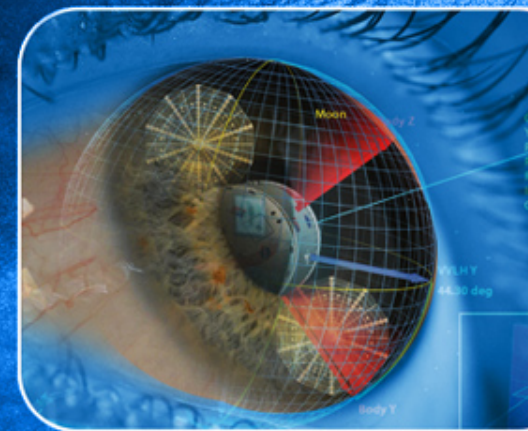**OCTOBER 7-9, 2008 • CHICAGO**

TOTAL ACCESS

Processing GPS Receiver Data for Improved Fermi GLAST Navigation

Mark Woodard

NASA Goddard Space Flight Center

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Company Overview

- NASA's Goddard Space Flight Center (GSFC) is in Greenbelt, Maryland, approximately 6.5 miles northeast of Washington, D. C.

- GSFC is a major U.S. laboratory for developing and operating unmanned scientific spacecraft.

- The Center manages many of NASA's Earth Observation, Astronomy, and Space Physics missions, including the Hubble Space Telescope (HST)

Program/Project Overview

- The Fermi Gamma-ray Large Area Space Telescope (GLAST) is a high-energy observatory launched June 11, 2008.

- Fermi GLAST's 5-year mission objectives:
  - Explore the most extreme environments in the Universe.
  - Search for signs of new laws of physics and what composes the mysterious Dark Matter.
  - Explain how black holes accelerate immense jets of material to nearly light speed.
  - Help crack the mysteries of gamma-ray bursts.
  - Answer long-standing questions across a broad range of topics, including solar flares, pulsars and the origin of cosmic rays.

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Challenges

- Fermi GLAST uses a General Dynamics Viceroy GPS receiver for orbit determination – time, position & velocity

- The operations team needed to improve the Viceroy velocity estimates in order to produce accurate 6-week orbit prediction for mission planning
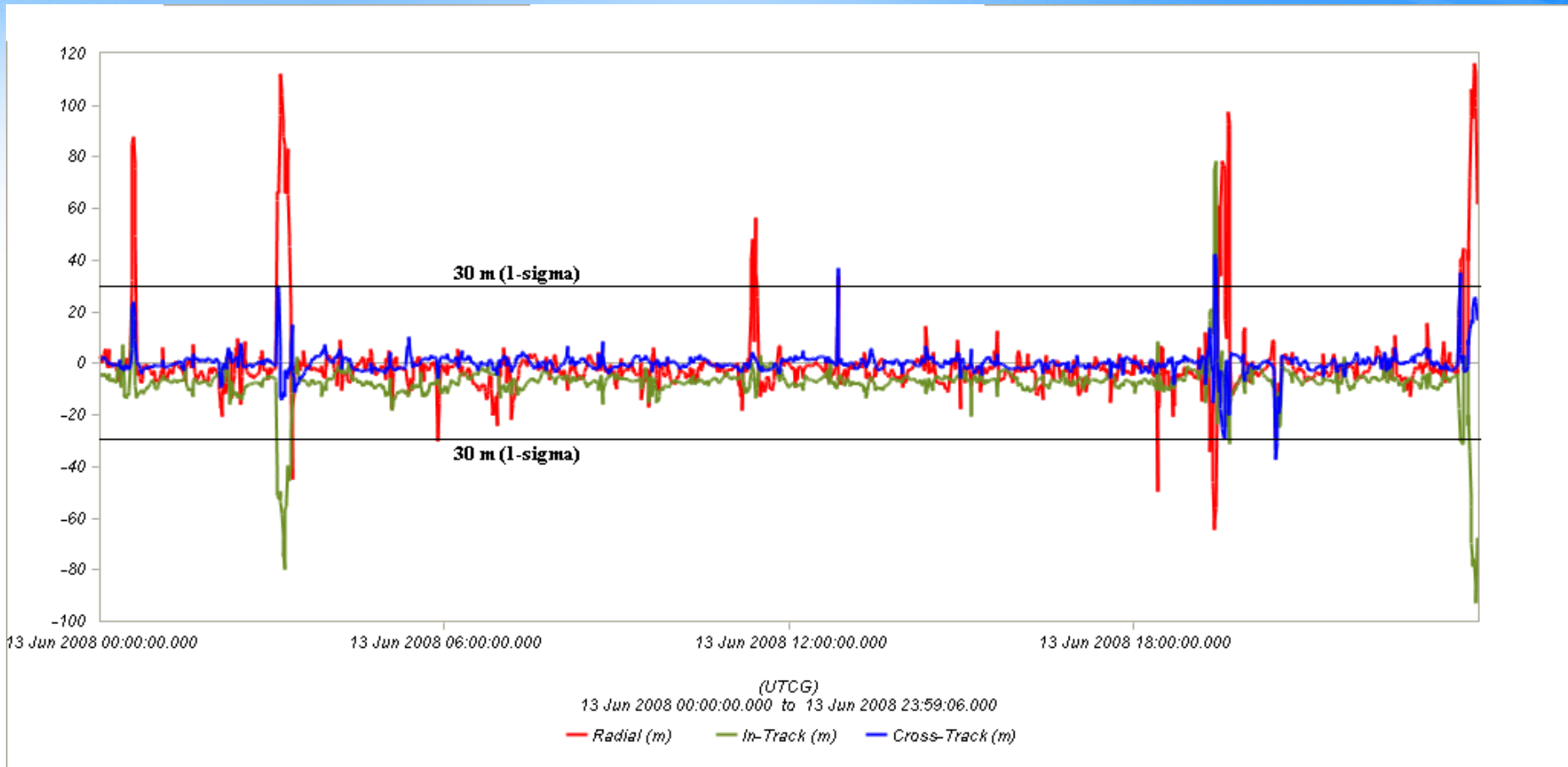
Solution

- ODTK provided a COTS solution to filter-smooth the Viceroy orbit data

- ODTK processed data formats were readily usable with other MOC STK products (STK/Pro, STK/Scheduler, etc.)

- We considered using a GOTS product - the Goddard Trajectory Determination System (GTDS)
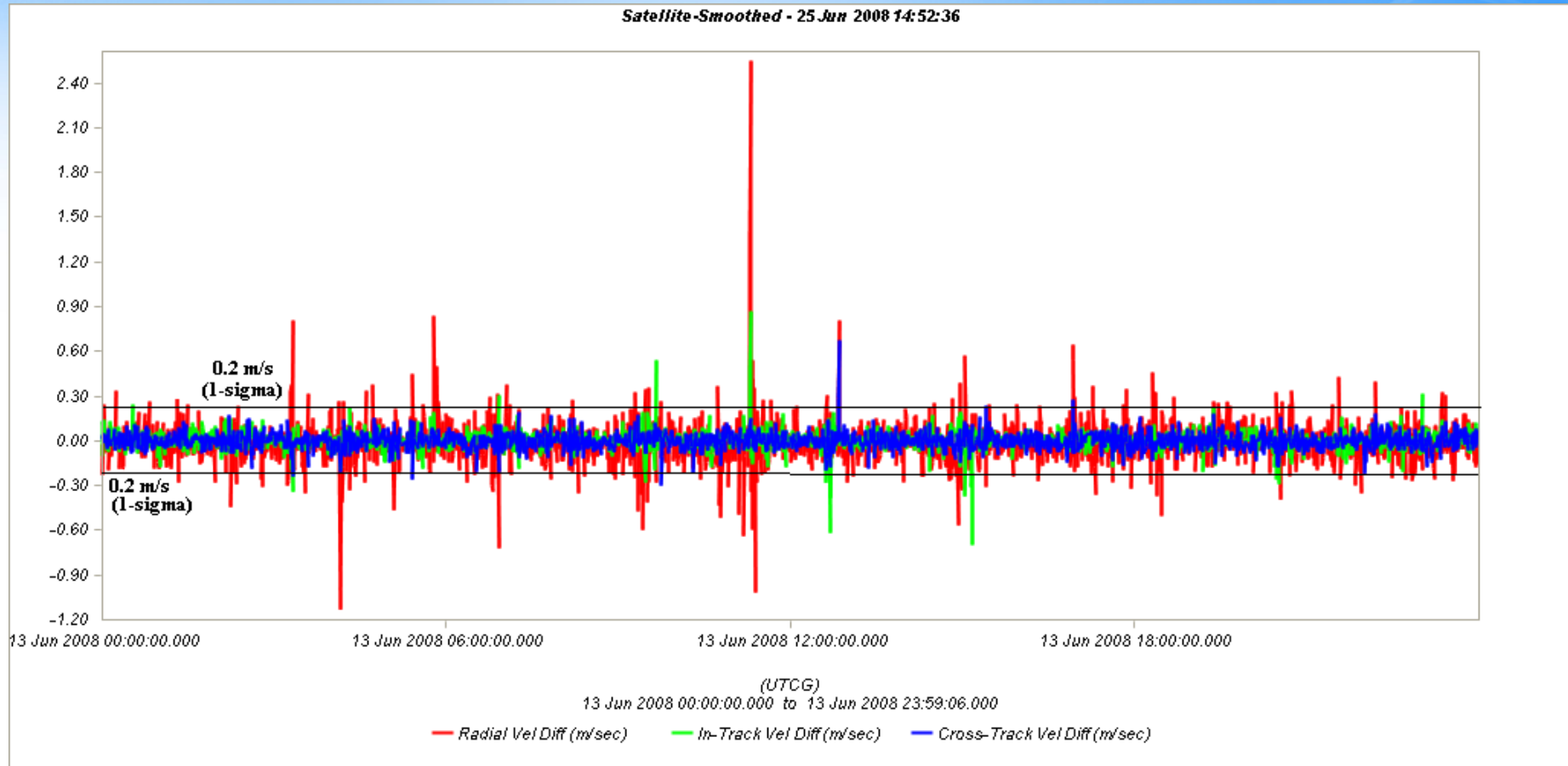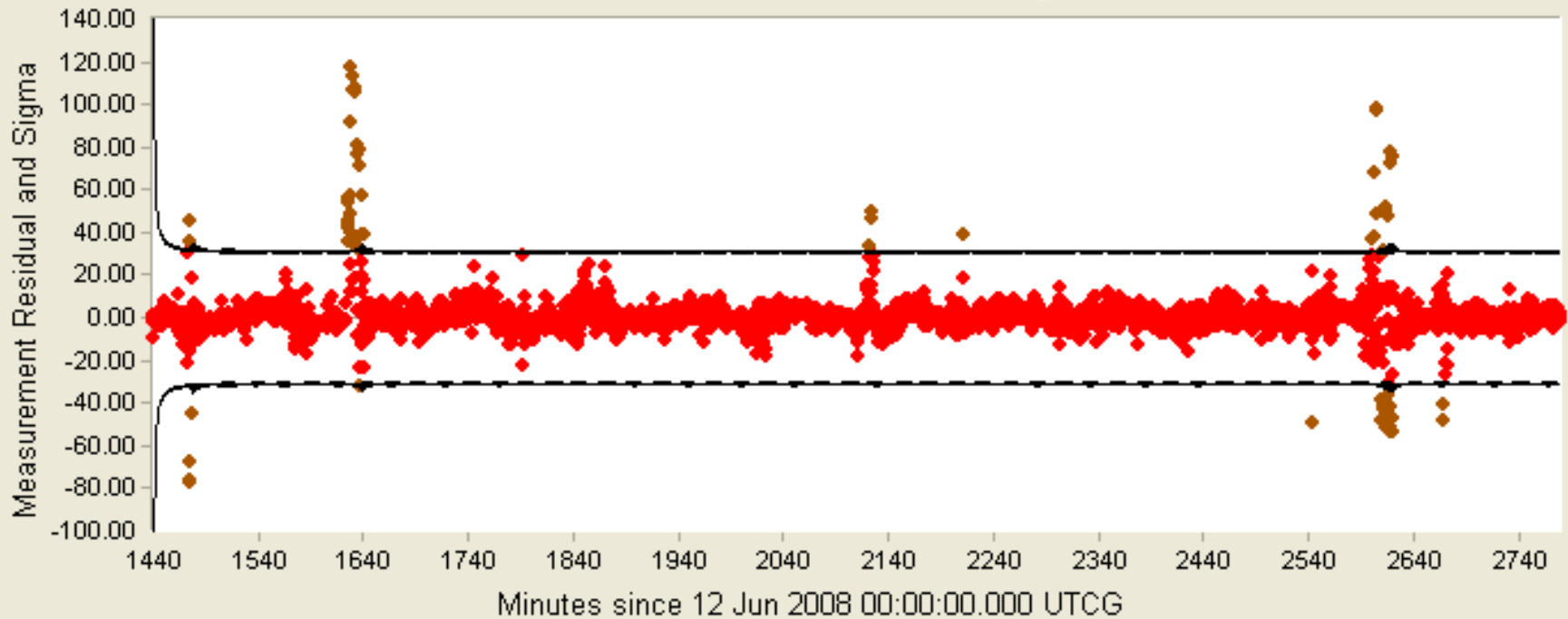 - Not practical to use GTDS with the MOC software architecture

Results

Results

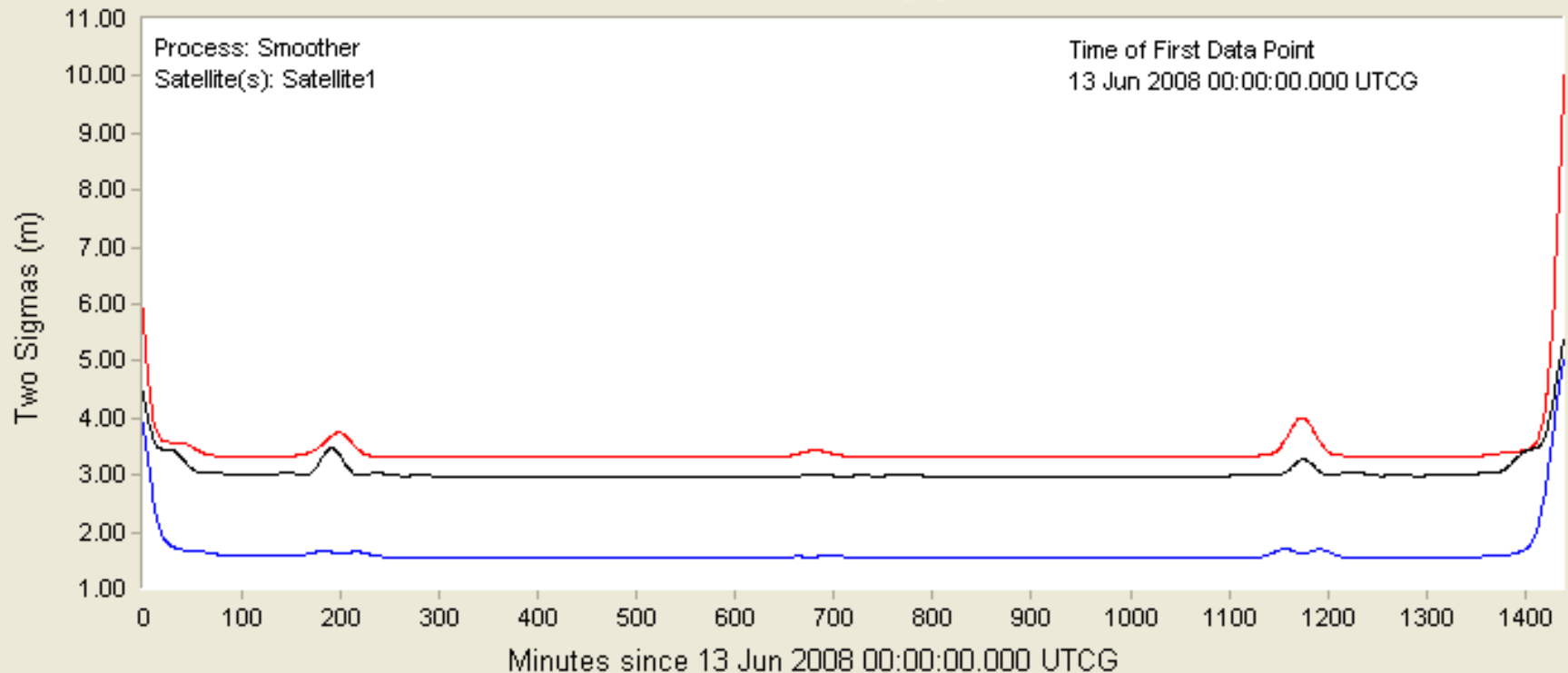# Results

Measurement Residual and Sigma

Legend:
- ♦ A Satellite1.GPSReceiver1 Meas Residuals
- ♦ RE Satellite1.GPSReceiver1 Meas Residuals
- — Satellite1.GPSReceiver1 3-Sigma Meas Residual
- — Satellite1.GPSReceiver1 -3-Sigma Meas Residual

Position Uncertainty (0.95P)

Process: Smoother
Satellite(s): Satellite1

Time of First Data Point
13 Jun 2008 00:00:00.000 UTCG

Two Sigmas (m) vs. Minutes since 13 Jun 2008 00:00:00.000 UTCG

— Satellite1 2-Sigmas Radial   — Satellite1 2-Sigmas Intrack   — Satellite1 2-Sigmas Crosstrack

Velocity Uncertainty (0.95P)

Process: Smoother
Satellite(s): Satellite1

Time of First Data Point
13 Jun 2008 00:00:00.000 UTCG
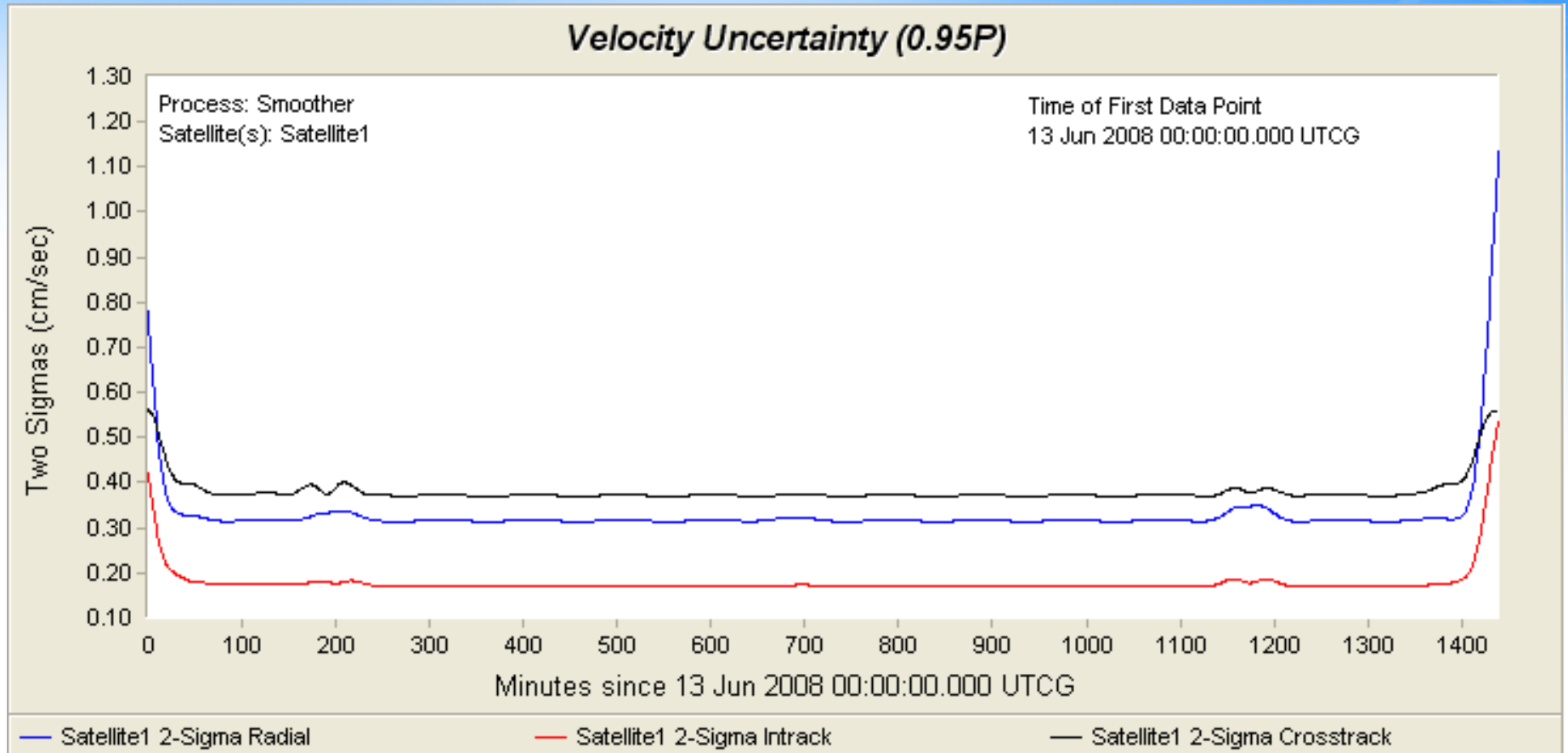
Minutes since 13 Jun 2008 00:00:00.000 UTCG

— Satellite1 2-Sigma Radial   — Satellite1 2-Sigma Intrack   — Satellite1 2-Sigma Crosstrack

Future Work

- ODTK is being considered for future GSFC missions that use GPS:
  - Global Precipitation Measurement (GPM) mission
  - Landsat Data Continuity Mission (LDCM)

Contact Information

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