



642943: Residual prediction to improve the meteorological based sea surface temperature forecasts using ANN

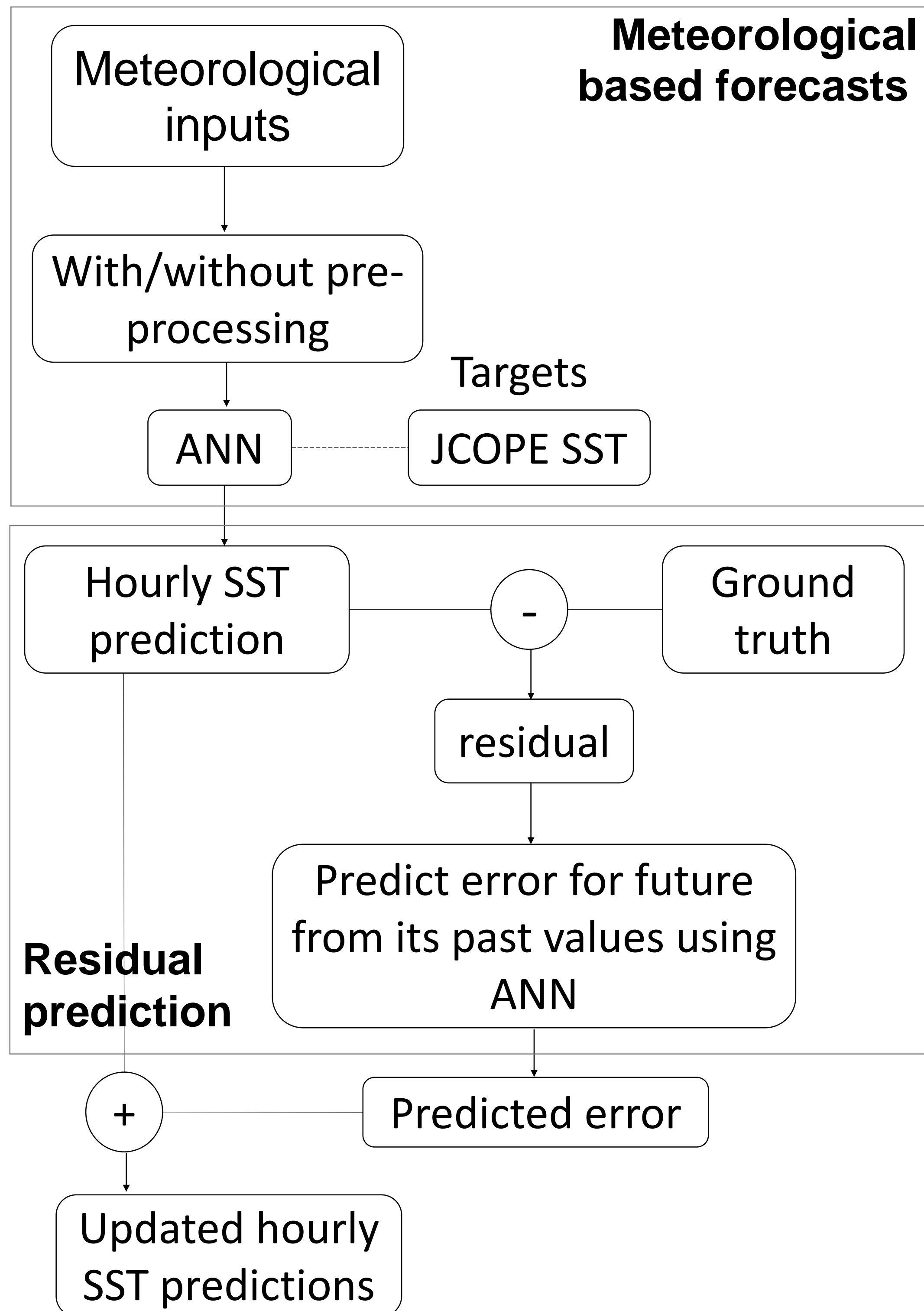
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Introduction

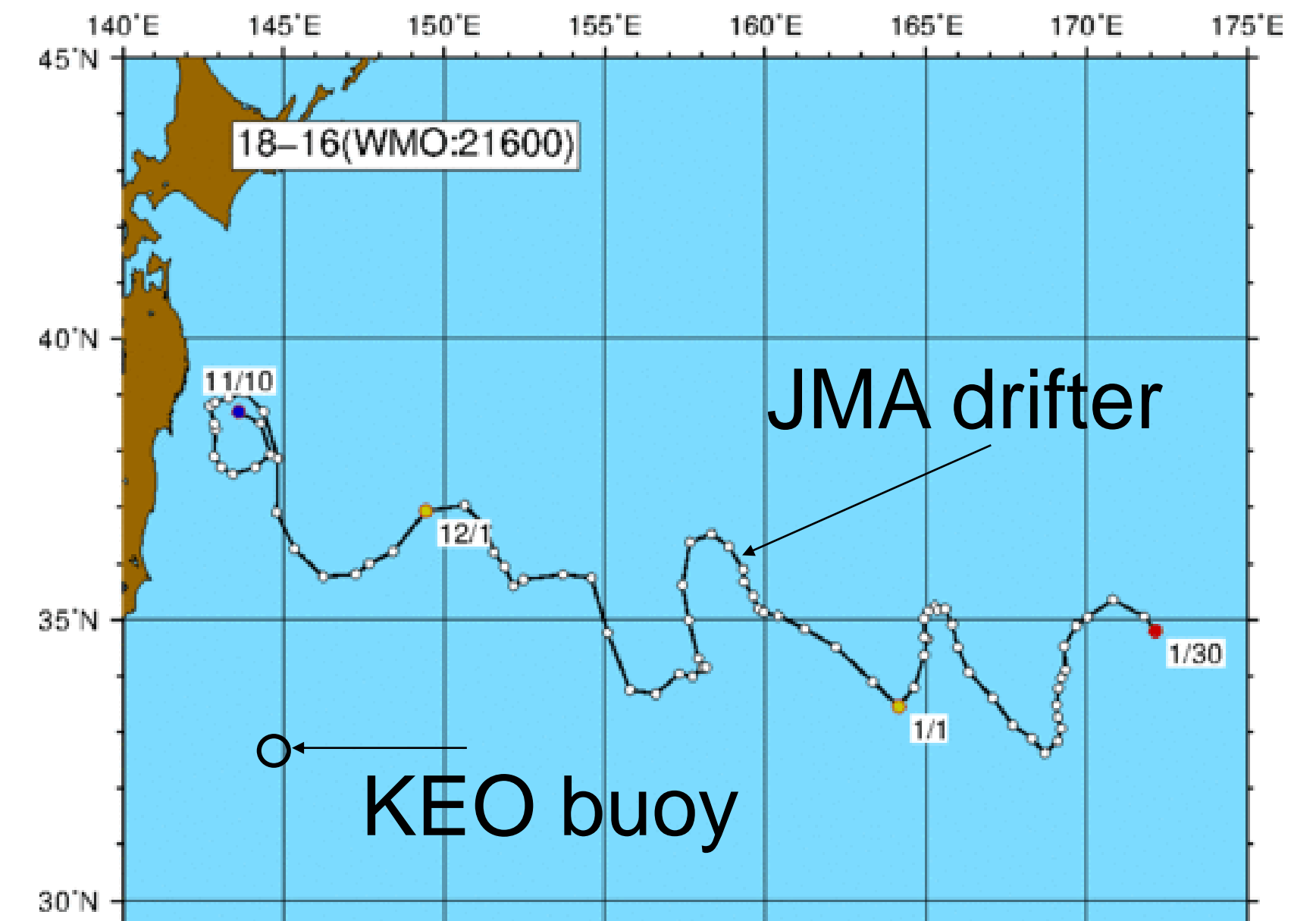
- Sea surface temperature (SST) is utmost important for locating fishing zones
- SST prediction is largely based on numerical models, but its output often largely deviate from ground truth due to many implicit assumptions
- This study attempts SST forecasts using meteorological parameters as inputs
- Further it also improves the forecasts by residual prediction

Methodology



Data

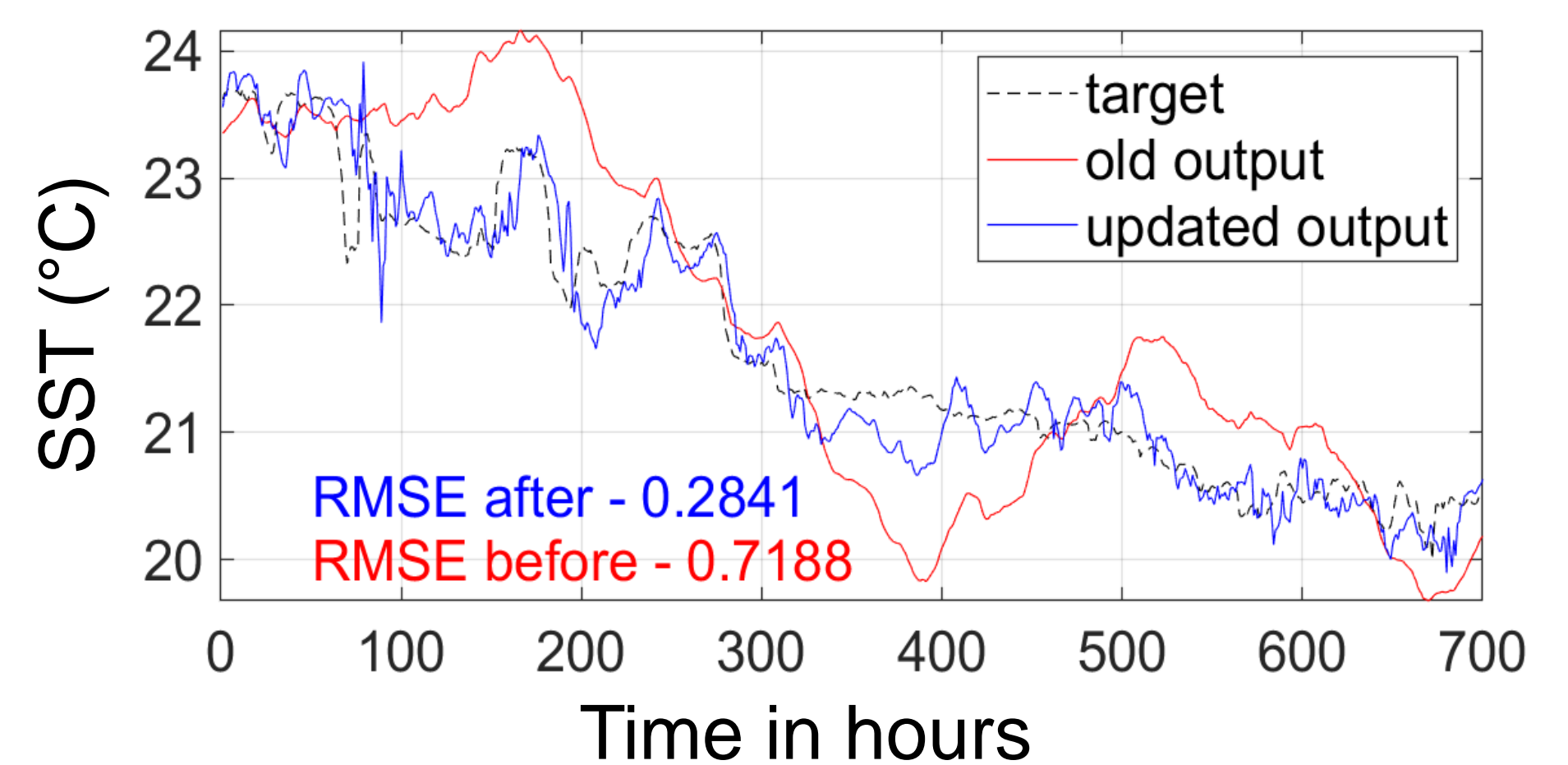
- Target data: JCOPE SST hourly data
- Input data: ECMWF reanalysis hourly data (ERA5)
- Ground truth: Buoy and drifter data
- Buoy: KEO buoy (32.3°N, 144.6°E)
- Drifter: JMA drifting ocean data buoys (32.3°N, 144.6°E)



Results

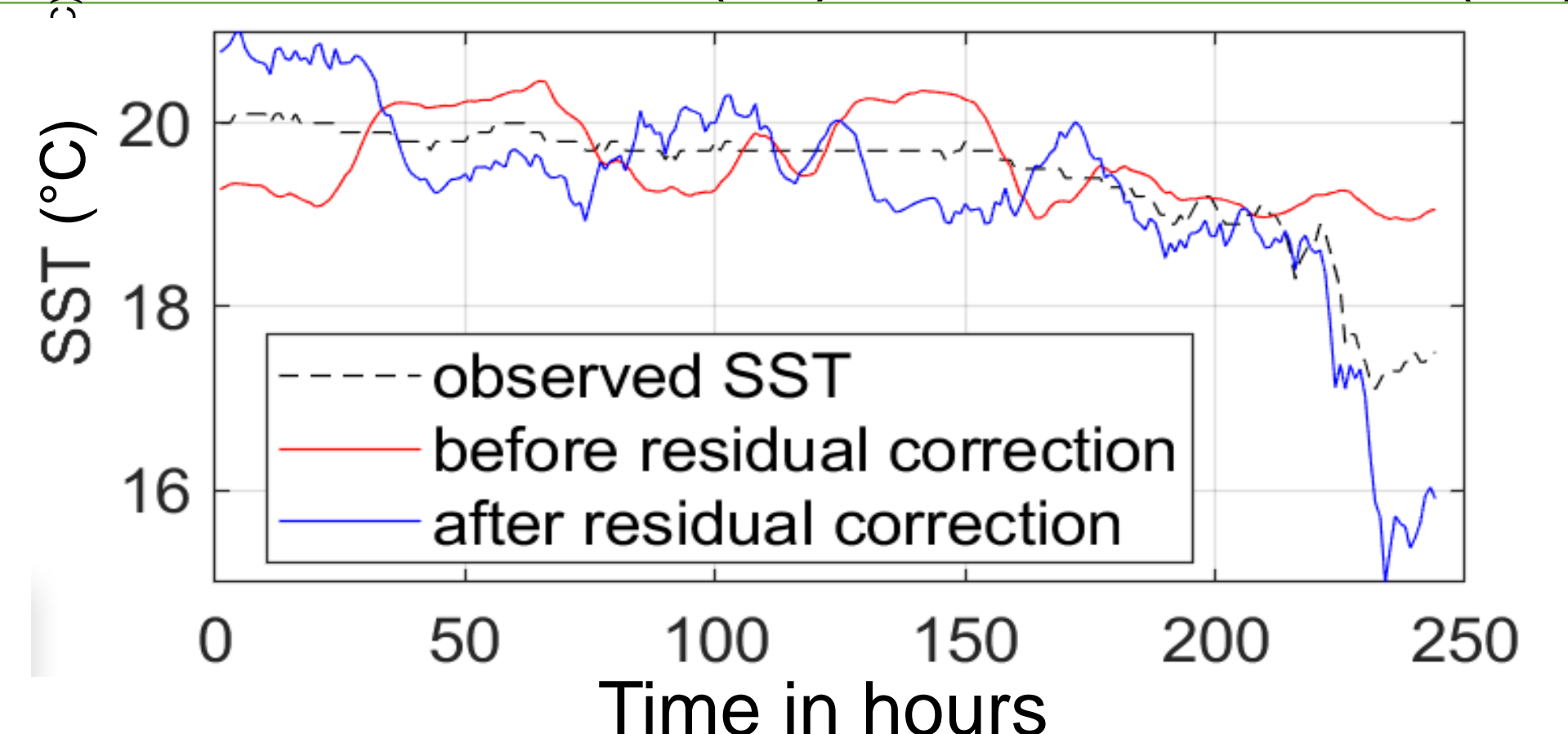
RMSE for Buoy

Leadtime	Without moving average	Moving average (60 to 144)
1 Hr	2.4893 (°C)	0.6232 (°C)
8 Hr	1.8365 (°C)	0.7188 (°C)
24 Hr	2.4032 (°C)	0.6150 (°C)
After residual prediction		
1 Hr	0.2659 (°C)	0.0539 (°C)
8 Hr	0.7056 (°C)	0.2841 (°C)
24 Hr	1.1795 (°C)	0.4675 (°C)



RMSE for Drifter

Leadtime	Without moving average	Moving average (1 to 48)
1 Hr	0.6804 (°C)	0.6364 (°C)
8 Hr	0.6735 (°C)	0.6313 (°C)
24 Hr	0.6834 (°C)	0.6213 (°C)
After residual prediction		
1 Hr	0.1224 (°C)	0.1067 (°C)
8 Hr	0.5034 (°C)	0.5534 (°C)
24 Hr	0.8432 (°C)	0.8454 (°C)

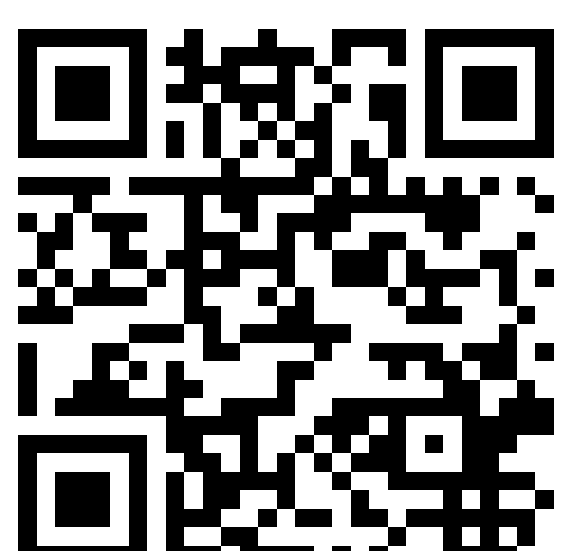


Conclusions

- ANN based meteorological forecasts can be an alternative to physics based models for small spatial regions
- Moving average method improves the prediction accuracy significantly
- Residual prediction is an effective technique to further improve this ANN based predictions like an offline data assimilation
- Buoy predictions shown more accuracy in ANN based and residual predictions
- Drifter predictions were showing low accuracy as they were not temporally correlated at same place

Prof. Masaaki Iiyama lab's other research

- SST image in-painting
- AI meets fisheries
- High-resolution Bathymetry Data Acquisition



Beneficiary of the study

- Fishery industries
- Meteorological organization

Future scope

- Deep learning for SST prediction from larger spatial domain of meteorological parameters