

Potential Synergies Between WG1 Tides/IGW and AdAC Efforts

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Overview:

- Tools for AdAC:
 1. Harmonic analysis software/advice
 2. Harmonic synthesis and tidal prediction, barotropic and baroclinic
 3. Research questions: types of estimators (least-squares, robust, spatially-coupled, etc.), confidence intervals, constituent selection, etc.
- Themes from the WG1 Ocean Session
 1. Tide prediction
 2. Mapping and describing tides
 3. Flow decomposition
- Considerations for the field programs
 1. Duration of observations
 2. Temporal sampling
 3. Spatial aliasing and variability

Themes from the WG1 Session: Tide prediction

- Arbic, “Recent progress in global hydrodynamical internal tide and gravity wave modeling”
- Egbert et al, “Empirical mapping of incoherent internal tides”
- Barbot et al, “Internal tides correction: from Bay of Biscay simulations to global empirical atlas”
- Cancet et al, “(yet another) FES2022 tidal atlas”
- (Erofeeva et al, “TPXO updates”)

Themes from the WG1 Session: Mapping and describing tides and their variability

- Kachelein et al, “Tides and Near-inertial Oscillations from HF Radar”
- Kaur et al, “Seasonal variability of internal tides in the global ocean”
- Solano et al, “Estimating internal wave energy transfer from the primary tidal to subtidal and supertidal frequencies in a global HYCOM simulation”
- Ponte et al, “High frequency motions characterization from drifter data for the analysis of SWOT data”

Themes from the WG1 Session: Flow decomposition

- Wang and Uncu, “Internal tide extraction ... deep learning”
- (overlap with WG2 HR Modelling)

Convergence of concerns from mesoscale and tides communities: The appropriate definition of the flow decomposition depends on the application:

- Prediction of slowly-evolving flows using balanced dynamics
- Prediction of aliased tidal signals
- Diagnose Lagrangian transports (vertical and horizontal)
- Diagnose $\langle u'v' \rangle$ or $\langle u'p' \rangle$ due to waves vs. macro-turbulence
- Understand energy flux across scales
- Understand interactions occurring near boundaries

Themes from the WG1 Session: High resolution and process studies

- Oladeji et al, “Remote internal wave forcing of regional simulations of the US West Coast”
- Koch-Larrouy et al, “Internal tides off the Amazon shelf: AMAZOMIX project”
- Bendinger et al, “High Resolution Modeling effort around New Caledonia”
- Wang and Uncu, “Scattering by vortices”
- (overlap with WG2 HR Modelling)

Considerations for field programs & tide research

- Need long time series (ideally, year or more) to characterize tidal modulations
- Spatial variability/aliasing (Wang et al, “Small-scale (10-30km) tides at the mission CalVal site – prelaunch oceanography campaign results”)
- Coastal regions:
 1. Sources of tidal/IGW variability
 2. Unique challenges for modeling
 3. Diverse interactions in shallow water (frictional coupling, tidal rectification, etc.)