
*TOPEX/POSEIDON PROJECT SATELLITE/SENSORS
PERFORMANCE CHARACTERISTICS WORKSHOP#10*

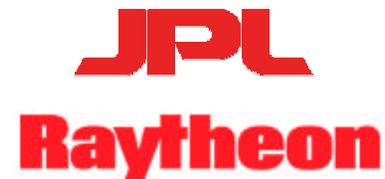
OPERATIONAL TRAJECTORY PRODUCTS

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NAV/PVT

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Operational Trajectory Products



Contents



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- **Operational Orbit Ephemeris (OOE) Performance**
 - **On-Board Computer (OBC) Ephemeris Performance**
 - **Other Orbit Products: Orbit Events File (OEF), Orbit Revolution File (ORF)**



OOE Performance



REQUIREMENTS

- **The accuracy requirements for the OOE are (all 3 σ):**

Sequence Development (OEF)	± 20 km after 7 days
OBC Ephemeris	± 6 km (3-D) after 7 days
Ground Track Repeatability	± 750 m at Ascending Node after 30 days
IGDR Data Location	± 1 km (3-D) after 5 days
DORIS Initialization	± 3 km along-track after 5 days

- **Driving requirement is for Ground Track Repeatability**

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OOE Performance



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- **The OOE accuracy can be evaluated by direct comparison with the POE.**
 - **EPVs received from the GSFC/FDF are compared with the POE on 60 individual days between 2 June 2000 and 22 May 2001.**
 - **Comparisons are performed in orbit plane coordinates.**

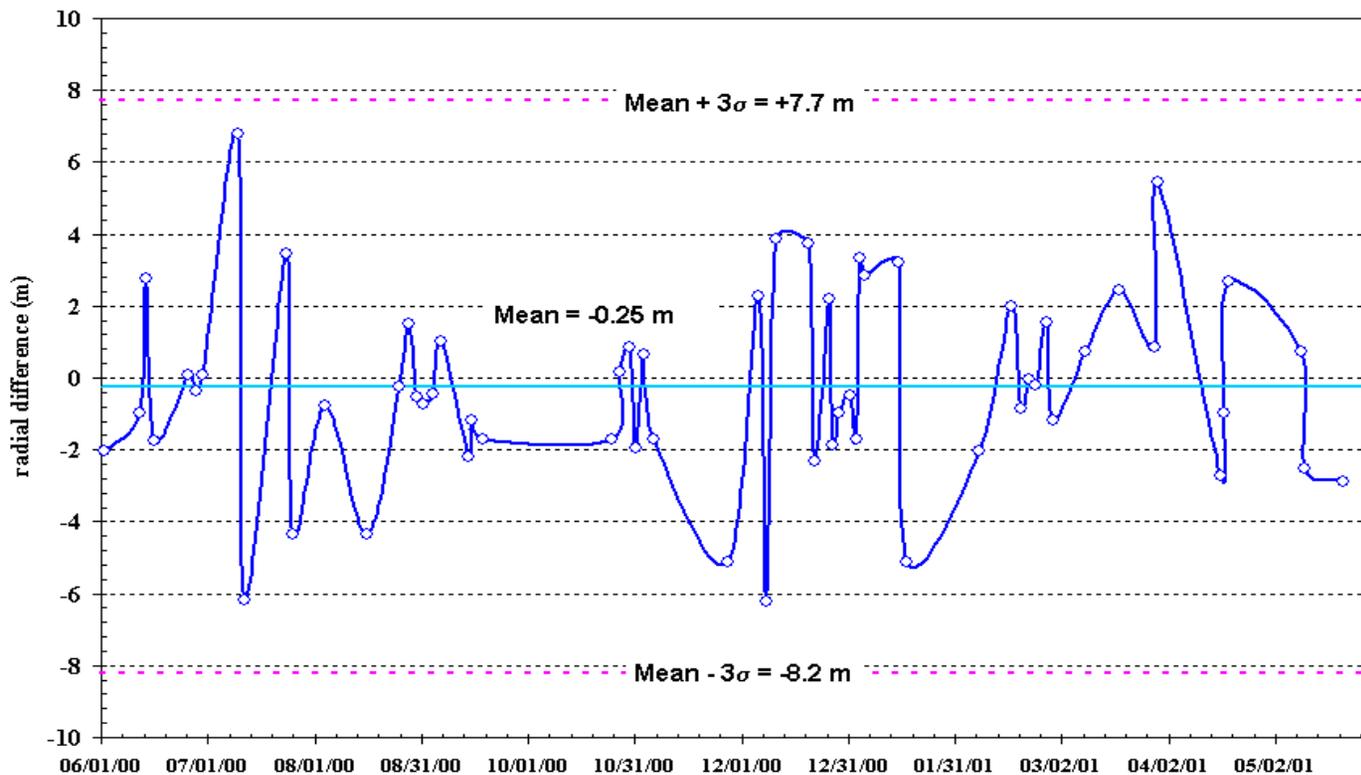
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OOE Performance



RADIAL POSITION DIFFERENCES AT EPOCH
(OOE minus POE)



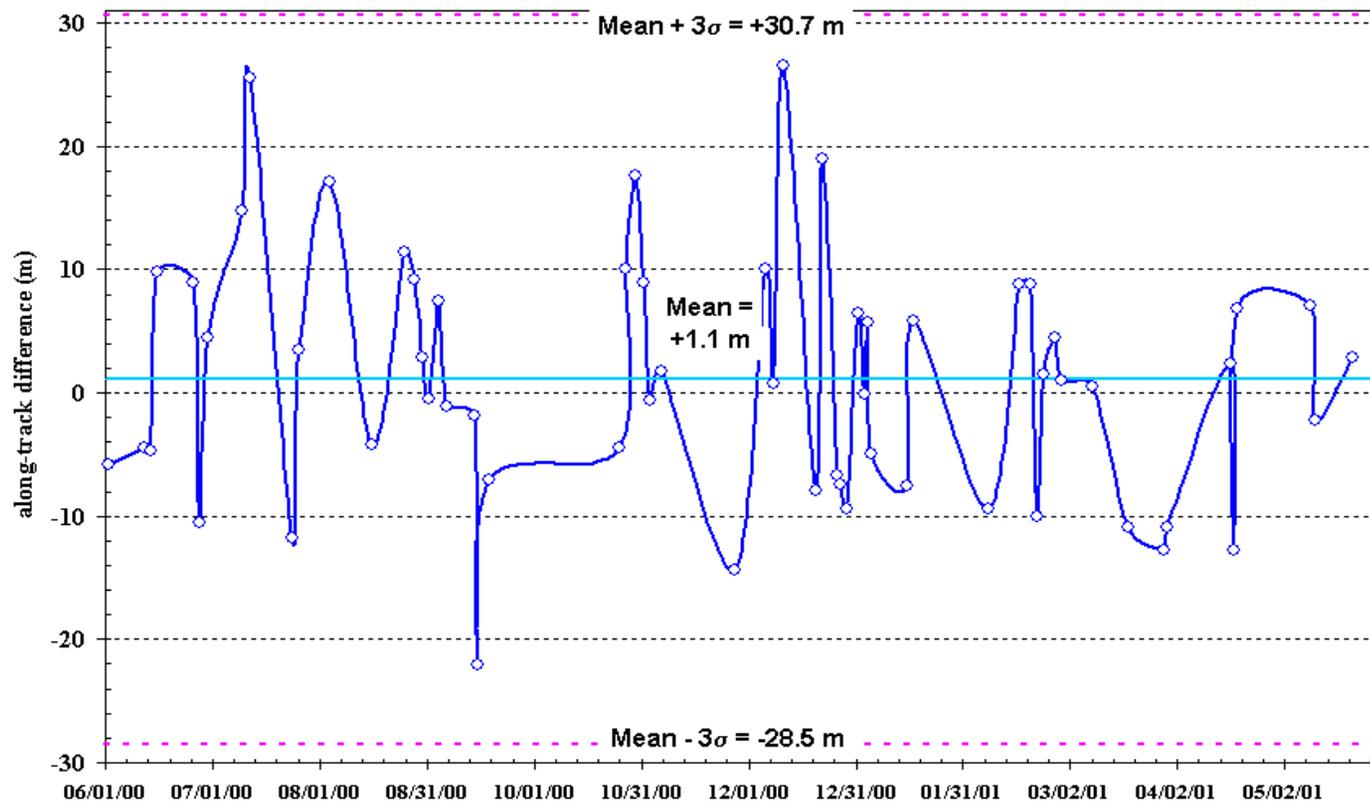
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OOE Performance



ALONG-TRACK POSITION DIFFERENCES AT EPOCH
(OOE minus POE)



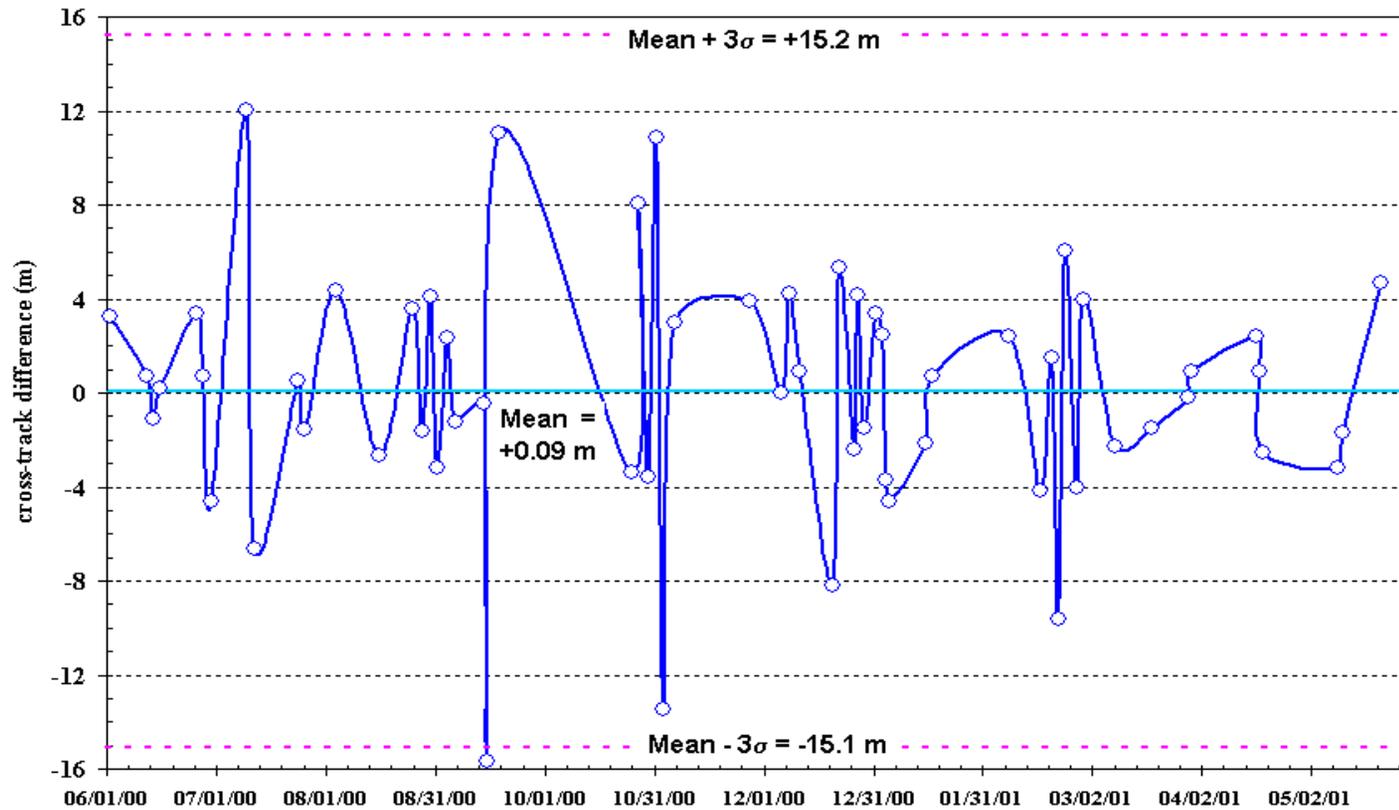
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OOE Performance



CROSS-TRACK POSITION DIFFERENCES AT EPOCH
(OOE minus POE)



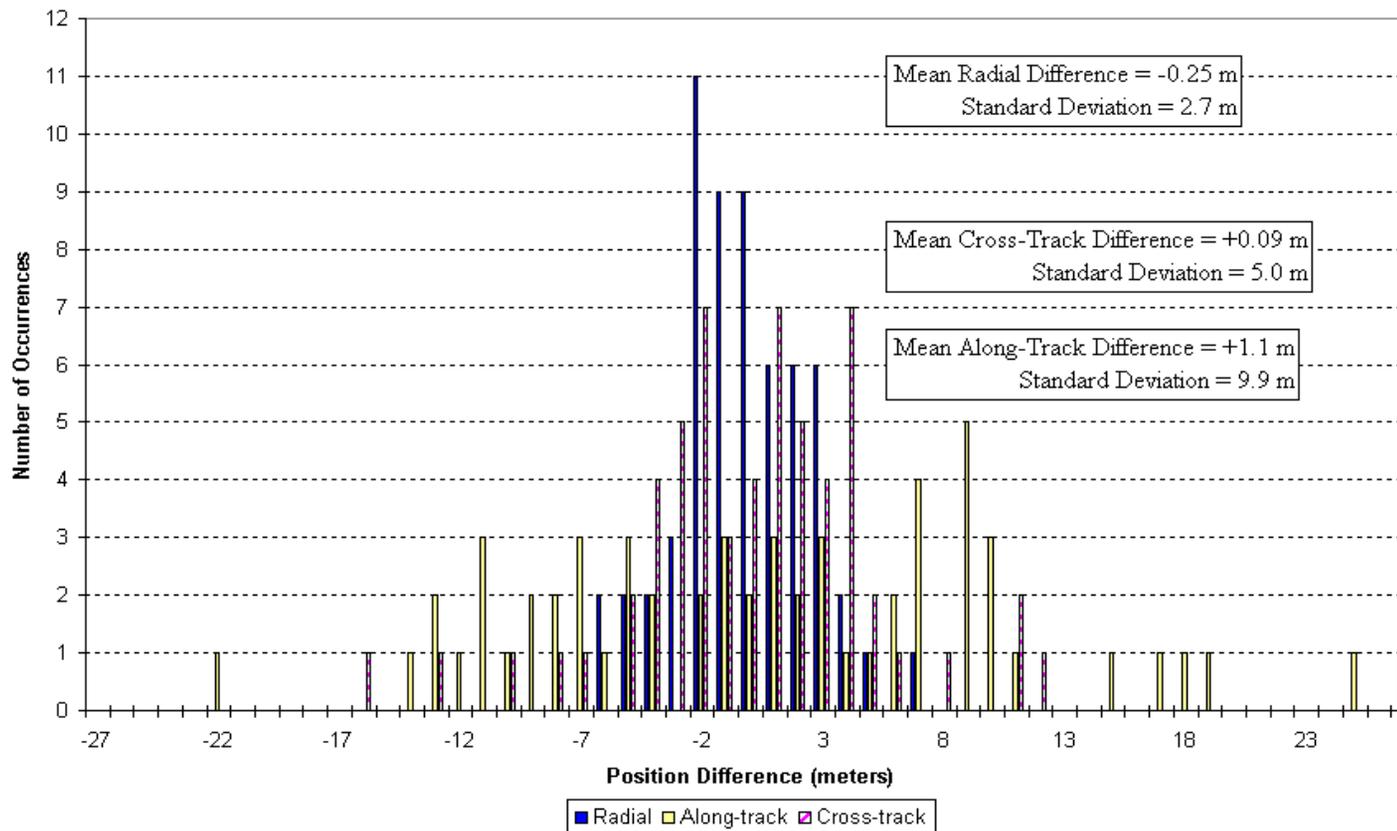
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OOE Performance



HISTOGRAM OF POSITION DIFFERENCES
(OOE minus POE)



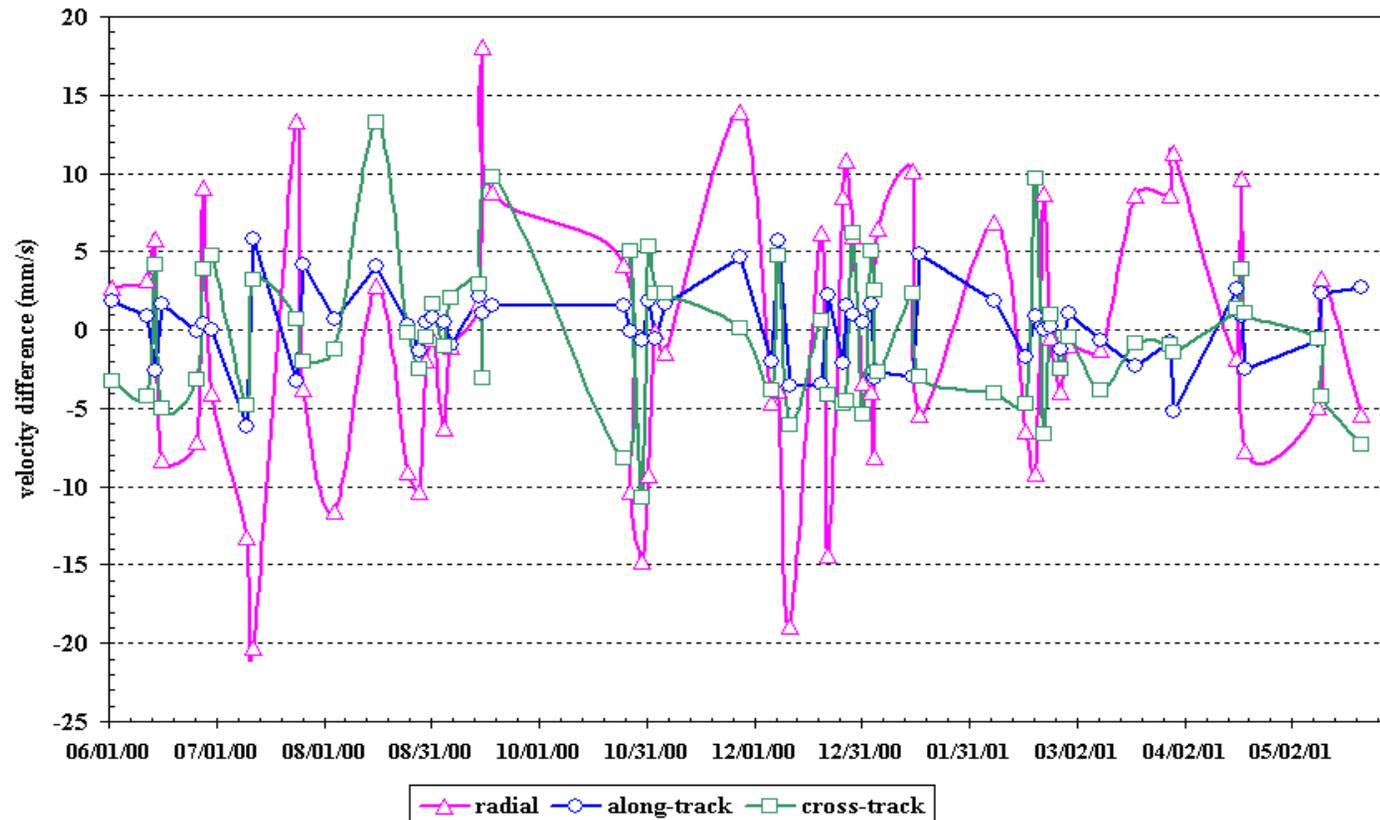
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OOE Performance



VELOCITY DIFFERENCES AT EPOCH
(OOE minus POE)



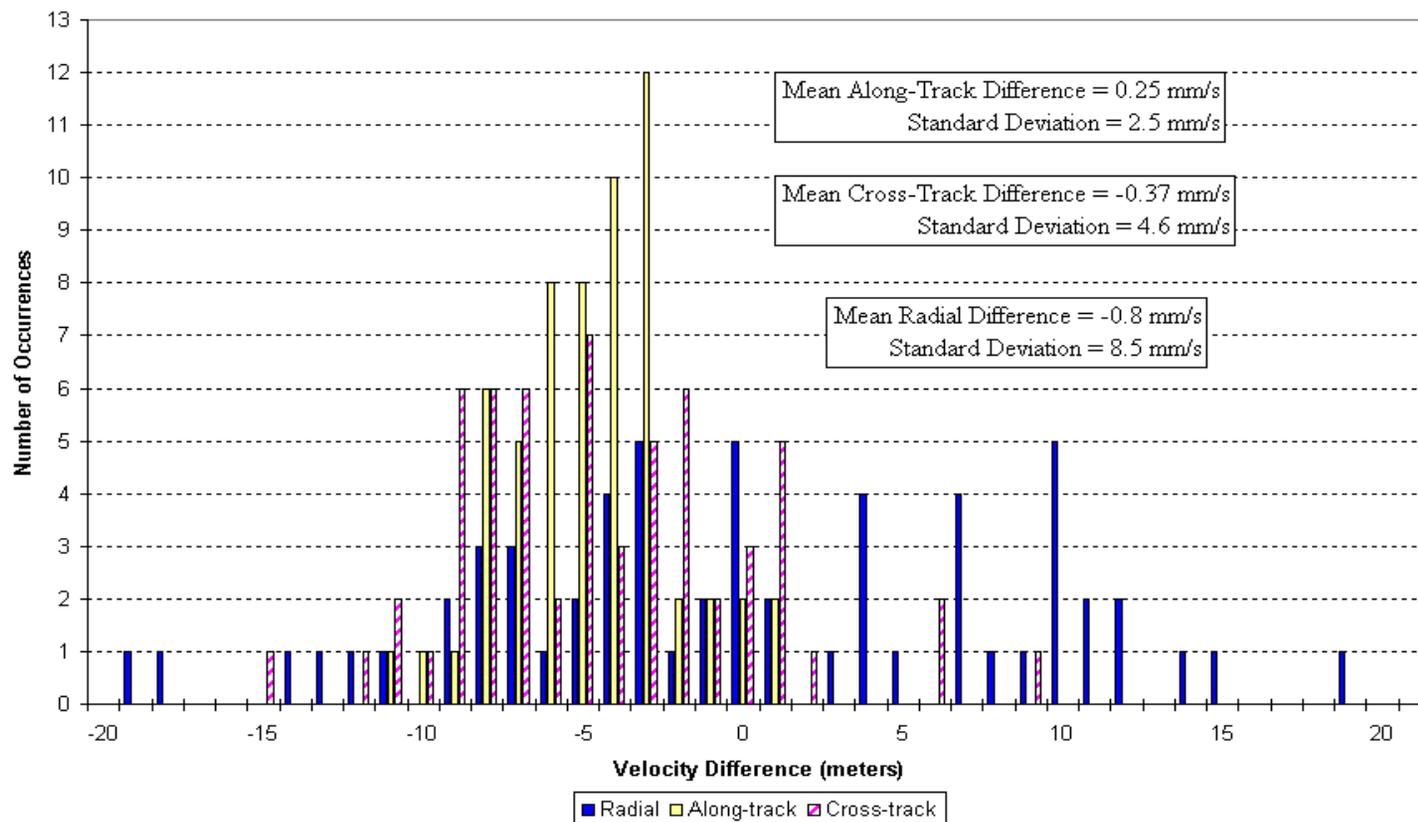
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OOE Performance



HISTOGRAM OF VELOCITY DIFFERENCES
(OOE minus POE)



CONCLUSION

- The Operational Orbit Ephemeris (OOE) continues to meet all accuracy requirements.
- It agrees very well with the POE:

Position differences (m)	Min.	Max.	Mean	Sigma
Radial	-6.2	6.8	-0.25	2.7
Along Track	-22.1	26.6	+1.1	9.9
Cross Track	-15.7	12.0	+0.1	5.1

Velocity differences (mm/s)	Min.	Max.	Mean	Sigma
Radial	-20.2	18.1	-0.8	8.5
Along Track	-6.2	5.8	-0.25	2.5
Cross Track	-10.7	13.2	-0.37	4.6

POINTING ERROR REQUIREMENTS

Ephemeris prediction errors due to operational orbit determination	< 0.015 deg (rms)	2 km along track position error
Ephemeris error due to on-board representation and computation	< 0.022 deg (rms)	2.9 km along track position error
Combined pointing error	< 0.027 deg (rms),	3.6 km along track position error



EPHEMERIS REPRESENTATION ACCURACY

- **Representation accuracy is routinely measured by duplicating OBC on-board computations as part of the Command Load generation process:**
 - **Tables 33 (T/P) and 34 (TDRSS) generated, then used to propagate ephemeris for direct comparison with original OOE's**
 - **Along track position and angular differences computed for direct comparison with required accuracy**

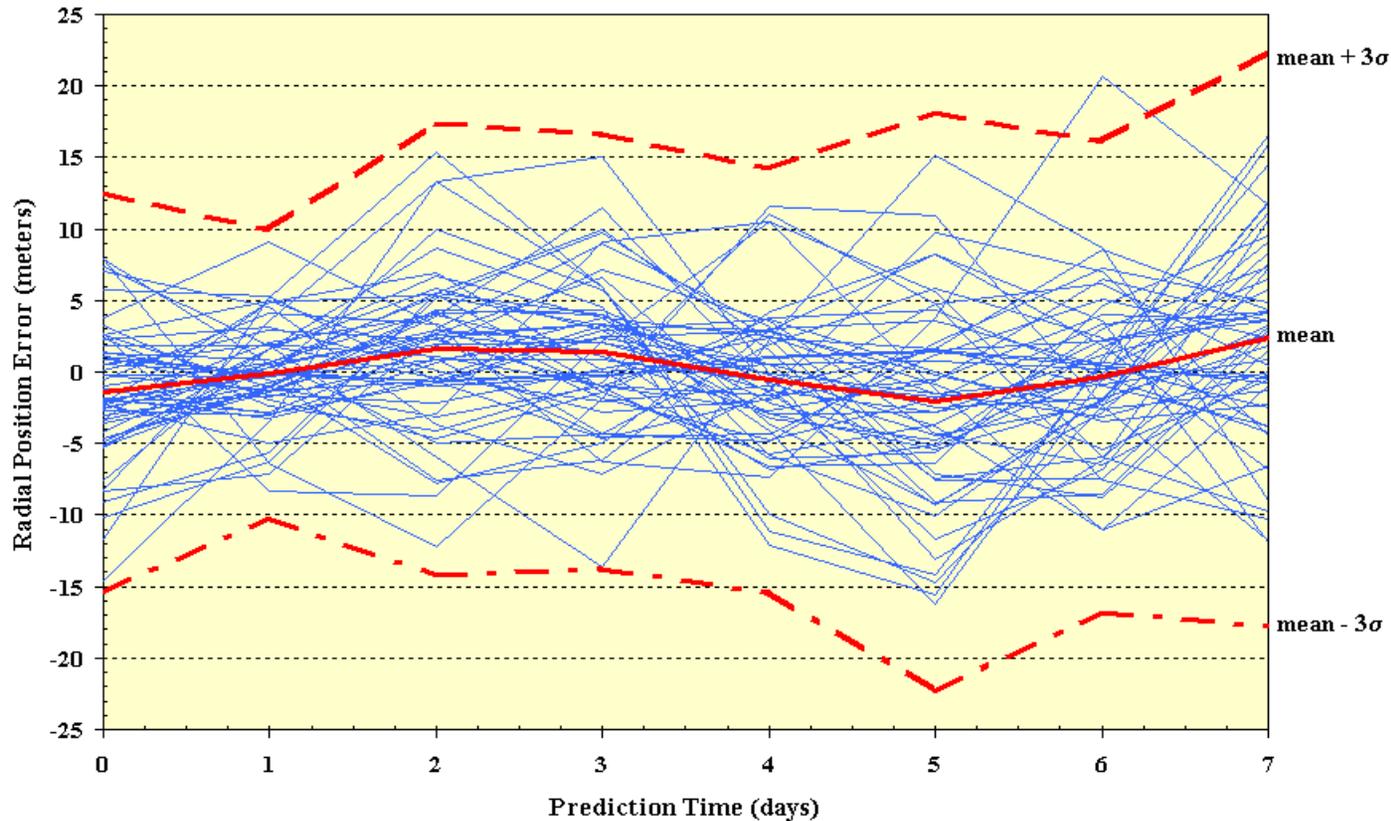
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OBC Ephemeris Performance



RADIAL POSITION ERRORS OF OOE USED TO COMPUTE
OBC EPHEMERIS COMMAND LOADS



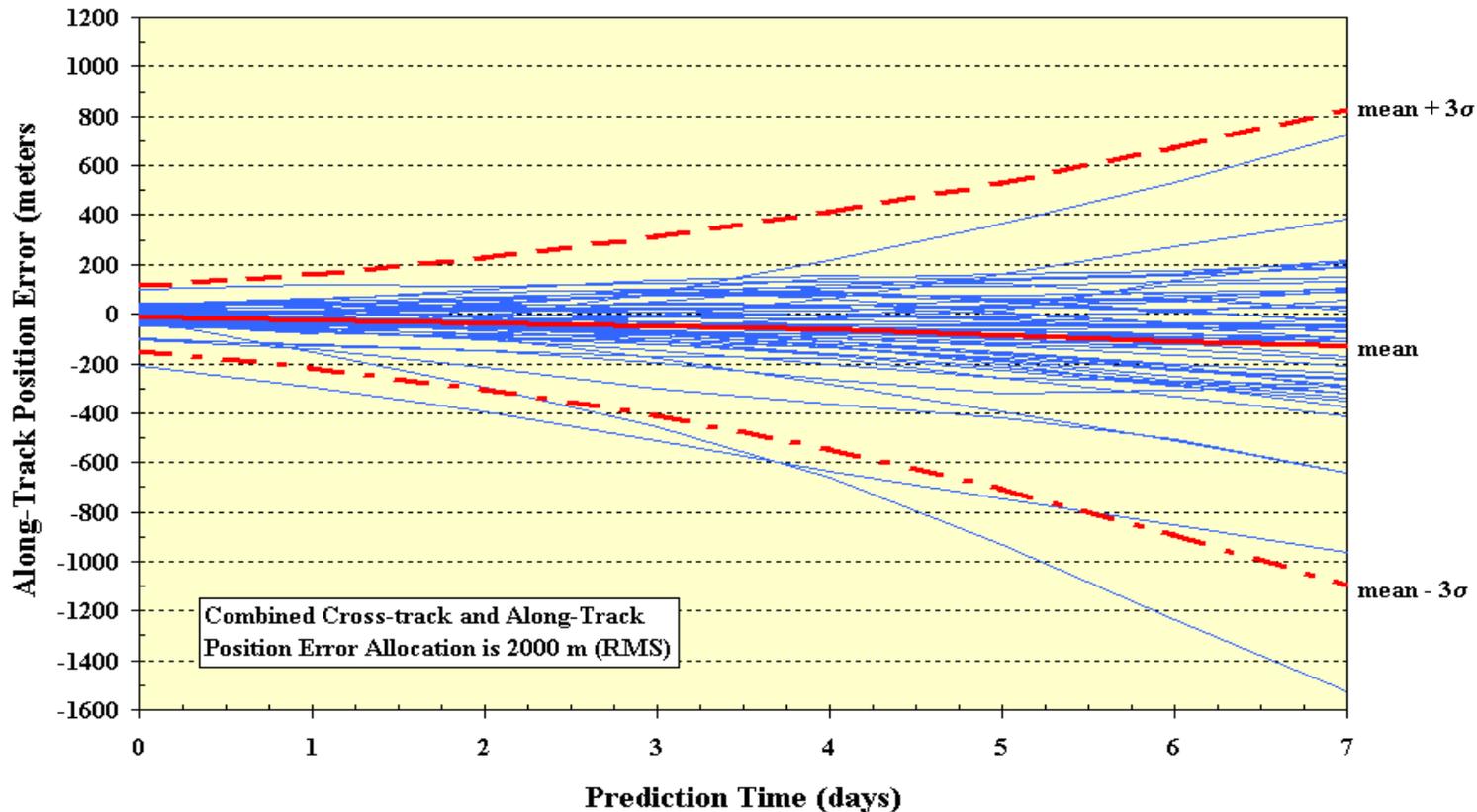
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OBC Ephemeris Performance



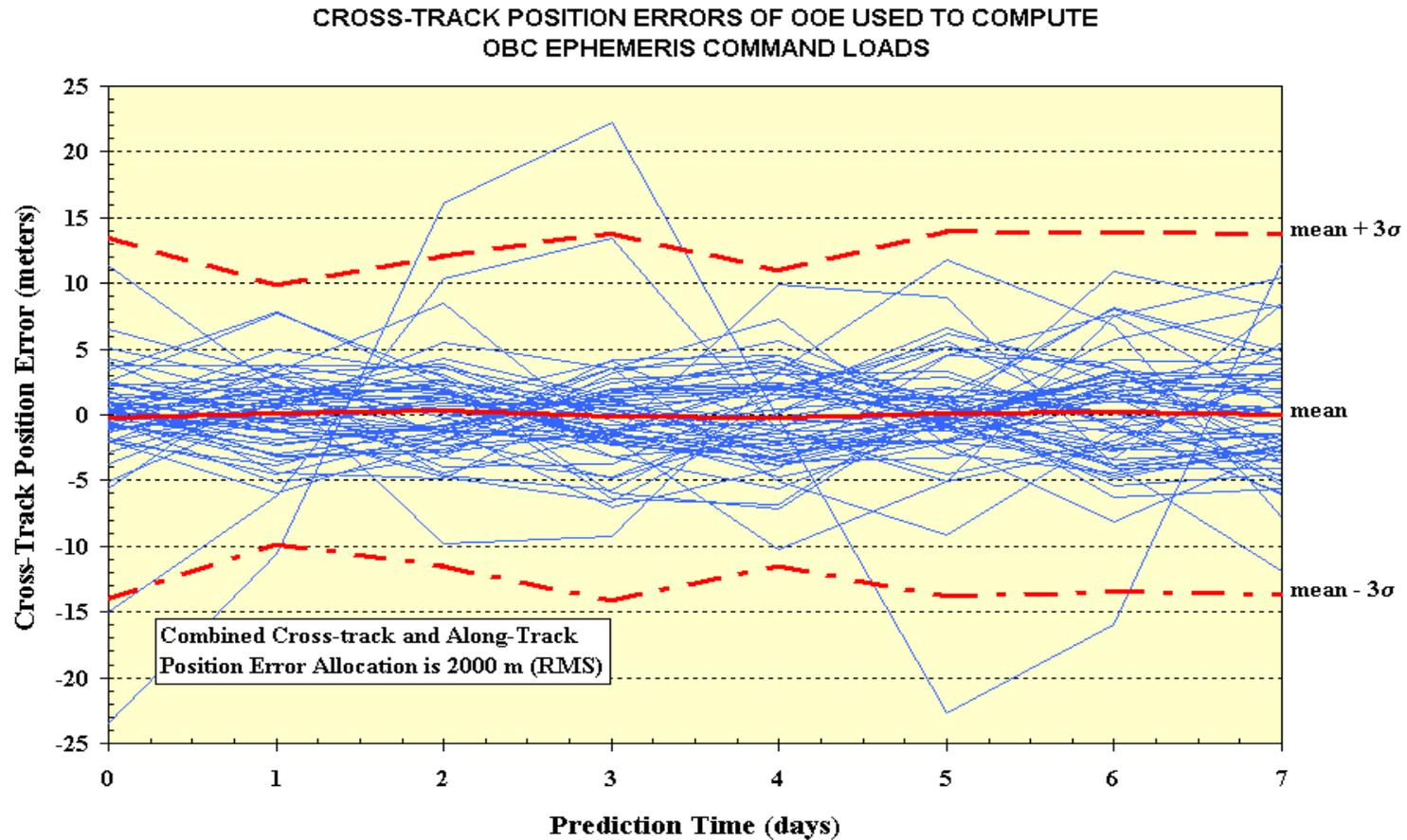
ALONG-TRACK POSITION ERRORS OF OOE USED TO COMPUTE
OBC EPHEMERIS COMMAND LOADS



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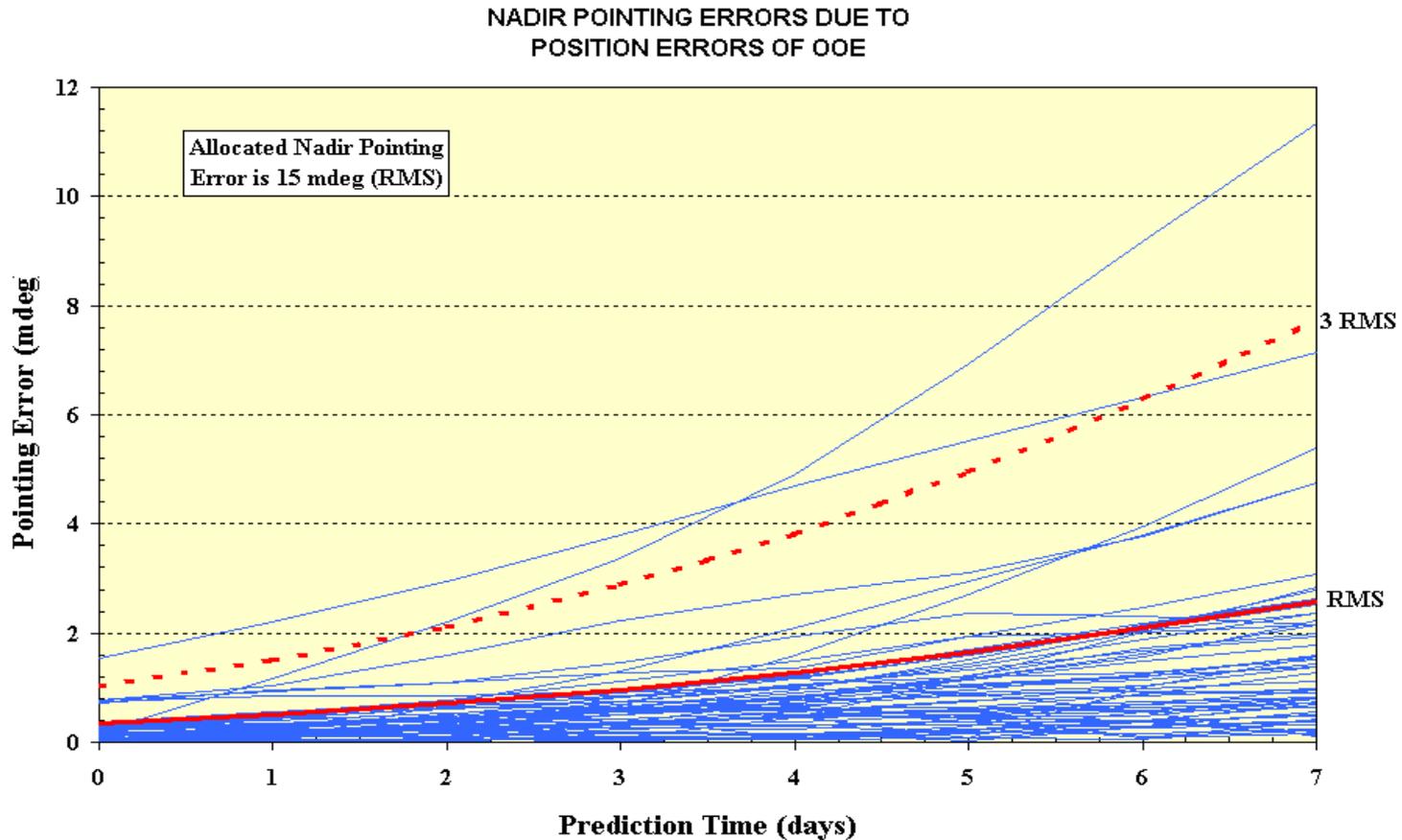
OBC Ephemeris Performance



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OBC Ephemeris Performance



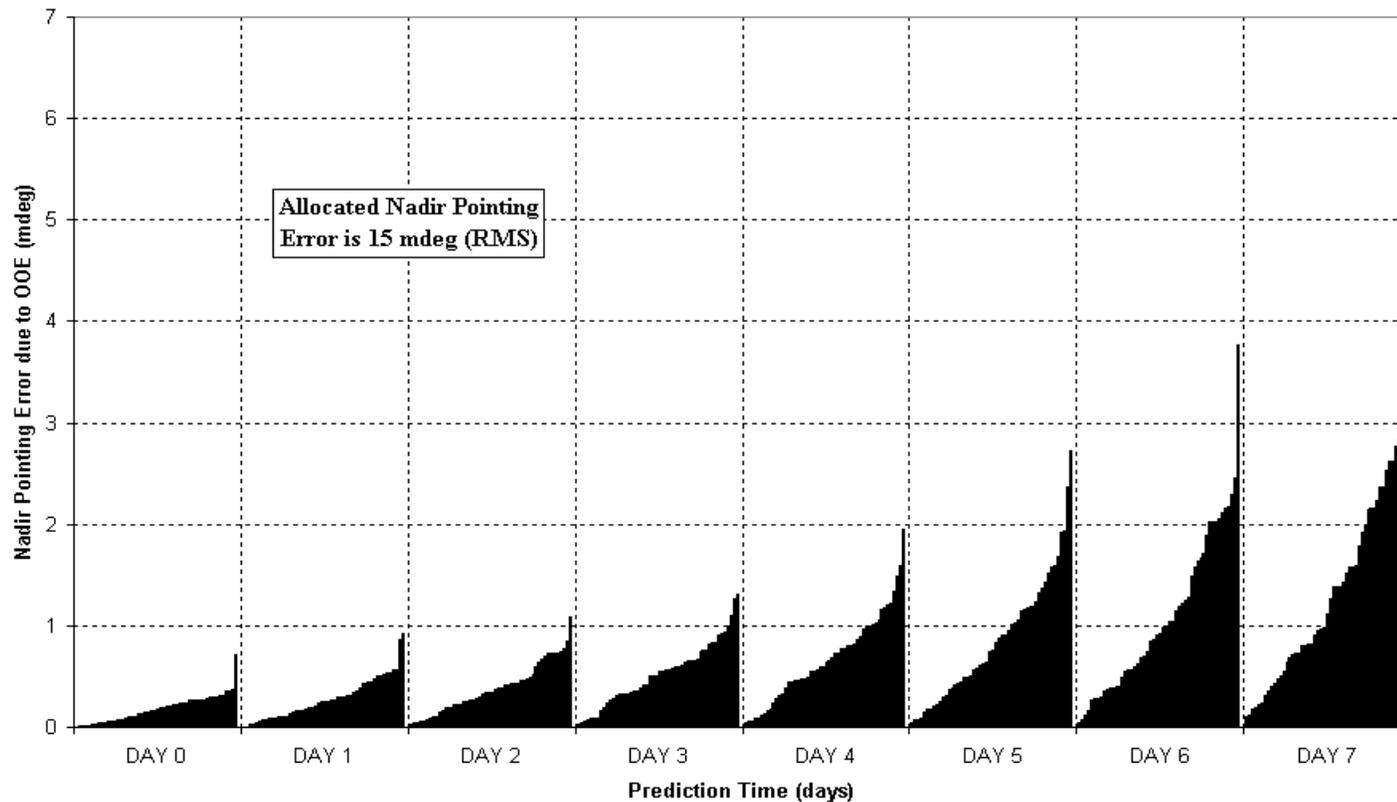
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OBC Ephemeris Performance



HISTOGRAM OF NADIR POINTING ERRORS DUE TO OOE POSITION ERRORS
FOR OBC EPHEMERIS COMMAND LOADS (SEQ0022-0125)



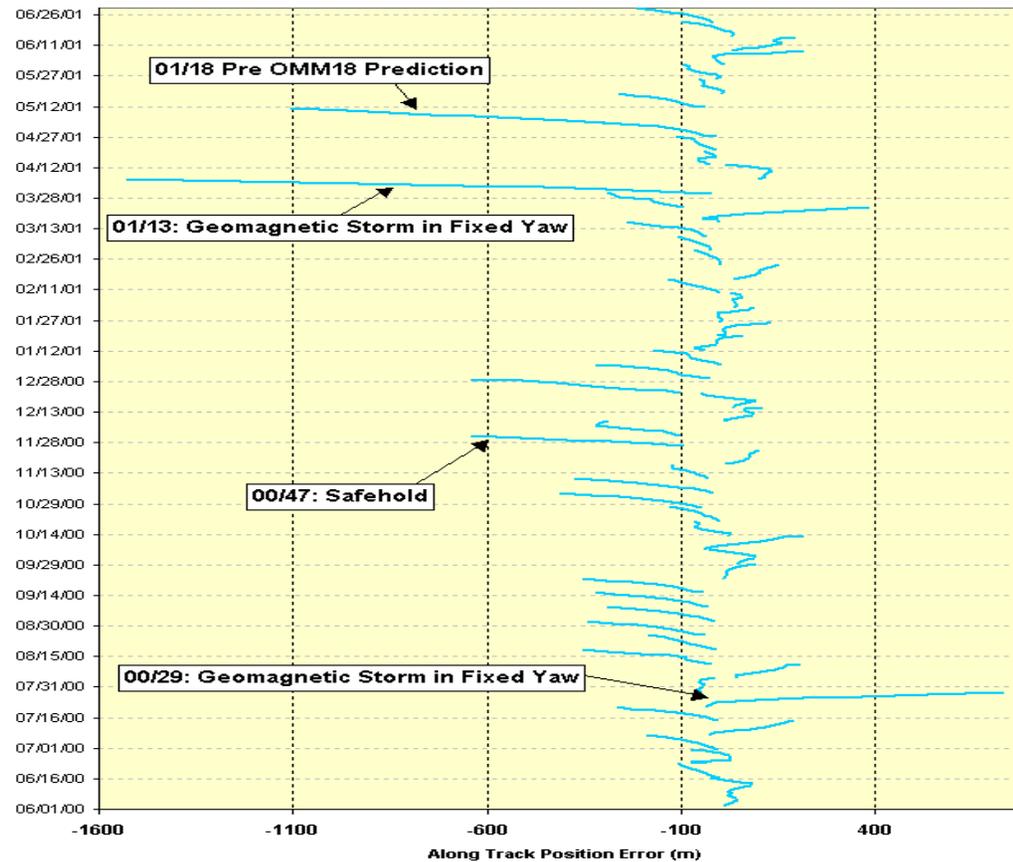
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OBC Ephemeris Performance



ALONG TRACK POSITION ERROR OF OOE USED TO COMPUTE OBC EPHEMERIS COMMAND LOADS





CONCLUSION

- **Pointing accuracy requirements placed on the OBC ephemeris command load continue to be met, including all data reported here between SEQ 2000/22 and 2001/25.**
- **Pointing errors for sequences 00/29, 00/47, 00/51, 01/13 and 01/18 were observed to be somewhat larger than those for other sequences, but still well within the requirements.**



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- **Generation of the OEF and ORF has continued uneventfully for the last year.**
 - **Two sets of OEFs are generated:**
 - Regular OEF : TDRS East (41W) & TDRS West (171W)**
 - Extra OEF: TDRS Spare (47W) & TDRS West (174W)**
 - **Operational procedures document: The NAVT completed the first comprehensive compilation of all TOPEX navigation procedures. This document and its associated files are maintained on the topex-server.**