Summary of the "Observation of SSH, currents at small mesoscales" session

1. The global HYCOM and MITgcm simulations have shown the potential entanglement between eddies and waves (10-100km), but there are conflicting theories and very few observational evidence for verification. Studies based on observations are needed to understand the relevant processes in the real ocean and assess the challenges we are facing.
2. Questions:
    1. Is the spectral slope change in the model analysis robust? Is it real?
    2. What are the contributions of tides and internal gravity waves to the entanglement problem?
    3. What can we learn from existing field campaigns in designing the future calval-related field experiments?
3. Preliminary studies show that **discontinuity in the wavenumber spectrum exists** in the altimeter data (Vergara et al.) and historical ADCP (Gille et al). The derived transition scales from steep slopes in the mesoscale to the shallower slope in the submesoscale are, to some extent, consistent with model results (Qiu et al. 2018, Torres et al., based on llc4320).
4. With a good tidal model, we will be able to subtract mesoscale signals, but depending on the relative strength between eddies and tides. Incoherent tides will be an issue degrading the separation (Drushka and Rainville) and the incoherent tides is clearly shown in the HF radar data (Kachelein and Gille). **We need good tidal models for both the coherent and incoherent components.**
5. Whether IGWs will be important in the 10-100km range **is still unsettled** from the theoretical perspective (Samelson, Callies, Farrar).
6. Lidar (Lenain/Melville) and DopplarScatt (Farrar/ Rodriguez) can be used to **reconstruct the synoptic the wavenumber spectrum** of SSH and velocity over a broad wavenumber range. It will be useful in answering the question related to the partition and entanglement between eddies and waves.
7. Intensive feature-based sampling can be achieved (d'Ovidio F & A Pascual, Girton). An army of EM-APEX floats exists (Girton). **Structure function is a very useful tool** for analyzing non-structured data, such as glider, in the spectrum-equivalent space to examine the distance-aware variance for the high and low frequency motions (Sérazin et al.)
8. The vertical structure of the baroclinic mode needs to be considered for deciding the sampling depth (Samelson; Girton).
9. Suggestions:
    1. Refine the altimeter results of the spectral slope discontinuity, identify the possible contamination by altimeter noise and coherent tides.
    2. More observational studies on the partition between eddies and waves within 10-100km scales, either using spectrum or structure function.
    3. Consider a variety of measurements in the prelaunch campaign to verify the existing eddy-wave partition from models and data.

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1. The global HYCOM and MITgcm simulations have shown the potential entanglement between eddies and waves (10-100km), but there are conflicting theories and very few observational evidence for verification. Studies based on observations are needed to understand the relevant processes in the real ocean and assess the extent of the challenges we are facing.
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