



Good, Better, Best: A Comparison of Jason-2 O//GDR Products

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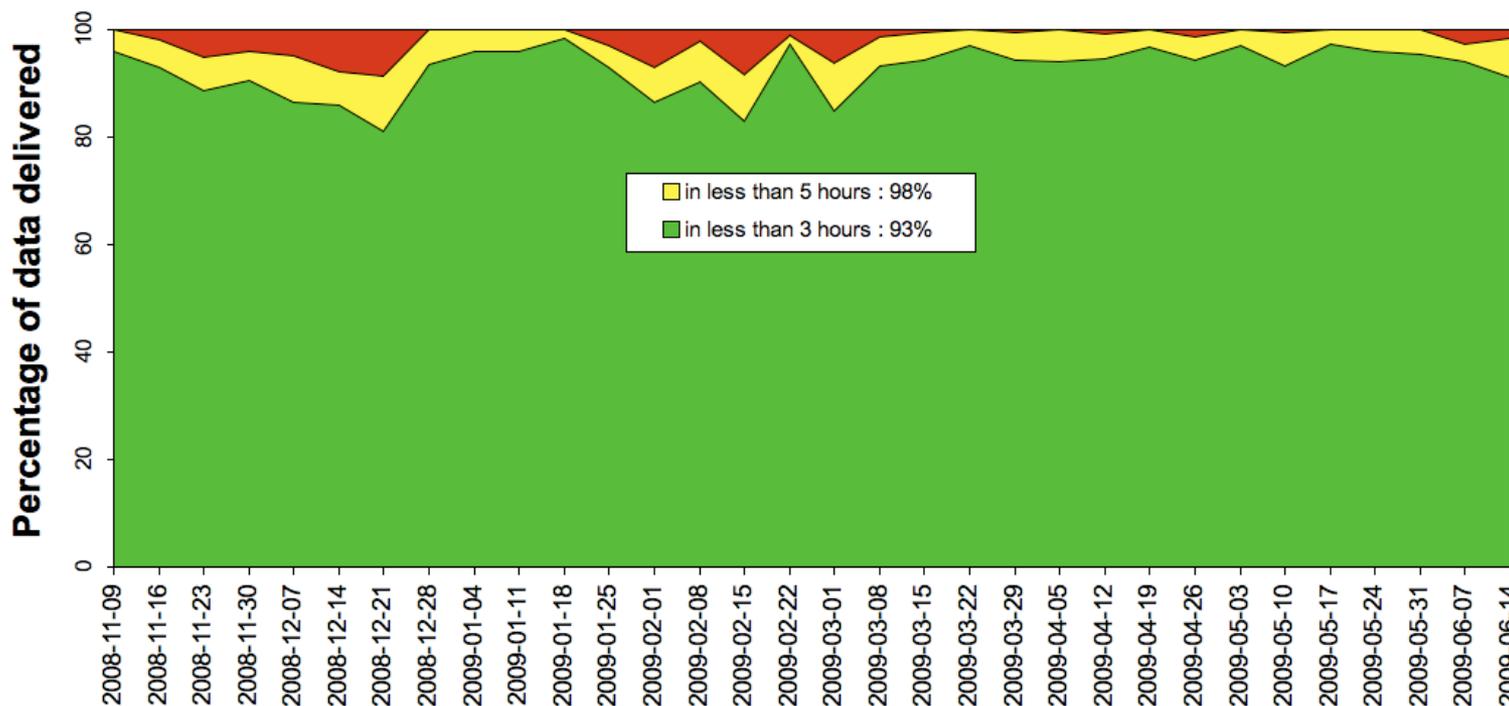
Main differences between O/I/GDR



- **Geophysical Data Records (GDR)**
 - Approximately 2 months delay (at CLS)
 - Precise orbits; final meteorological fields
 - Fully validated
- **Interim Geophysical Data Records (IGDR)**
 - Delivered once* daily, approx. 10:30 UTC (at CLS)
 - Delay: 2-3 days
 - Preliminary orbits; final meteorological fields
- **Operational Geophysical Data Records (OGDR)**
 - Within 3 hours after measurement time
 - Generation at NOAA and Eumetsat
 - Dump-to-dump files (not pass files)
 - DIODE/TRIODE orbits; predicted meteo; no MOG2D

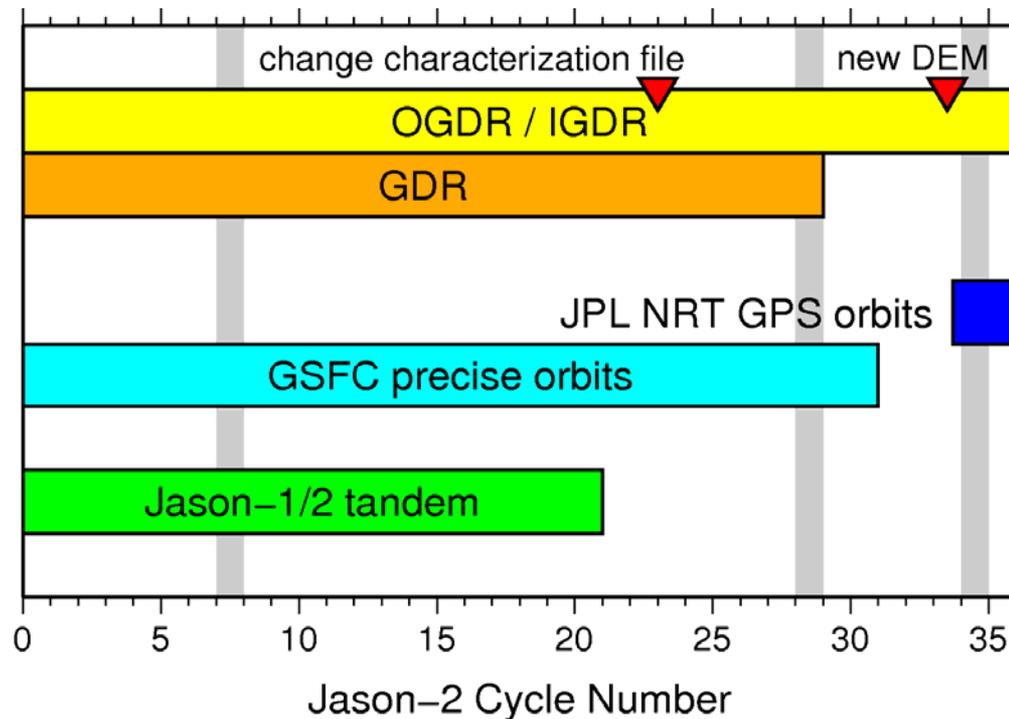
- Latency = Time file delivery – Time measurement
 - Target is < 3 hours
 - When delivery of a file is partially > 3 hours late, only a fraction counts as delivered in time
 - Chart shows the averages per week since handover of operations from CNES to NOAA

OGDR Timeliness Statistics



• Comparisons

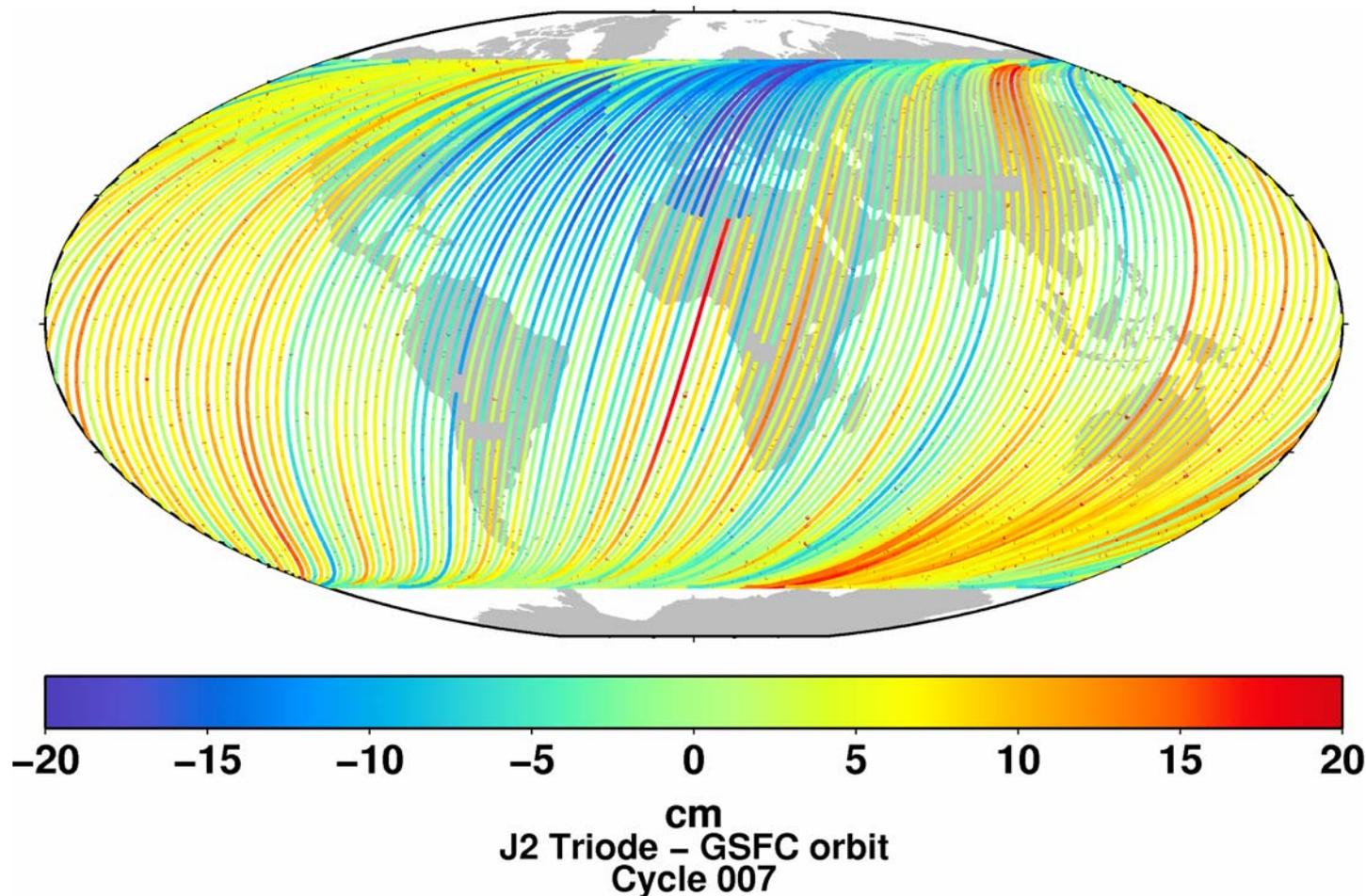
- Cycle 7
 - OGDR, IGDR with GDR
 - J1 with J2
 - Includes effects characterization file change
- Cycle 28
 - OGDR, IGDR with GDR
 - After characterization file change
- Cycle 34
 - JPL Near Real-Time GPS with TRIODE orbits
 - Effect of change DIODE/DEM



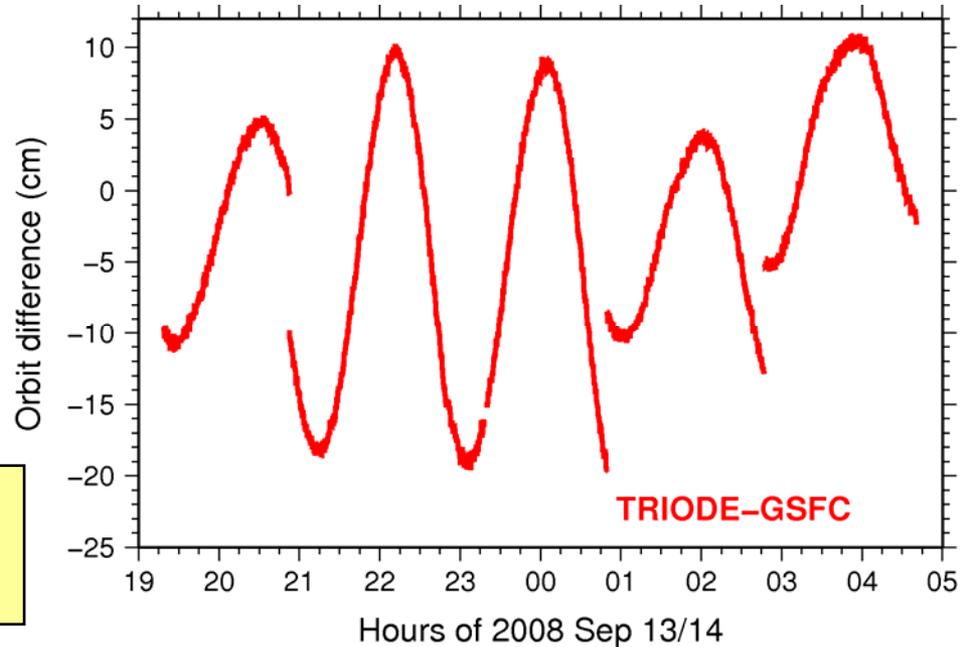
- Prior to characterization file change of Cycle 23
 - Differences include the effect of this change
 - Most OGDR-GDR differences are less than J1-J2 difference!
 - Orbit is serious concern

Field	OGDR - GDR	IGDR - GDR	J1 - GDR
SWH (cm)	0.1 ± 14.1	0.0 ± 6.3	-10.9 ± 19.3
Sigma0 (dB)		0.06 ± 0.08	0.18 ± 0.18
Sigma0 (dB) (smoothed)	0.06 ± 0.07		0.32 ± 0.27
Windspeed (m/s)	-0.20 ± 0.22	-0.20 ± 0.18	-0.96 ± 0.68
SSH (mm)	9.7 ± 75.0	4.7 ± 18.5	-77.0 ± 35.3
SSH (mm) (GSFC POE)	-0.2 ± 33.7	4.6 ± 14.8	-77.6 ± 34.8
Radiometer wet tropo (mm)	-4.7 ± 0.9	-4.7 ± 0.8	-0.6 ± 2.6
Iono (mm)	-0.1 ± 10.0	-0.1 ± 4.8	-8.5 ± 14.8

- Comparison with GSFC GDR-C' orbit
 - Edge of Usingen data dump is visible
 - New TRIODE orbit initialized there



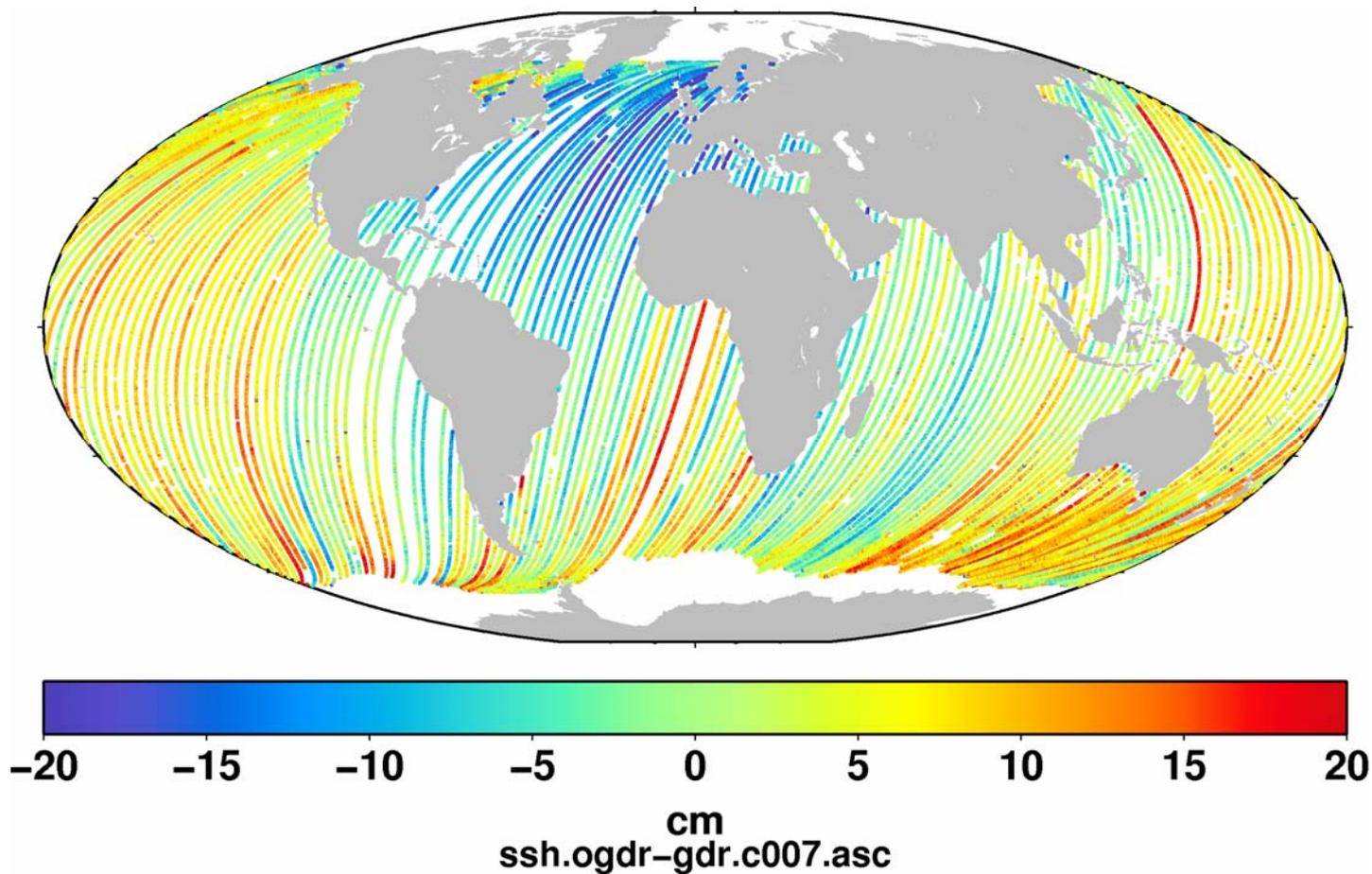
- Comparison with GSFC GDR-C' orbit (Cycle 7)



MEAN \pm RMS
(not formal error)

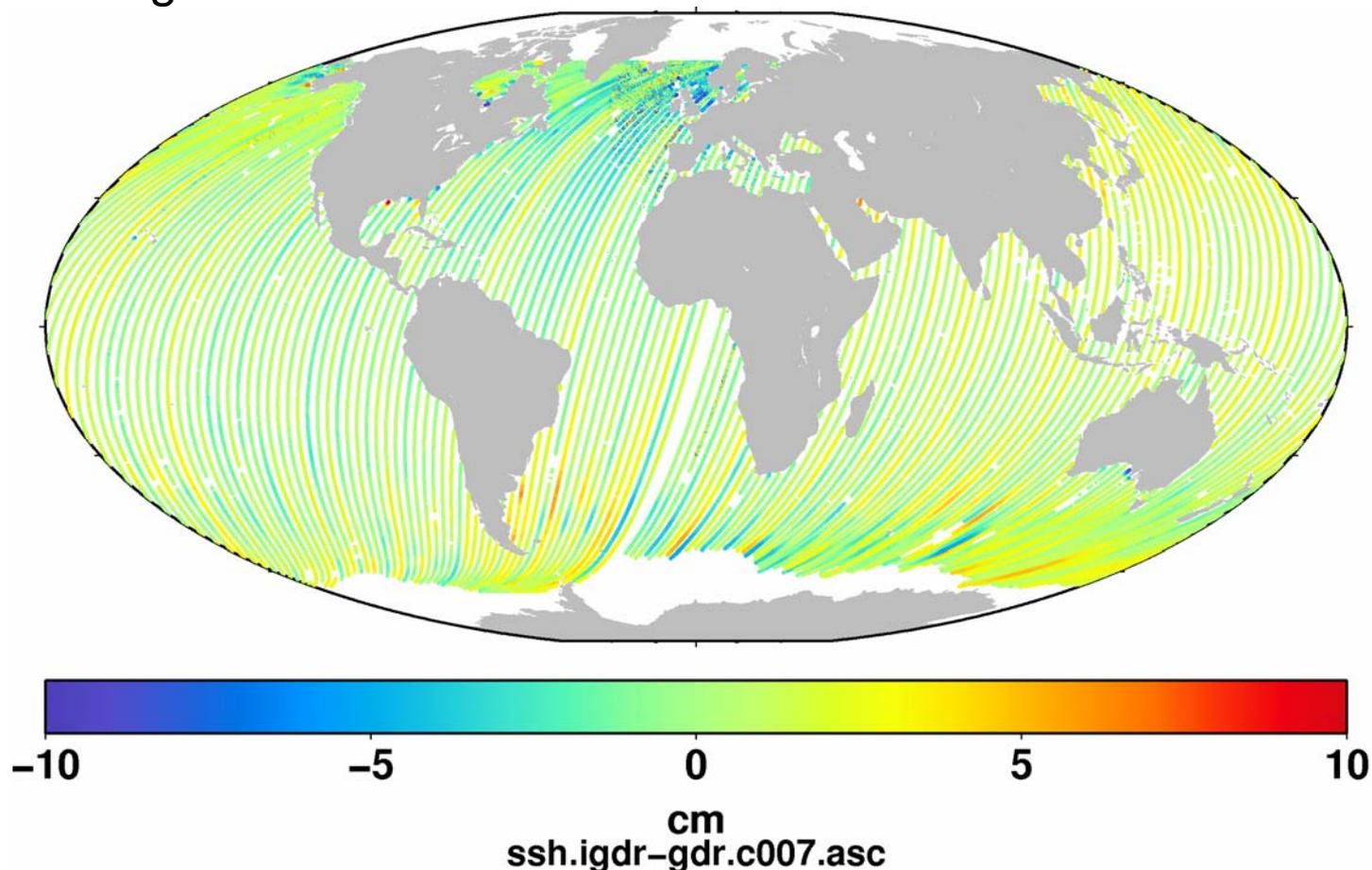
Field	OGDR	IGDR	GDR
Orbit	DORIS/TRIODE, initialized every data dump	Preliminary orbit based on DORIS	Precise orbit based on DORIS / SLR
Difference with GSFC orbit (mm)	3.4 \pm 70.6	-0.7 \pm 7.9	-0.6 \pm 10.3
Xover (mm)	23.8 \pm 113.8	4.9 \pm 53.8	1.1 \pm 49.7
Xover with GSFC orbit (mm)	0.6 \pm 61.4	0.0 \pm 54.3	1.1 \pm 53.6

- OGDR-GDR
 - Orbit differences are most prominent

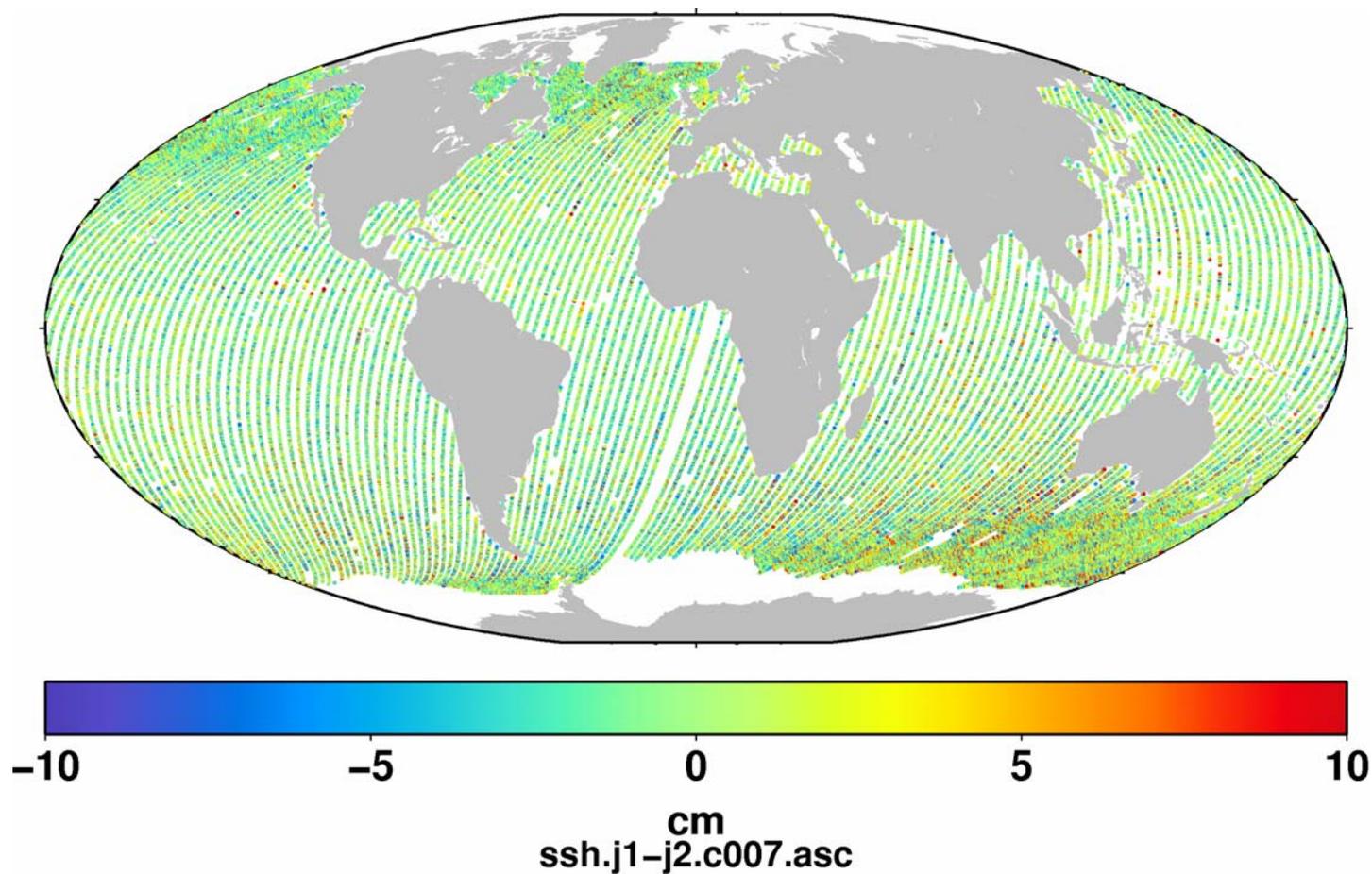


- **IGDR-GDR**

- Still mostly orbit differences
- ‘Noise’ within Usingen circle due to difference in IGDR and GDR timing

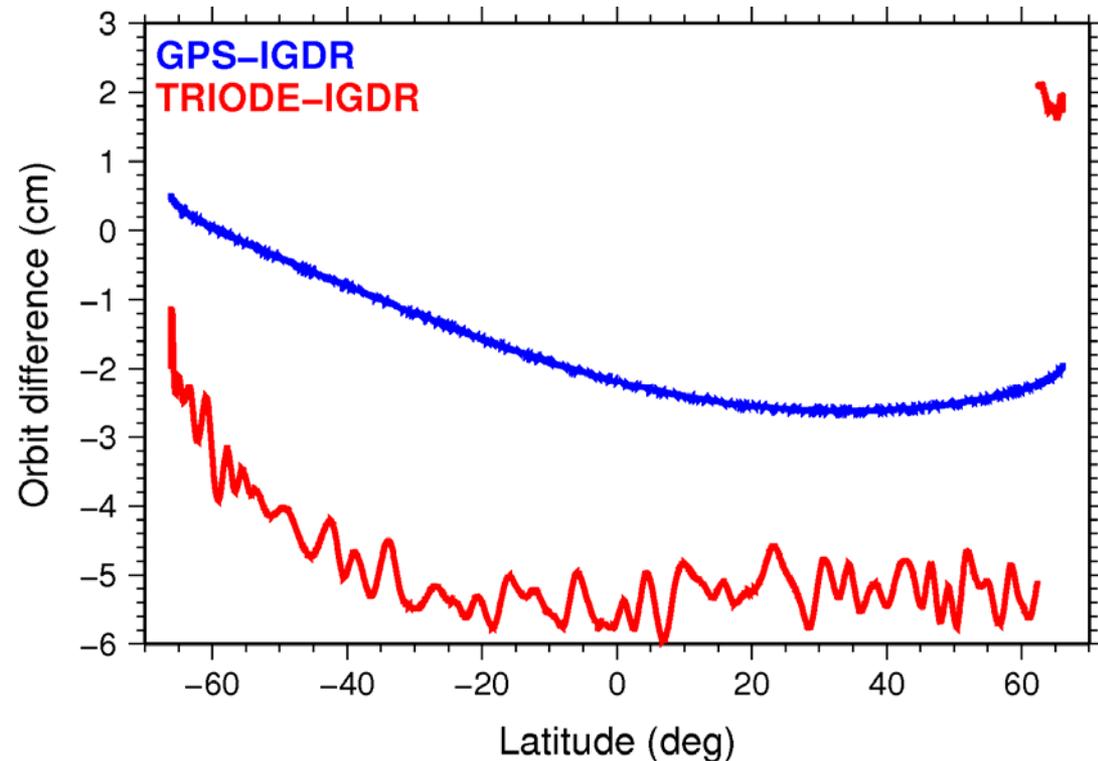


- Jason-1 - Jason-2 (GDR)
 - Some noise due to interpolation
 - Slight differences in instrumentation



- JPL NRT GPS orbit available since end Cycle 33

- Available a few hours after the OGDRs
- No jumps at Usingen
- No short wavelength noise



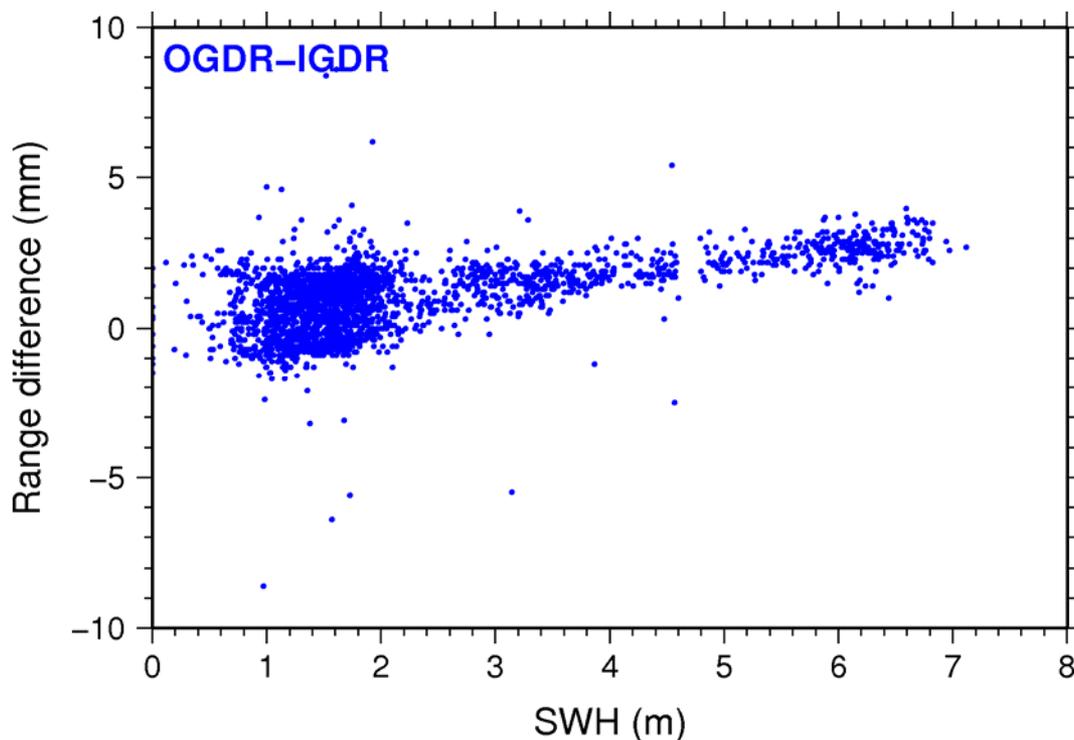
OGDR-IGDR diff	TRIODE Orbit	GPS Orbit
SSH (mm) (OGDR-IGDR)	5.3 ± 51.7	1.4 ± 38.5
Xover (mm)	-10.1 ± 82.6	2.6 ± 62.6

- Compare OGDRs and IGDRs to GDRs

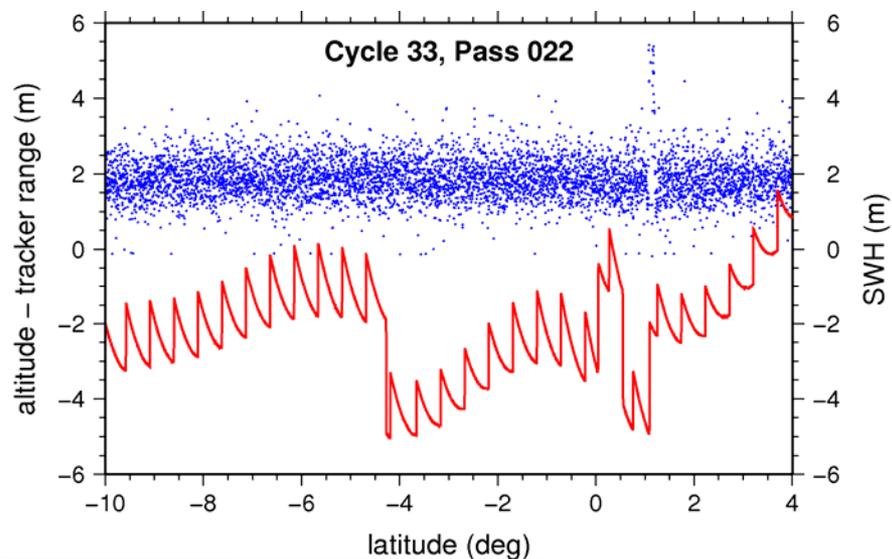
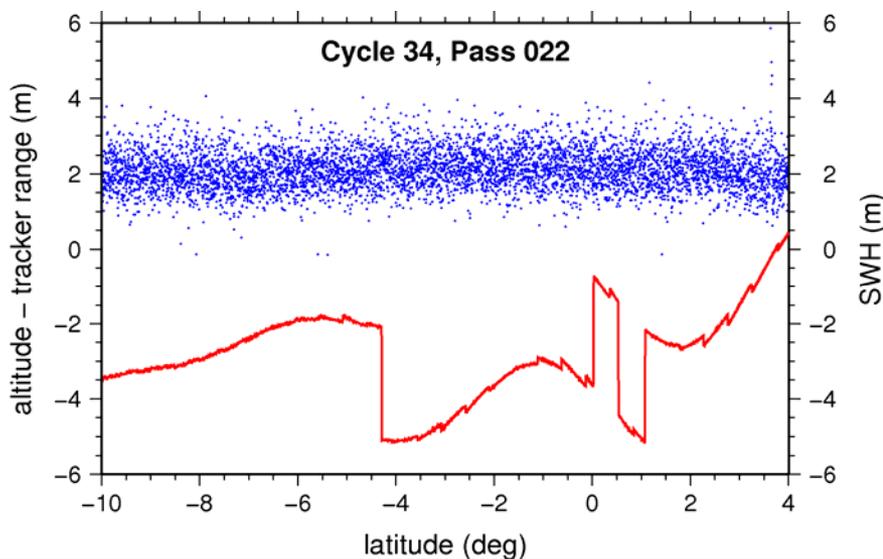
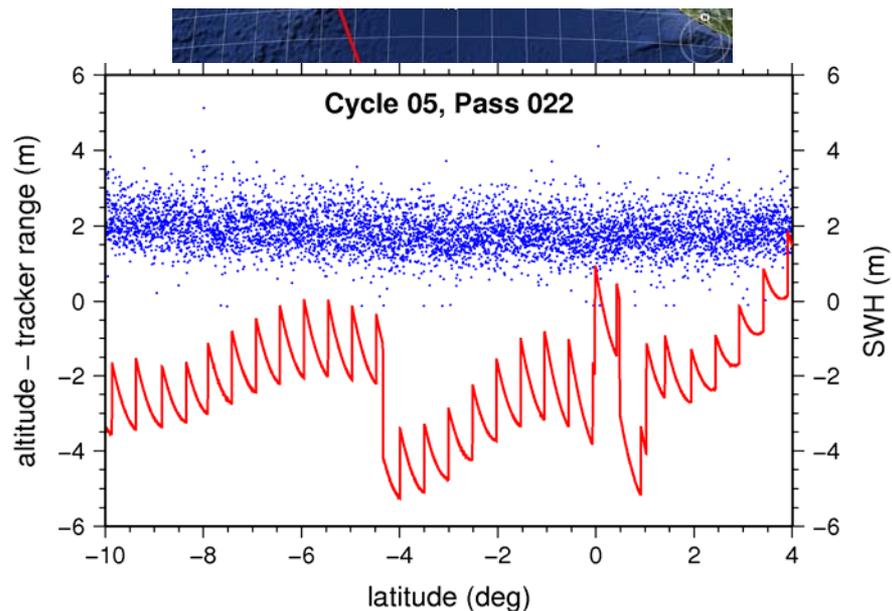
Field	OGDR - GDR	IGDR - GDR
SWH (cm)	0.0 ± 0.8	0.0 ± 0.6
Sigma0 (dB) (sm)	0.00 ± 0.04	0.00 ± 0.01
Windspeed (m/s)	-0.01 ± 0.10	0.00 ± 0.04
SSH (mm)	11.7 ± 47.1	-0.2 ± 21.3
Wet tropo (mm)	0.0 ± 1.2	0.0 ± 0.1
Iono (mm)	-0.2 ± 6.3	-0.1 ± 0.6
ECMWF wet	-1.1 ± 14.8	0.0 ± 0.0
ECMWF dry	-0.1 ± 2.5	0.0 ± 0.0
IB	-3.3 ± 21.9	-0.8 ± 10.7

SSH	OGDR	IGDR	GDR
Xovers (mm)	-5.9 ± 74.8	28.6 ± 55.7	10.8 ± 48.4
Xovers with GSFC orbit (mm)	12.4 ± 61.0	12.3 ± 51.6	12.3 ± 49.4

- Cycle 34, pass 115
 - Has identical time tags on OGDR and IGDR
 - Range, SWH, Sigma0 differences can be quite significant over land
 - Retracker conversion depends on initial height
 - Range difference depends on SWH. Why?



- Considered alternative
 - Presets range gate based on DIODE orbit and DEM
 - Repeatable artifacts
 - Sawtooth reduced since C34
 - Large 2-m jumps at 1° intervals
 - No apparent effect on SWH





Available enhancements



- **AMR Enhancement product**
 - Shannon Brown has produced AMR data to be used in coastal areas; reverts to original data about 40 km from coast
 - Approximately one week delay
- **GPS sea surface height anomalies**
 - This product is similar to the OGDR SSHA product but includes a GPS-based orbit and its associated SSHA
 - A few hours delay after OGDR release
- **Sigma0 smoothing**
 - Graham Quartly has suggested a correction model



Lingering issues



- All products
 - High noise in σ_0
 - Graham Quartly suggests an empirical fix
 - Pierre Thibaut suggests computing σ_0 with MLE3
 - SSB should be different from Jason-1
 - New model needed
 - Rain flag never set
 - Algorithm was based on MLE3, no more applicable
 - Long-period non-equilibrium tide is erroneous
 - Contains part of equilibrium tide. Ignore, is small.
 - Pole tide over inland seas and lakes is as over ocean
 - Should be as over land; simple scale factor
 - All AMR measurements are moved 1 second down the track
 - Applies also to JMR



Take home messages



- **Product quality**

- Wind and wave data on Jason-2 OGDR and IGDR are closer to the GDR than Jason-1 GDR measurements
- SSH on Jason-2 IGDR is closer to the GDR than the Jason-1 SSH
- Only orbit error makes OGDR SSH less accurate
- With GPS NRT orbits OGDR SSH comes as close the GDR as Jason-1 SSH

- **Remaining issues**

- Recommendation to include more accurate orbit on OGDR
- Smaller problems in all products need to be considered before final GDR release