Compact Remote Sensing Ocean Models for Adaptive Sampling in the Coastal Ocean

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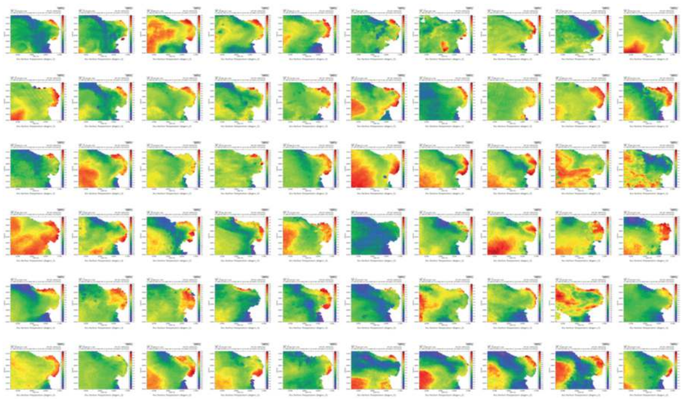
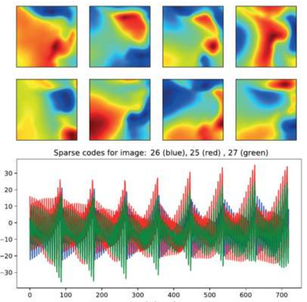
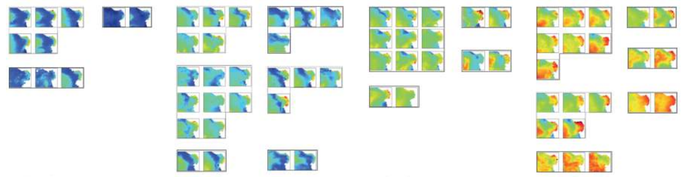




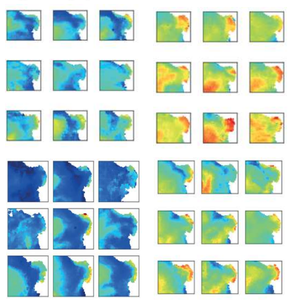
Dictionary Learning + Hierarchical Clustering

Characteristic sub-classes j=1, ..., m of dominant image types/sea conditions (1-4).

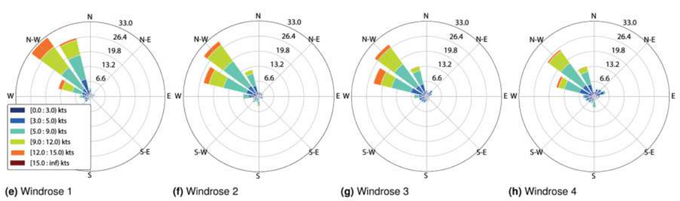


Reclassify

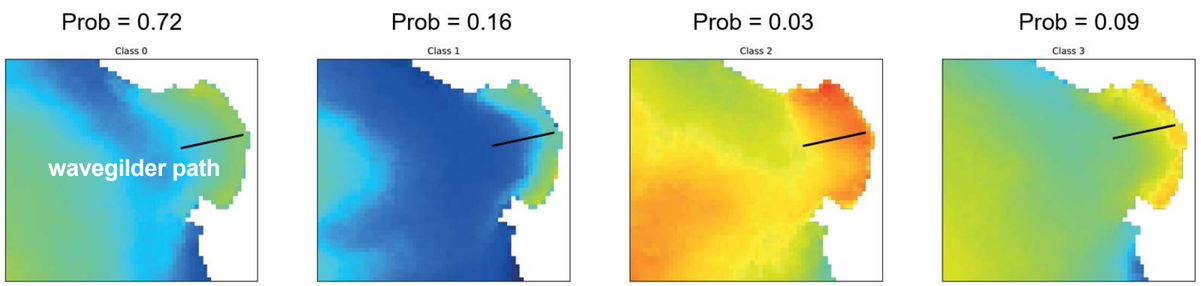
Characteristic/Dominant image types/classes 1-4



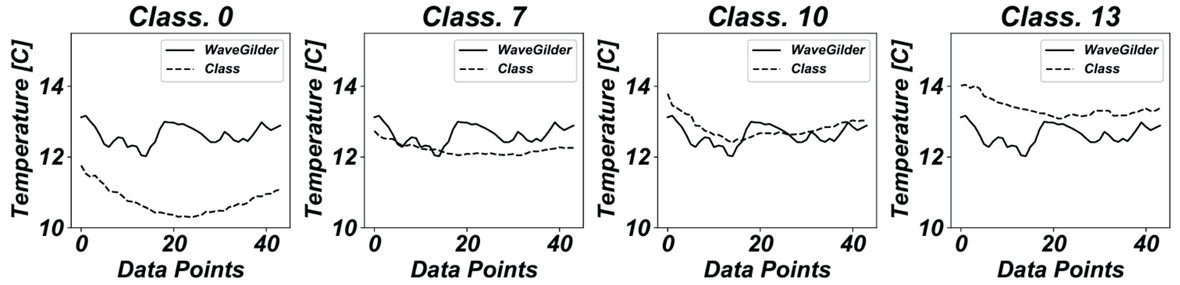
Dictionary Learning + Hierarchical Clustering



In-situ data + compact model = Forecast and sampling



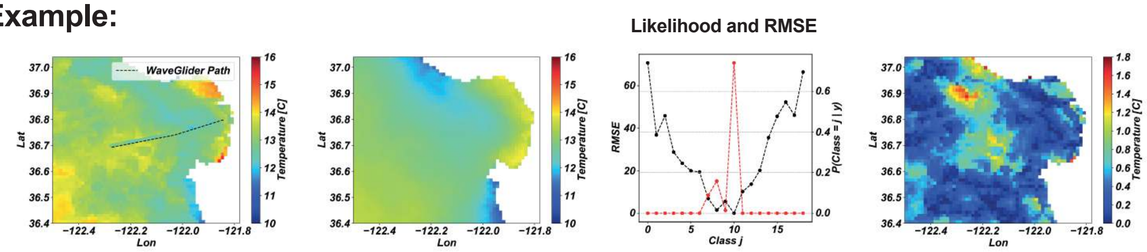
Predicting the environment using sparse data



Estimate current conditions using:

$$S\hat{S}T_i = \sum_{j=1}^{m} P(\text{class} = j|\boldsymbol{y})\mu_{ij}.$$

Example:



(a) True SST 2018-05-17. **(b)** Estimated SST. **(c)** Likelihood and RMSE. **(d)** Estimation error.

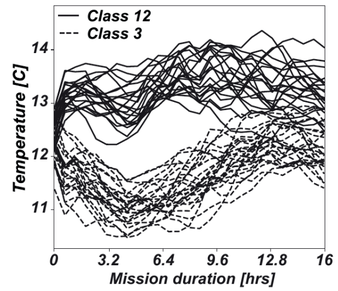
Evaluation of prediction error using the compact model.

$$PE = 1 - P(\text{class} = j^*).$$

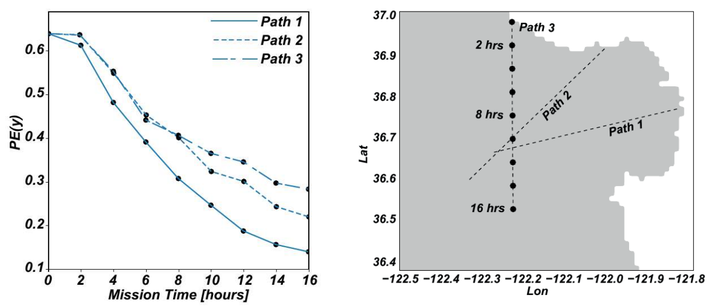
$$PE(\boldsymbol{y}) = E\{1 - P(\text{class} = j|\boldsymbol{y})\}$$

$$= \int (1 - P(\text{class} = j^*(\boldsymbol{y})|\boldsymbol{y})p(\boldsymbol{y}))dy,$$

$$PE(\boldsymbol{y}) \sim \frac{1}{B}\sum_{b=1}^{B}(1 - p(j^*(\boldsymbol{y}^b)|\boldsymbol{y}^b)),$$



Effects on mission duration and survey paths



(a) Predicted error vs. mission time. **(b)** The different mission paths.

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