

Update from the Tides/Inertia-Gravity Waves WG

Brian Arbic, Florent Lyard, Richard Ray & Ed Zaron

SWOT-ST meeting
September 13-15, 2021

Overview of the Tides/IGW WG Activities:

3 WG meetings (February, March, April) + 1 joint with DA (June):

- The meetings were well-attended (30+ participants); on hiatus for summer holidays.
- Saw numerous studies which demonstrate the size and character of the baroclinic tides in the Bay of Biscay, South China Sea, Brazil, New Caledonia, Gulf of Guinea (LEGOS).
- Shared updates regarding ongoing work: non-stationary tidal currents from HF radars off California, FES2022, approaches to quantifying non-stationarity, ...
- Discussions/Questions: role of wave-steepening and overtides, wave/mesoscale separation in idealized vs. realistic simulations, need for more discussion of coastal and estuarine tides, ...
- And side discussions on: “SWOT Data Challenge”, steric height as a proxy for baroclinic SSH, ...

Barotropic tides: status

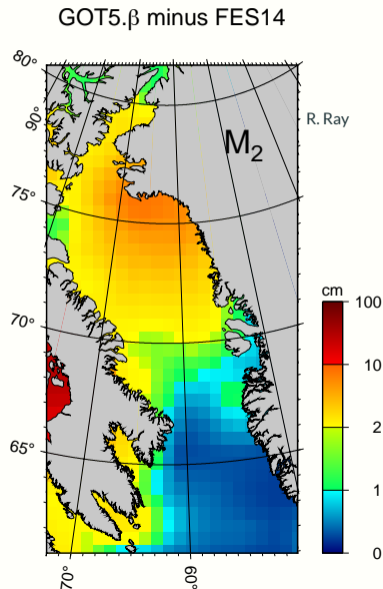
Recent publications:

- Cancet et al (2018) on ArcTide2017
- Lyard et al (2021) on FES2014
- Hart-Davis et al (2021) on EOT20
- Zaron and Elipot (2021) TPXO9 vs. FES2014 using drifter-derived currents

Cancet, Andersen & Lyard:

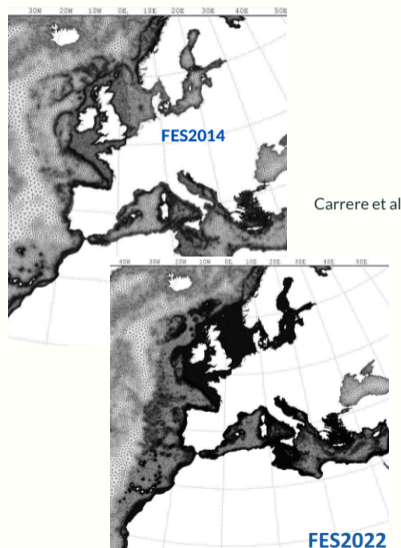
RegAT regional tidal models (2019-2021, NOVELTIS/LEGOS for CNES) – preparation for FES2022

ALBATROSS ESA project (2021-2023) – influence of Antarctic bathymetry and ice sheets on global tides.



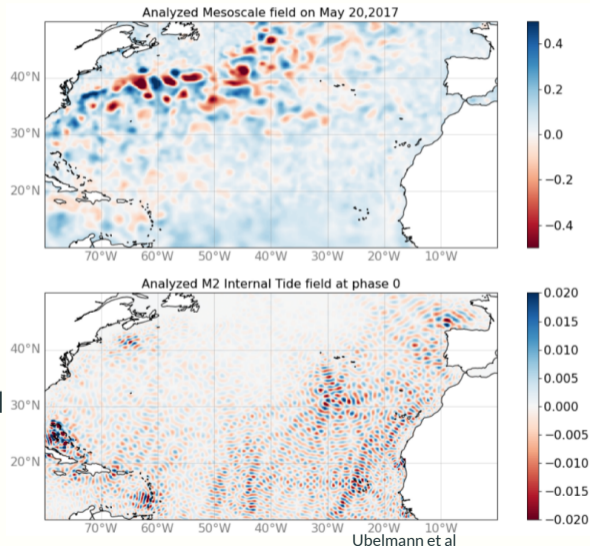
Barotropic tides: next steps

- TPXO9: assimilate smaller constituents, refine bottom drag, less use of inference for predictions
- FES2022: refined grid, very accurate prior, more accurate regional bathymetry
- Expected improvements near coast could be up to 10 cm, combined over all constituents.
- Improvements to forward (non-DA) models: HYCOM, MITgcm, NEMO, etc.



Phase-locked baroclinic tides: status and next steps

- Ubelmann et al (in review at OSD) Simultaneous estimation of mesoscale and tides; available as MOIST-IT at Aviso website.
- Next version of HRET: combines altimetry and surface drifters; moving towards (non-harmonic) seasonal analysis and predictions.
- New HYCOM, NEMO, MITgcm, and MOM6 comparisons: Ansong and Arbic



Non-phase-locked baroclinic tides: status and next steps

- Idealized model studies: Wang, Grisouard, and Ponte (machine learning)
- Realistic modeling studies: Nelson and Arbic (comparison of altimetry and operational model), Wang, Grisouard, and Arbic (machine learning analysis of realistic model)
- Egbert and Erofeeva: regression onto model-derived modes of variability; Thakur and Arbic to apply globally
- Rainville, Drushka & Menemenlis: LLC3220 analysis of time scales and vertical structure of tide/mesoscale interactions
- Ponte et al: tides from surface drifters for high-resolution model validation and IT assimilation
- New analysis of dual-satellite crossovers (Zaron, submitted)
- New analysis of ARGO park-mode data (Gaspar and Nycander, submitted)

Summary and Miscellaneous

- Pre-launch field campaign analyses (Ray and Zaron)
- LEGOS (Ayoub, Gourdeau, Koch-Larouy, Dadou, Lyard, Tchilibou) regional circulation/tides modelling and SWOT dedicated campaigns (Brazil, New Caledonia), dynamical coupling and energy budgets.
- Arbic group has more papers in the pipeline: surface tidal velocities in drifters vs. HYCOM vs. MITgcm, etc.
- Resume monthly meetings
- “SWOT Data Challenge” → “SWOT Data Opportunity” with MOANA New Zealand regional model outputs

