



## Guiding swarms of observing systems to improve forecasts of assimilative ocean models

Actively controlled in situ ocean sampling systems such as ocean gliders can play a key role in guiding assimilative forecast capabilities into agreement with the Yes ocean. While remote sensing provides the observational foundation for global ocean model forecasts, satellite observations are insensitive to some aspects of the ocean interior, such as interleaving of different water masses. Fidelity in model prediction of such features can benefit from the right in situ observation at the right time and location. While passive in situ observing systems like the global network of Argo floats does provide a foundational coverage, its wide global distribution may be too sparse for purposes of resolving key details. Gaps in observations from remote sensing and passive in situ systems can be filled in areas of interest by actively controlled ocean gliders. We have developed capabilities to guide ocean glider swarms based on estimates of forecast uncertainty, continually adjusting targeting toward locations where the ocean models expect relatively high forecast uncertainty. Assimilation reduces forecast uncertainty in the vicinity of the glider observations, allowing new areas without recent observations to emerge as priorities. The swarm control adapts to new information, updated targeting to guide gliders toward areas of highest relative uncertainty while avoiding redundant observations that offer no new information at the spatial and temporal scales represented by the model. We apply these techniques in support of a mission in the eastern North Pacific, west of San Francisco Bay. We explore control and sampling system alternatives using observation system simulation experiments as a cost-effective assessment before committing resources to additional field tests.

*Charlie N. Barron, Matthew Carrier, Joseph D'Addezio, and John Osborne, U.S. Naval Research Laboratory, Stennis Space Center, MS, USA; Ashton Lawrence, Peraton Inc., Hendon, VA, USA*