Geoid, Mean Sea Surface and Mean Dynamic Topography Splinter.

Summary

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Posters

The session was a poster session with a total of 8 posters:

- ICESat-2 for Coastal MSS Determination—Evaluation in the Norwegian Coastal Zone (Tomić et al.)
- Lake Geoid and gravity from altimetry (Franze et al.)
- Development of Puerto Rico and US Virgin Islands sea surface topography for vertical datum transformation using retracked altimetry and tide gauges (Jeong et al.)
- The mean dynamic topography model DTUUH22MDT from satellite and in-situ observations (Knudsen et al.)
- Accuracy and Resolution of SWOT Altimetry: Foundation Seamounts (Sandwell et al.)
- The 2023 Hybrid Mean Sea Surface (Schaeffer et al.)
- The first validation of NMBU23 – an updated coastal mean sea surface in Norway based on a combination of new-generation laser and radar altimetry (Tomic et al.)
- ICESAT-2 altimetry for coastal MSS improvement (Vrettou et al.)

Poster highlights

[ICESat-2 for Coastal MSS Determination—Evaluation in the Norwegian Coastal Zone](#) (Tomić et al.)

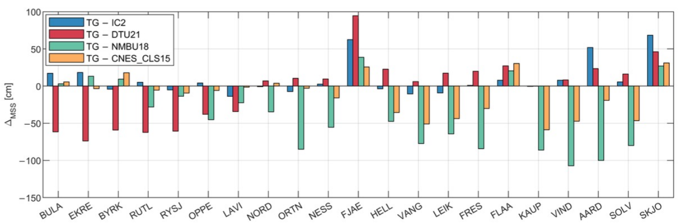


__Figure 3.__ The height difference between temporary tide gauges and the IC-2 MSS model inside Sognefjorden.

Δ	MIN [cm]	MAX [cm]	MEAN [cm]	STD [cm]
TG – IC2	-13.8	68.3	9.4	23.2
TG – DTU21	-73.8	94.5	-3.9	42.9
TG – NMBU18	-107.3	38.8	-39.0	45.2
TG – CNES_CLS15	-58.7	31.1	-12.5	21.7

__Table 1.__ Statistics of differences between the MSL observed by temporary tide gauges inside Sognefjorden and MSS from altimetry.

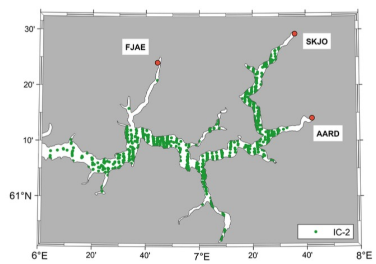
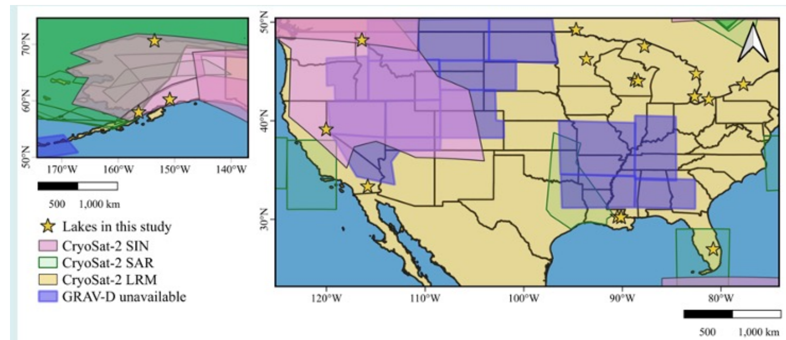


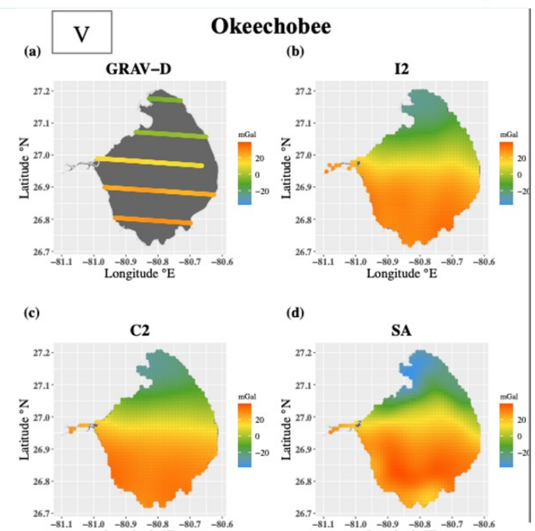
__Figure 4.__ Branches of Sognefjorden with available ICESat-2 observations.

Example of the benefits of using Icesat-2 for MSS in the coastal zone

Franze demonstratet the use of Icesat-2 for lake Gravity

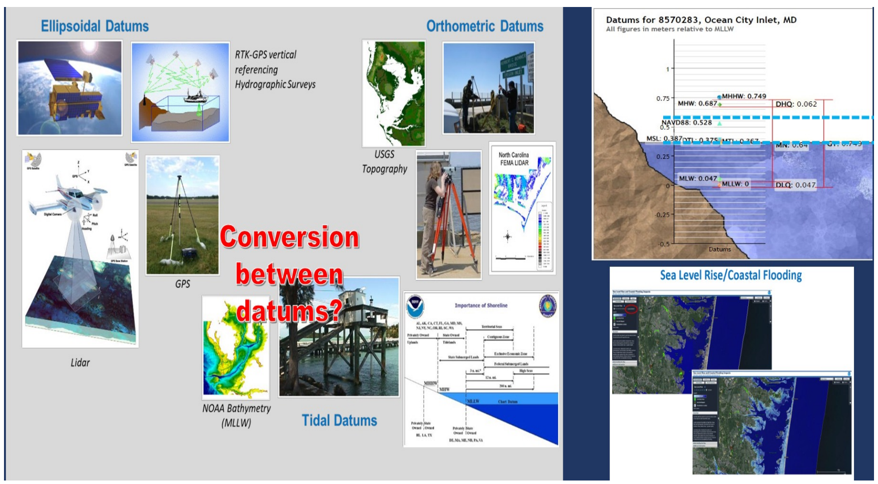
[Lake Geoid and gravity from altimetry](#) (Franze et al.)





Poster highlights

Development of Puerto Rico and US Virgin Islands sea surface topography for vertical datum transformation using retracked altimetry and tide gauges (Jeong et al.)



Update of development for PR vertical datum

The mean dynamic topography model DTUUH22MDT from satellite and in-situ observations (Knudsen et al.)

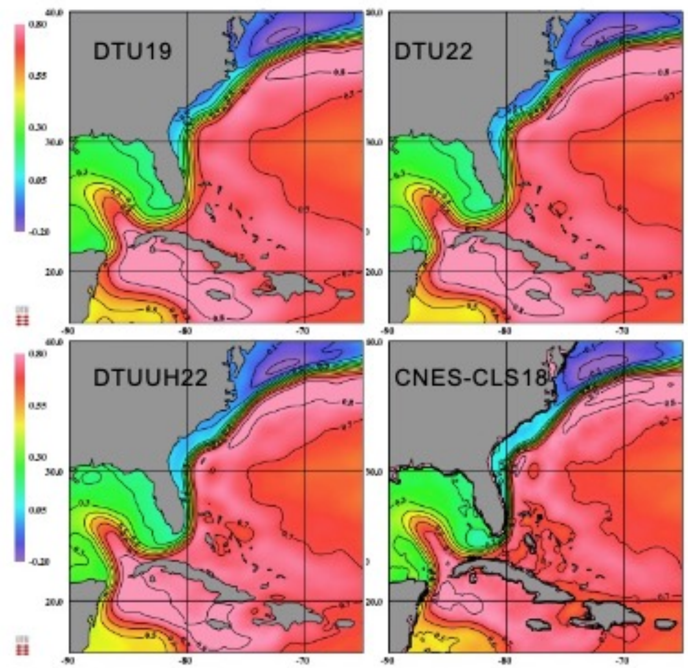


Figure 6. The two geodetic and the two combination MDTs

A new mean dynamic topography DTUUH22MDT

Poster highlights

Accuracy and Resolution of SWOT Altimetry: Foundation Seamounts (Sandwell et al.

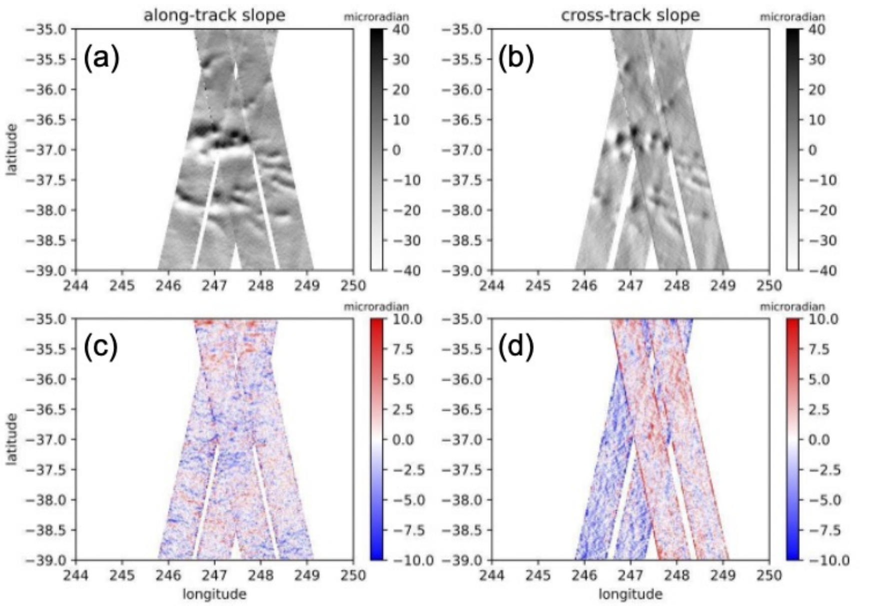
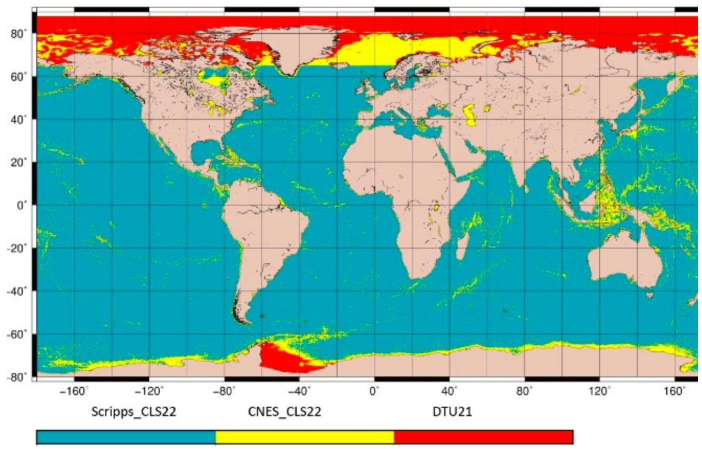


Figure 4. (a) Along-track and (b) Cross-track slope for one SWOT cycle (541) along ascending (pass 011) and descending (pass 026). (c) Difference between SWOT along-track slope and model slope shows mainly small spatial scale noise with higher noise on the edges of the swaths. (d) Difference between SWOT cross-track slope and model slope shows noise but also a mean slope difference of -2.5 μrad (Pass 011) due to uncorrected spacecraft roll error.

The 2023 Hybrid Mean Sea Surface (Schaeffer et al.)



Contribution of the different MSSs

- The Hybrid23 MSS is the result of the combination of SCRIPPS_CLS22 in the open ocean, supplemented by CNES_CLS22 in regions of strong ocean currents and near the coast, and complemented by DTU21 in polar regions.

Poster highlights

The first validation of NMBU23 – an updated coastal mean sea surface in Norway based on a combination of new-generation laser and radar altimetry (Tomic et al.)

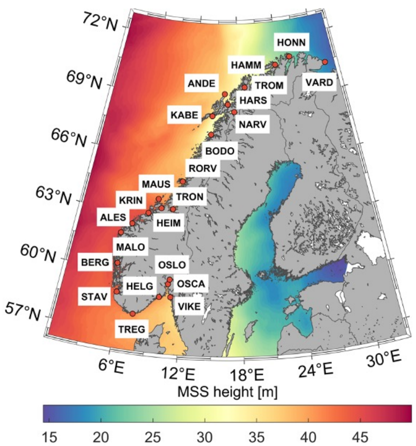
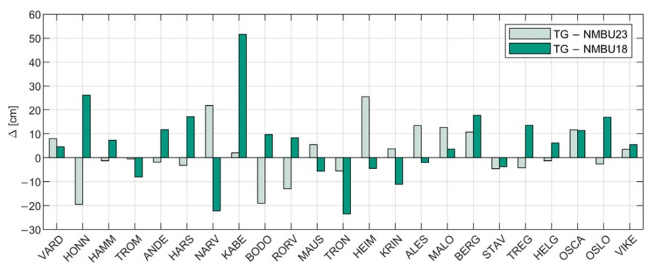
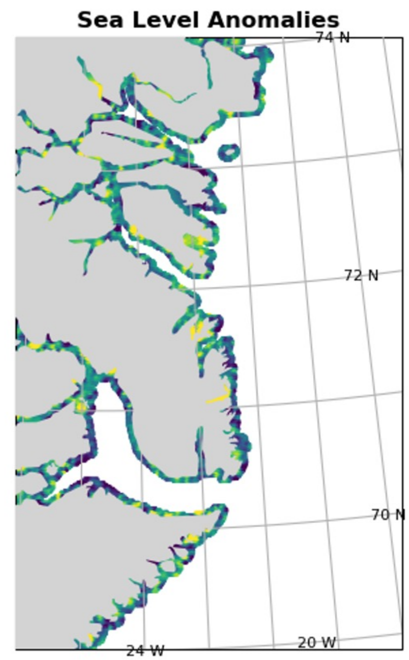


Figure 1. *The mean sea surface for Norway for the period 2010–2023 from combination of radar and laser altimetry observations with marked locations of permanent tide gauges used for validation.*



ICESAT-2 altimetry for coastal MSS improvement (Vrettou et al.)



Question discussed

- Is Long-Repeat Orbit (LRO) still necessary?
- If not, which kind of mission phase (after tandem) will make better return for the communities?

Options:

1. Go to the LRO orbit after the second tandem (current baseline)
2. Return to the interleaved orbit until Sentinel-6 MF joins Jason-3 on the interleaved track in ~2026
   - Should there be a third tandem?
   - And which kind of mission phase after that?
3. Go to another orbit phase after the second tandem
   - Which kind of mission phase is preferred?

Please provide strong arguments for your preferred solution.

NOTE: Recommendations here only represent the Splinters DRAFT recommendations from Wednesday's round table. Further discussion will go on in the Forum

Geoid/MSS/MDT DRAFT recommendations for Jason-3 EoL

The splinter acknowledges the important work in preparing the Jason-2 LRO due to its favourable sub-cycles periods and value to oceanography and geodesy and uses this for Jason-3 EoL:

The Long Repeat Orbit (LRO) accommodates both geodetic science (e.g. mean sea surface, geoid) and operations (model assimilation)

It is approximately 27 km below the reference orbit and has sub-cycles (near-repeat) and cycle (exact repeat):

- Sub-cycle: 4 nodal days - 3.97 days - 51 revolutions (beneficial for sea state and mesoscale)
- Sub-cycle: 17 nodal days - 16.86 days - 217 revolutions (beneficial for sea state and mesoscale)
- Sub-cycle: 81 nodal days - 80.31 days - 1034 revolutions
- Sub-cycle: 145 nodal days - 143.77 days - 1851 revolutions
- Cycle: 371 nodal days - 367.84 days - 4736 revolutions (fine grid of approximately 8-km, per cycle)

Each period of 17 days yields a geographically regular grid of 434 passes (approx. 180 km at the Equator). Due to the presence of the 81-day sub-cycle, subsequent grids are shifted in longitude by approximately 40 km (resolution of the 81-day sub-cycle). The same phenomenon exists with the 4-day and 17-day sub-cycles (780 km grid translated by 280 km every 4 days) and other sub-cycles.

The Splinter stresses the importance opportunity to perform 2 LRO sub-cycles of 369-day sub-cycles shifted by 2 km wrt to Jason-2. This will result in a systematic 2-km global grid combining Jason-2 and Jason-3 LRO data.

Discussing the value of Jason-3 EoL in the presence of SWOT.

We acknowledge the high quality of SWOT for MSS/geoid after 1-2 years of operation.

Jason-3 LRO is paramount in the event of the failure of SWOT in the coming years.

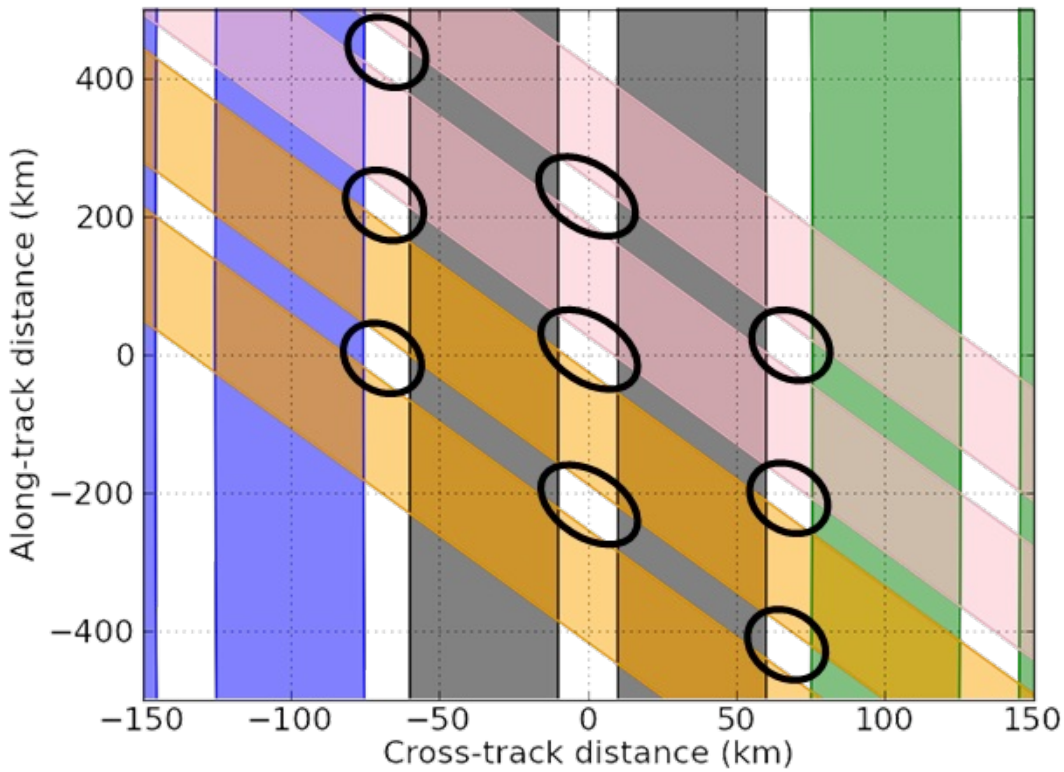
Jason-3 LRO will compliment altimetry in un-mapped diamonds of SWOT @ 2 km resolution.

The splinter recommends to the SWOT Science team to considering shifting the ground tracks of the mission for a potential SWOT mission extension

Discussing the value of Jason-3 EoL in the presence of SWOT.

SWOT gaps at low latitudes
The gaps size ranges from
200 to 400km2

(Courtesy G. Dibarboure)



Geoid/MSS/MDT recommendations for Jason-3 EoL

The Splinter recommends the following potential EoL scenario:

1. **The Splinter encourages efforts to maximize the operating time of Jason-3 and the importance of completing at least 2 LRO sub-cycles of 369 days**
2. **The Splinter recommends re-occupying the LRO orbit of Jason-2 with Jason-3**
3. **The Splinter recommends performing 2 LRO sub-cycles of 369-day sub-cycles shifted by 2 km wrt to Jason-2. This will result in a systematic 2-km global grid combining Jason-2 and Jason-3 LRO data.**
4. **If the health of Jason-3 is high after the 2 LRO sub-cycles, the splinter encourages a further 369 days replacement of the second subcycle of Jason-2 due to serious problems with gaps due to safe holds (> 20% of the time).**
5. **The timing of the transition of Jason-3 to its EoL is NOT critical (so other options can be explored before shifting orbit to the EoL orbit**