JPL Scatterometer Project Activities and Opportunities

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Rob Gaston
Topics

- QuikSCAT Mission Status
- QuikSCAT Follow-on Mission
QuikSCAT Mission Status

• QuikSCAT instrument and spacecraft are healthy, but aging
  – June 19, 2009 will be the 10 year launch anniversary
• We’ve had two significant anomalies during the last year
  – Weak cell in the battery required some special operations during eclipse season last winter
  – An anomaly with the star tracker CCD (probably single event upset) caused a fault protection reset of the flight computer
• Otherwise QuikSCAT mission operations are relatively uneventful
• Senior Review 2009
  – We will propose 4 more years of operations
Age Issues for QuikSCAT Flight System

• Attitude control system
  – Star tracker CCDs may be showing minor age effects
  – GPS receiver – operates on 6 channels
    ♦ Backup receiver appears to have failed
    ♦ Ground tracking backup plan is ready, but expect some science data degradation if plan is implemented

• Command and telemetry system
  – Operating on the backup science data transmitter since July 2006
  – If backup transmitter fails, science data can’t be downlinked

• Electrical power system
  – Spare battery cell has been connected to overcome weak cell

• Scatterometer Instrument
  – Continues to operate on the primary string
  – Antenna bearings are showing their age
Antenna Motor Torque Trend
June 1999 to November 2008
QuikSCAT Follow-on Mission
NOAA operational objectives drove the design
  - high resolution, all wind, all weather capabilities
  - Temporal resolution was addressed by an optional tandem system

Instrument concept evolved from earlier studies that had been funded by NASA
  - Specific issues that were identified at the “Instrument Concept Peer Review” held in May 2007 helped us set priorities for the study
    - Key feasibility questions were resolved
    - Instrument configuration (mechanical and electrical)
    - Performance analysis and simulations
    - Cost

JPL’s technical concept, plans, schedule and cost were thoroughly reviewed before submitting the study report
  - Table top peer reviews
  - Formal Technical, Management and Cost (TMC) review including NOAA representatives

Study concluded that the concept is mature and ready to proceed into phase A immediately
XOVWM Flight System

- **Instrument:**
  - Ku-band SAR scatterometer
  - C-band scatterometer
  - X-band radiometer
  - Effective aperture is 3.5m in diameter
  - 800 km altitude, sun-synchronous orbit

- **Performance Capabilities:**
  - 1800 km swath
  - Accuracy for 3-80 m/s winds:
    - RMS Speed: 2 m/s or 10%
    - RMS Direction: 20°
  - Spatial Resolution:
    - Ku-band 5 km
    - C-band 10 km
  - Coastal mask: < 5 km
  - Coverage: 90% of global oceans every 24 hours
  - Latency: Delivered to operational users within 3 hours of measurement 85% of the time
GCOM-W2 is the third launch of JAXA’s Global Climate Observation Mission program

DFS is less capable than XOVWM but a significant improvement over QuikSCAT

GCOM-W2 will also carry an AMSR2 instrument

Intended to launch January 2016
  – DFS instrument delivery is required by May 2014

This mission is shaping up to be an affordable alternative for NOAA

Through international cooperation between JAXA, NOAA and JPL a viable mission approach has evolved
  – There have been two meetings; JPL and JAXA have agreed on the key spacecraft resources (mass, power, data rate, etc.)
  – DFS has been baselined as a second mission sensor for the GCOM-W2
Spacecraft resource availability drives the DFS concept
- JAXA concluded that the XOVWM instrument could not be accommodated
- Mass limitation (275 kg allocation)
- Plenty of power is available (640 W allocation)
- Volume is limited by launch vehicle fairing and by the field of view requirements for spacecraft sensors and communications antennas

- Maximum reflector dimension that fits the available volume is 2.1m
- Significant improvements relative to SeaWinds on QuikSCAT are achieved
DFS Instrument for GCOM-W2

- 2 C-band and 2 Ku-band channels
  - 1800 km Swath
- 2.1 m antenna fits within allowable volume
- 4 channel RF rotary joint
  - Only the antenna and feeds rotate
  - Minimizes angular momentum that must be compensated
- 220 W TWTA transmitters capitalizes on the available DC power
- Performance advantages include resolution, all-weather and high winds capabilities
QuikSCAT has exceeded all expectations, but is becoming more vulnerable as time passes
  - Nonetheless, we believe 4 more years of operations are possible and will propose that in the 2009 Senior Review
A NOAA/JAXA partnership on GCOM-W2 is the most promising opportunity to fly a QuikSCAT Operational Follow-on mission
  - NOAA and JAXA are working on a letter of intent to describe the planned partnership
    - Enables both agencies to work toward approval of the necessary budgets
  - An instrument Mission Concept Review is being planned for next September or October
    - A portion of the funding to support this effort is already in place and NOAA plans to provide the rest later this year
  - JPL will support JAXA’s Mission Definition Review for GCOM-W2 next December