

Rapid Delivery GPS-Based Orbits for Altimetry Support

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TOPEX/Poseidon (August 1992 —)

- **NASA/CNES mission directed at observing large-scale circulation.**
- **1300 km orbit with 10-day repeating ground track**
- **Extended observational phase since Fall 1995**
- **Tracked by Doris, SLR and GPS**
- **Radial orbit accuracy: 2-2.5 cm RMS**
- **Sea surface height accuracy: ~4 cm RMS**

Anti-Spoofing Issues for T/P GPS POD

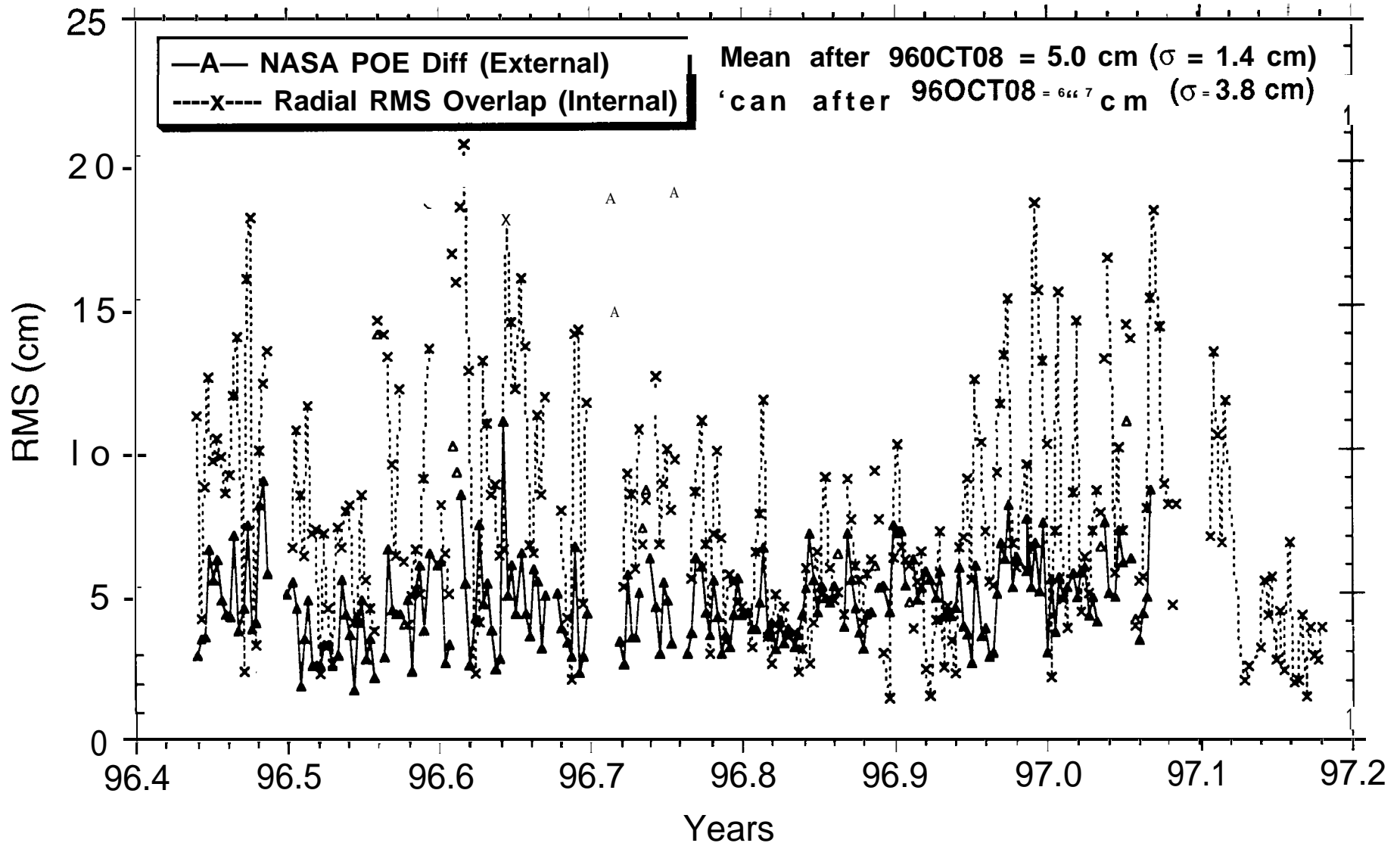
- **AS activated routinely since January, 1994.**
- ⇒ **GPSDR reverts to single-frequency operation**
 - **Ionosphere emerges as leading source of error, even at 1300 km.**
 - **Traditional “reduced-dynamics” not advisable.**

- **With AS on, GPSDR is still a powerful POD system:**
 - **Orbits with 3-6 cm radial RMS accuracy routinely produced.**
 - **Preliminary results from experimental strategies suggest <3 cm accuracy.**
 - **New GPS techniques lend themselves to significant automation and very rapid turnaround.**

Quick-Look Analysis: **GPS-Based** Orbits for T/P

- T/P “**Next-day quick-look**” orbits (since 8/95)
 - For U.S. Navy Altimetry Data Fusion Center
 - Based on predicted (1-day) GPS orbits (1 m 3D accuracy)
 - Need data from 12 ground stations ($\zeta = 4000$ km) for GPS clocks
 - Radial RMS accuracy of 3–9 cm by ~1000 UTC for previous-day orbits
 - Radial RMS accuracy of 15–50 cm in real time based on predict
- T/P **Rapid precision science orbits** (since 6/96)
 - . Used in NOAA quick-look analyses
 - Need data from 18 ground stations ($\zeta = 3400$ km) for GPS orb./clocks
 - Based on “quick-look” GPS orbits (25 cm 3D accuracy)
 - Radial RMS accuracy of 3–6 cm by -1400 UTC for previous-day orbits

Radial Accuracy History for T/P GPS Rapid Precise Orbits



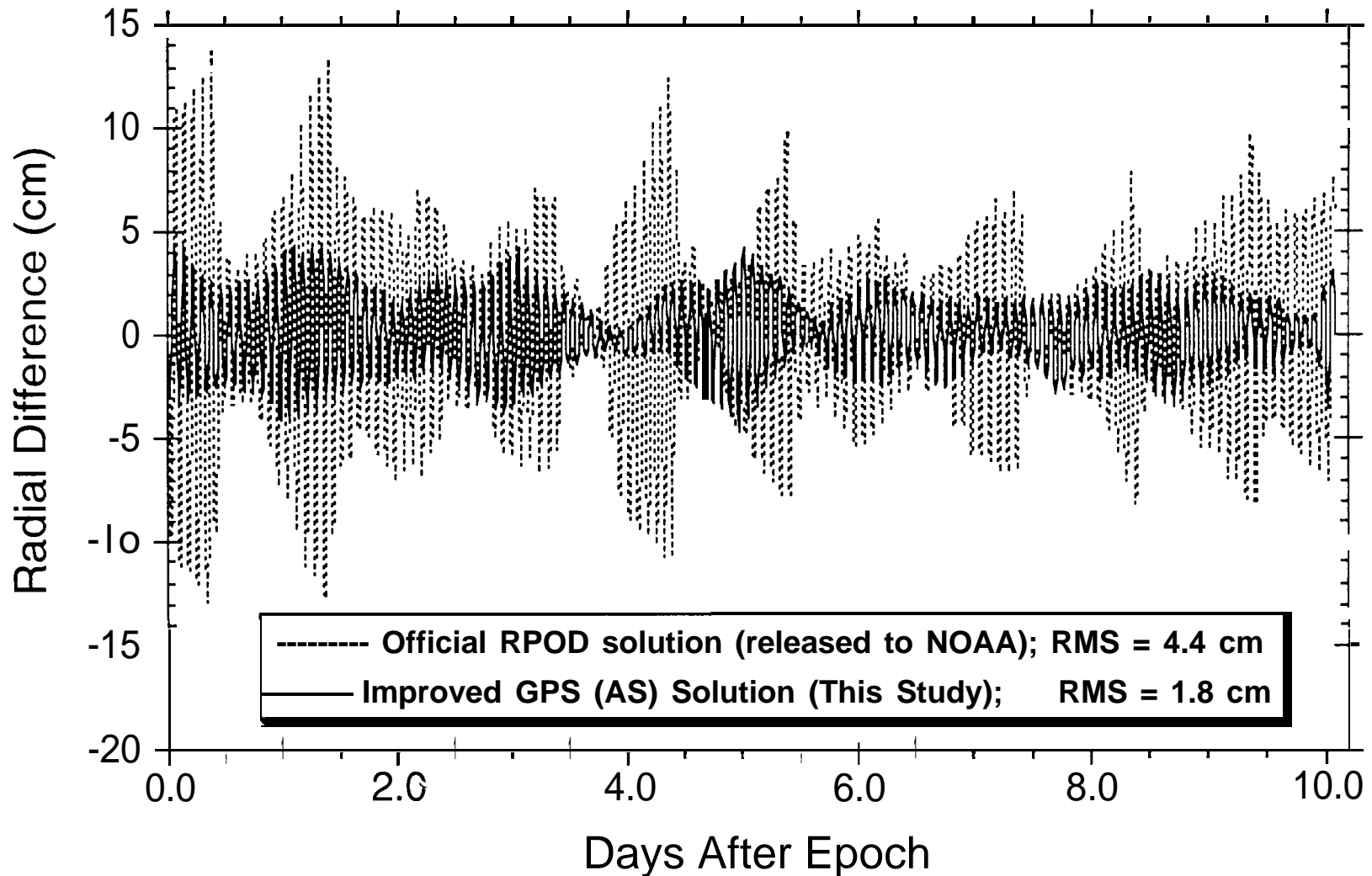
Operational Applications of Near Real Time Satellite Altimetry

⇒ Examples of Activities presently relying on the GPS-based rapid service T/P orbits:

- **Produce near real time estimates of global sea heights**
 - **NOAA/Natl Ocean Service** (http://ibis.grdl.noaa.gov/SAT/near_rt/topex_2day.html)
 - **Univ. Of Colorado** (http://www-ccar.colorado.edu/research/alt/html/alt_nrt.html)
- **Rapidly assimilate data into global ocean models**
 - **Improve global circulation models at U.S. Navy Altimeter Data Fusion Center**
 - **Improve ENSO forecasts at NOAA/Natl. Center for Environmental Prediction** (http://nic.fb4.noaa.gov:80/products/analysis_monitoring/enso_advisory/)
- **Monitor regional ocean dynamics in near real time**
 - **Track eddies in Gulf of Mexico to support offshore oil industry, ocean surveys** (http://www-ccar.colorado.edu/research/gom/html/gom_nrt.html)

T/P Repeat Cycle 150 Orbit Differences

GPS AS Orbits vs NASA POE



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