be bias offsets due to instrument alignment uncertainty.



Note: These corrections generally change the geolocation only at a small fraction of a pixel level.