SYMPOSIUM OP'24
ADVANCING OCEAN PREDICTION SCIENCE FOR SOCIETAL BENEFITS

Theme 5.4

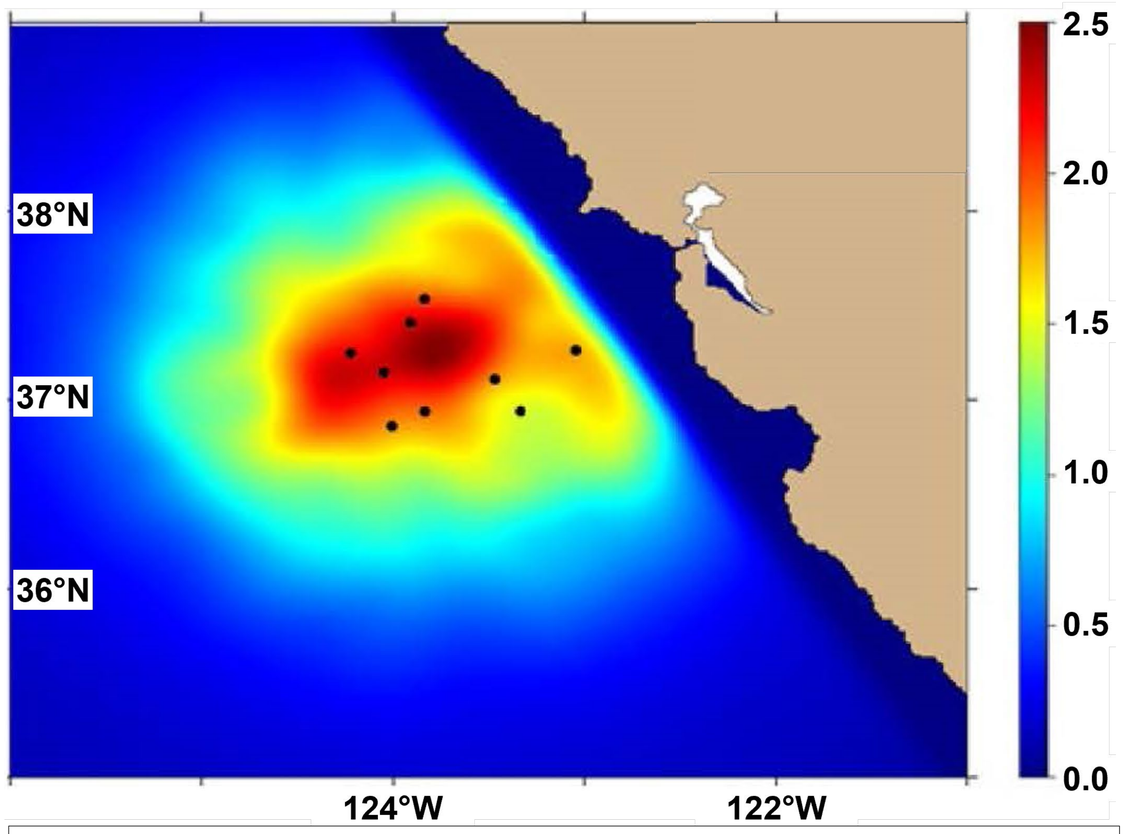
Guiding swarms of observing systems to improve forecasts of assimilative ocean models

We control *in situ* ocean sampling systems according to mission priorities and limits.

Introduction

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 true ocean

- Satellite observations provide foundation but miss 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



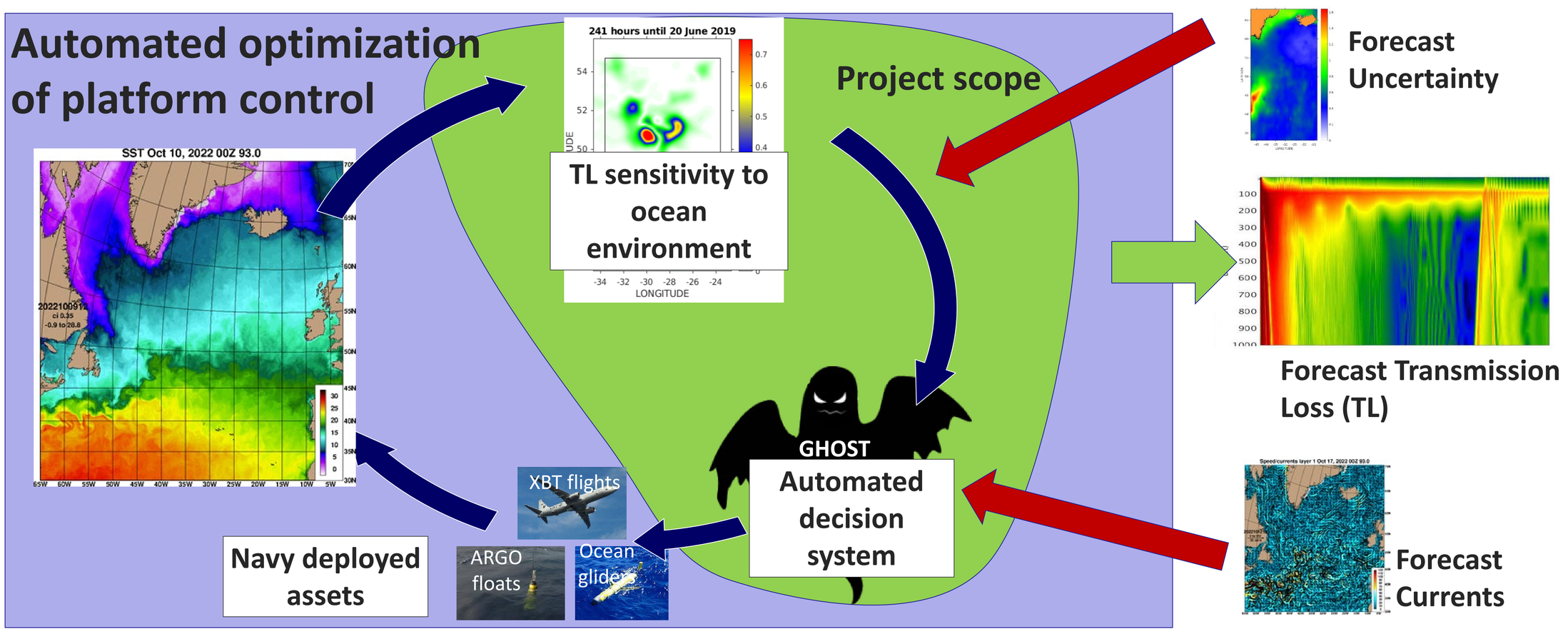
2021 glider deployment during S-MODE pilot campaign

Glider locations superimposed on the non-dimensional reward used to guide overall swarm coverage. The reward combines normalized uncertainty of forecast temperature with localization in the experiment area off the California coast.

Jacobs, G.A., J. D'Addezio, B. Bartels, C. DeHaan, C.N. Barron, M.J. Carrier, A. Shcherbina, and M. Dever, 2023: Adapting constrained scales to observation resolution in ocean forecasts. *Ocean Modelling*, 186, https://doi.org/10.1016/j.ocemod.2023.102252.

Approach to swarming observations

- Global network of Argo floats confirms background but may be too sparse to resolve relevant details
- Gaps in remote and passive in situ coverage can be filled by actively controlled ocean gliders
- We have demonstrated capabilities to guide ocean glider swarms to reduce forecast uncertainty, continually adjusting targeting toward locations where localized uncertainty is relatively high



Conclusions

- Automated ocean glider control based on impact of their observations on forecasting systems
- Future approached for adaptive observing systems seek to combine forecast sensitivity with forecast uncertainty to emphasize observations with the highest expected mission-relevance
- Fill coverage gaps based on cost/benefit analysis of supplemental deployment options

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