

Validation of Sea Surface Temperature Analyses in the Beaufort Sea Using UpTempO Buoys

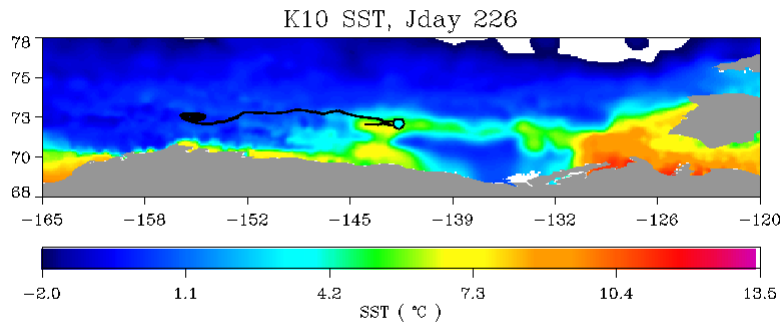
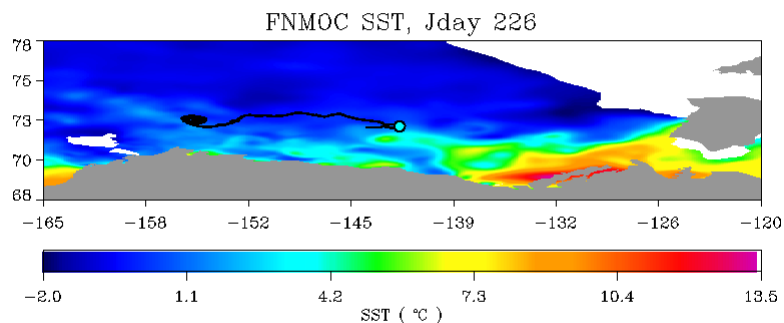
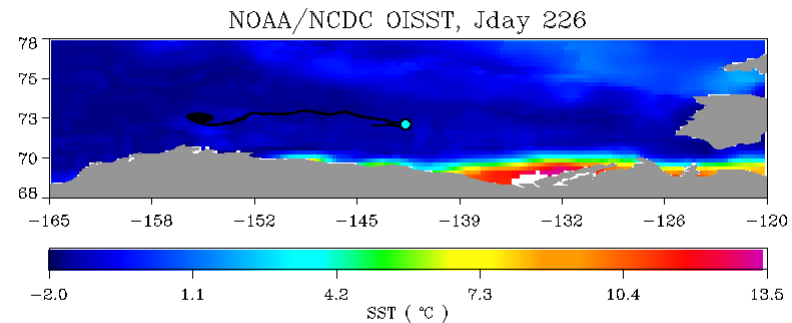
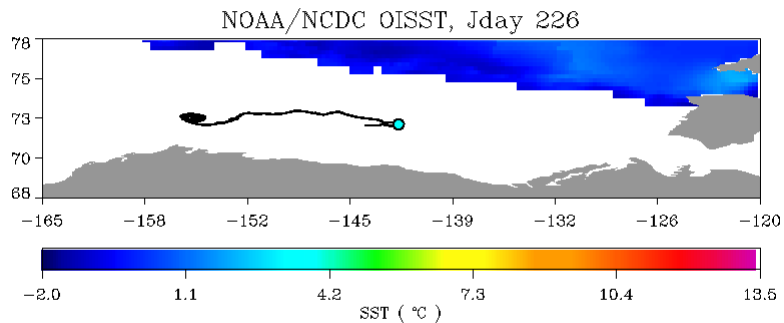
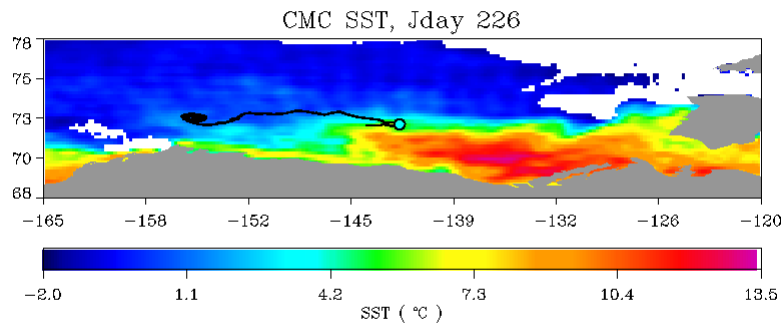
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What is the best gap-free SST product for high-latitude applications?



L4 SST Products

CMC

OISST

FNMOCS

MUR

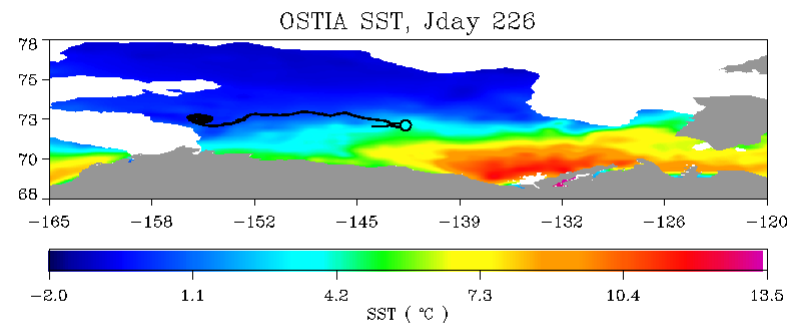
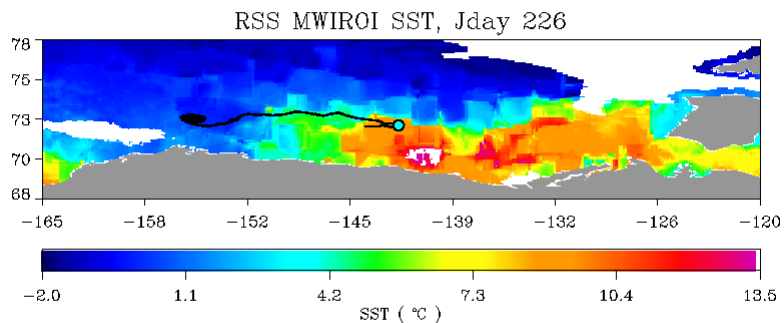
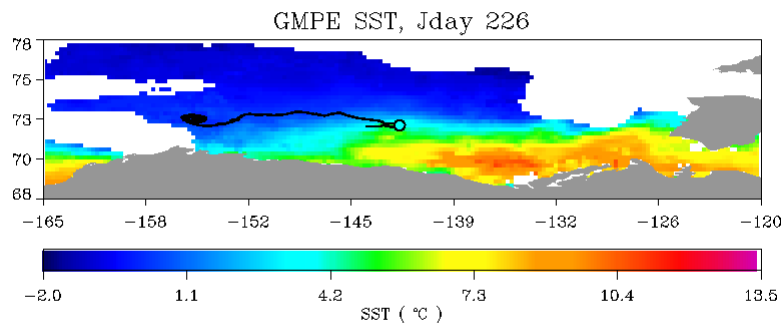
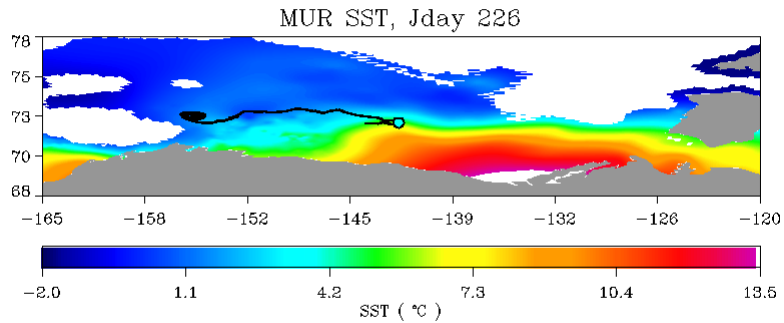
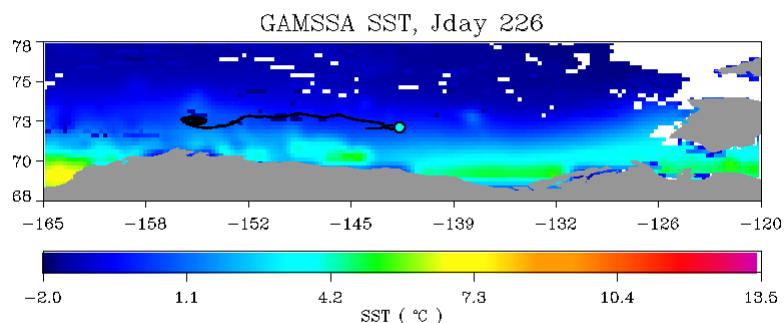
GAMSSA

OSTIA

GMPE

MWIROI

K10



In Situ Reference

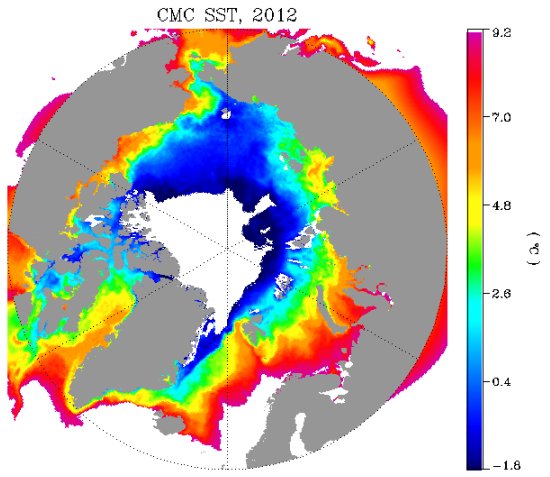
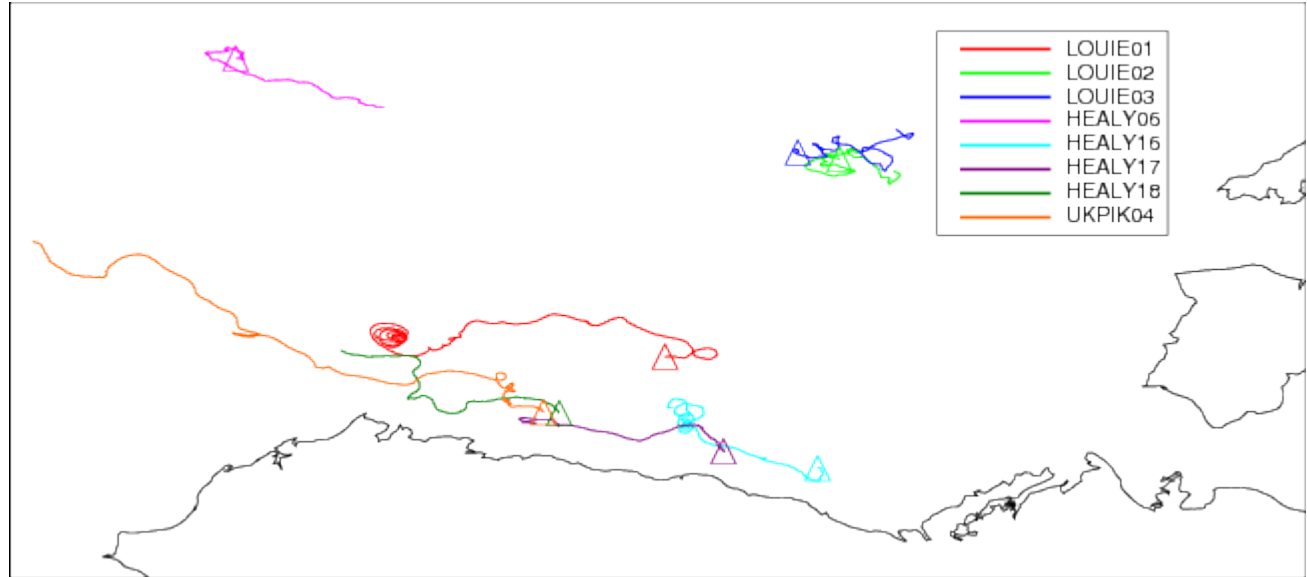
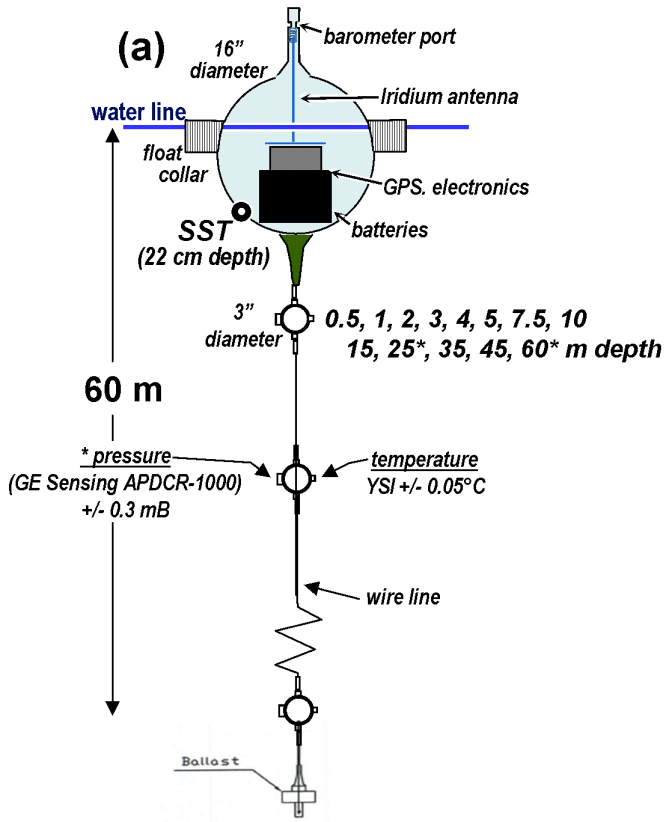
UpTempO Buoys

2012 Buoys:

- LOUIE01
- LOUIE02
- LOUIE03
- HEALY06

2013 Buoys:

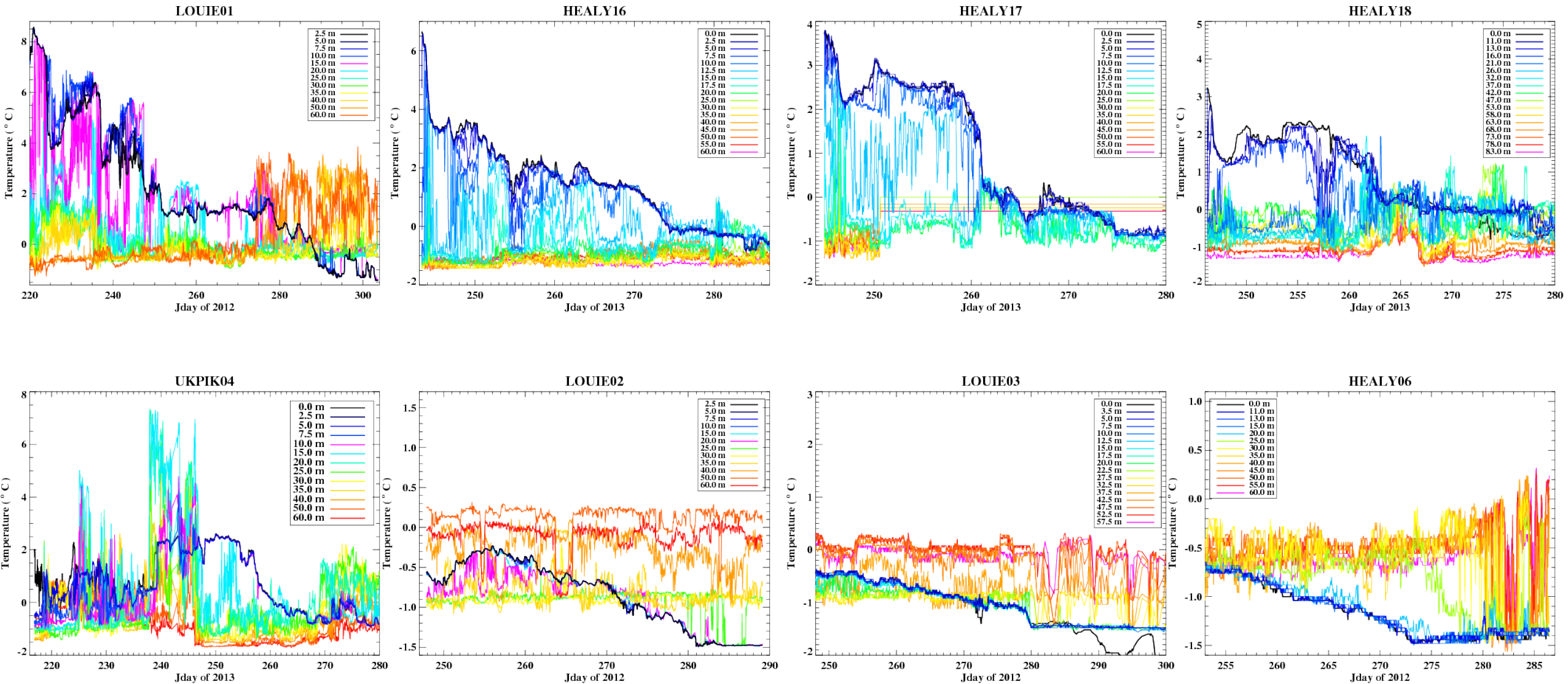
- HEALY16
- HEALY17
- HEALY18
- UKPIK04



Buoy Combinations/Regimes

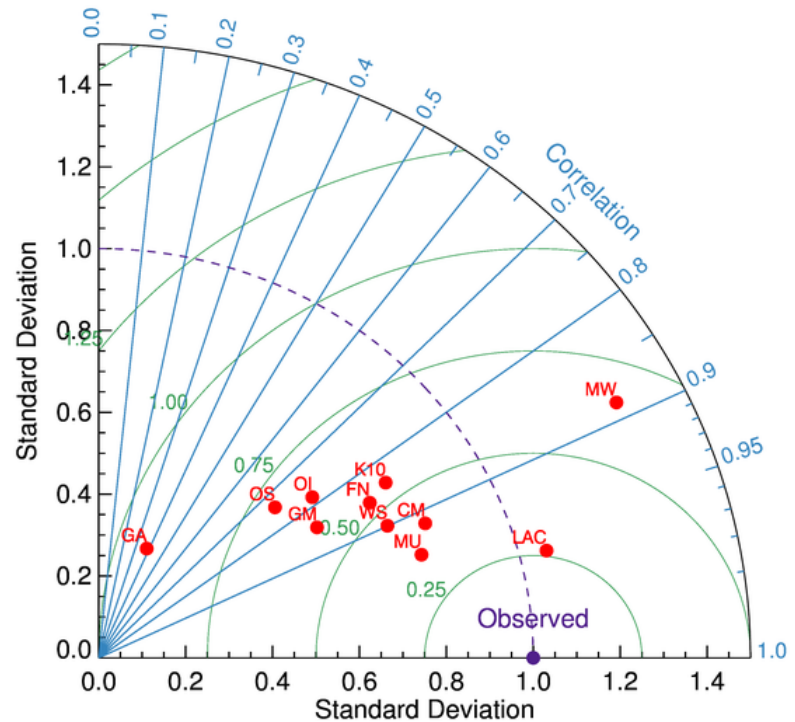
- High Latitude Buoys: LOUIE02, LOUIE03, HEALY06
 - Coastal Buoys: LOUIE01*, UKPIK04*, HEALY16, HEALY17, HEALY18
 - High latitude and Coastal buoy combined excluding storm and MIZ periods
-
- Special Cases:
 - Super Storm/SST Gradient region: LOUIE01
 - MIZ: UKPIK04

Time Series of UpTempO temperatures in the top 60 m



Performance Classification Method

- Taylor Diagrams



$$RMS'^2 = \sigma_{sat}^2 + \sigma_{obs}^2 - 2\sigma_{sat}\sigma_{obs}\rho$$

- Skill Scores and Performance Thresholds

$$TS = \frac{4(1 + \rho)^4}{\left(\hat{\sigma}_{sat} + \frac{1}{\hat{\sigma}_{sat}}\right)^2 (1 + \rho_{max})^4}$$

$$SS = 1 - \widehat{RMS'}^2 - \left(\frac{\overline{Sat} - \overline{Obs}}{\sigma_{obs}}\right)^2$$

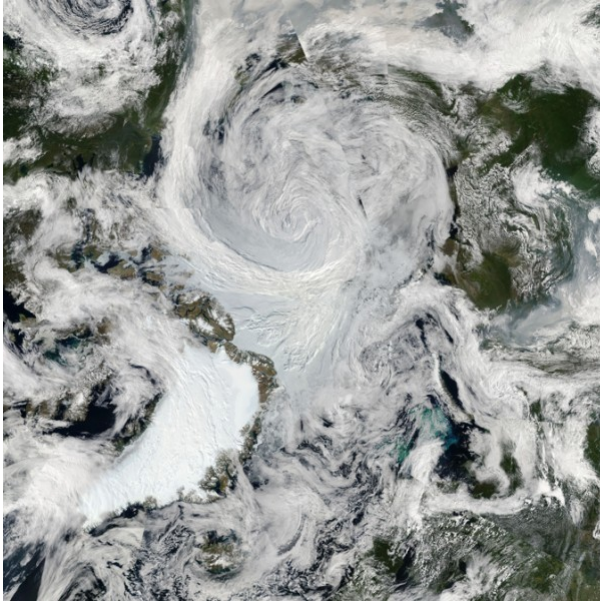
$$Threshold = 1 - Accuracy$$

If Score ≥ 0.75 then Product has Good Performance

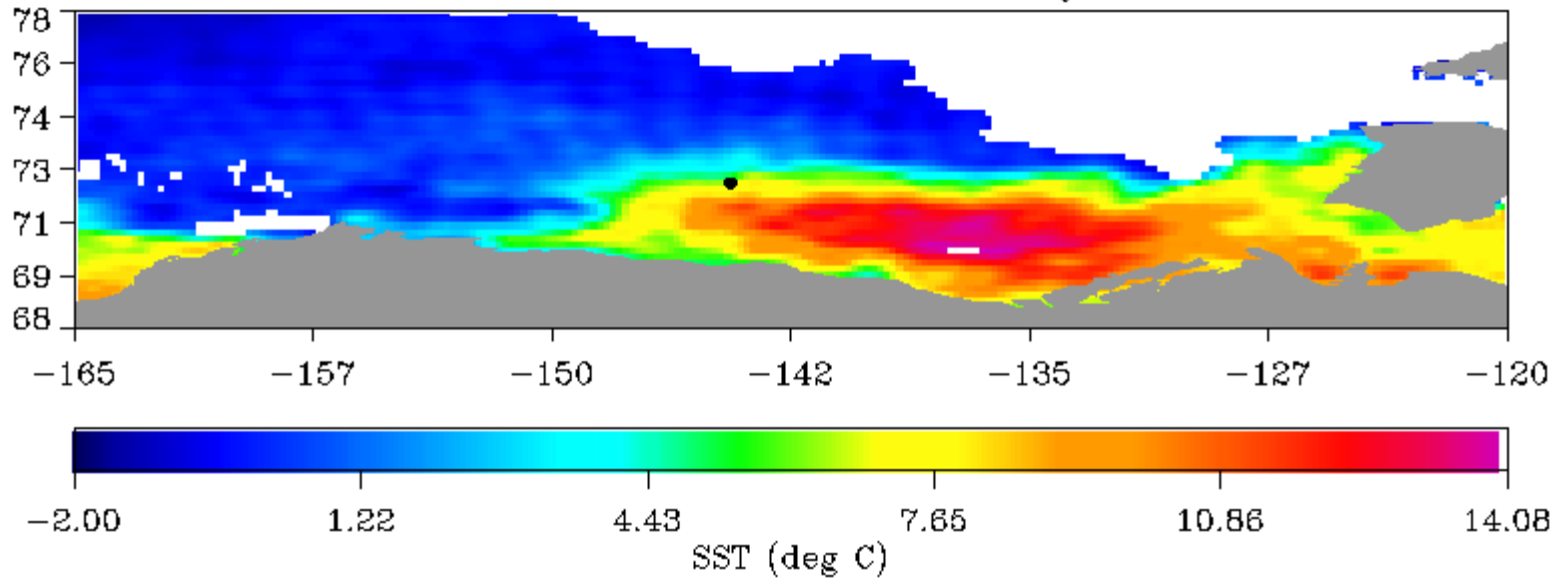
If $0.51 \geq \text{Score} < 0.75$ then Product has Adequate Performance

If Score < 0.51 then Product has Poor Performance

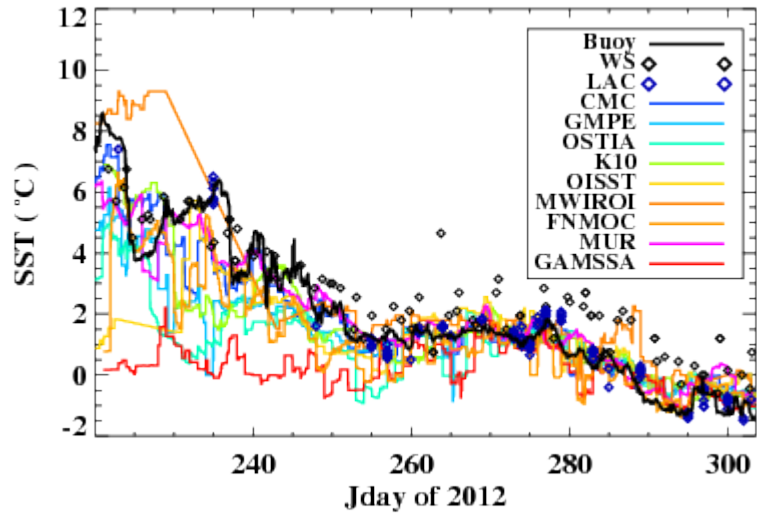
UpTempO buoy LOUIE01, 2012



CMC SST and LOUIE01, Jday 220

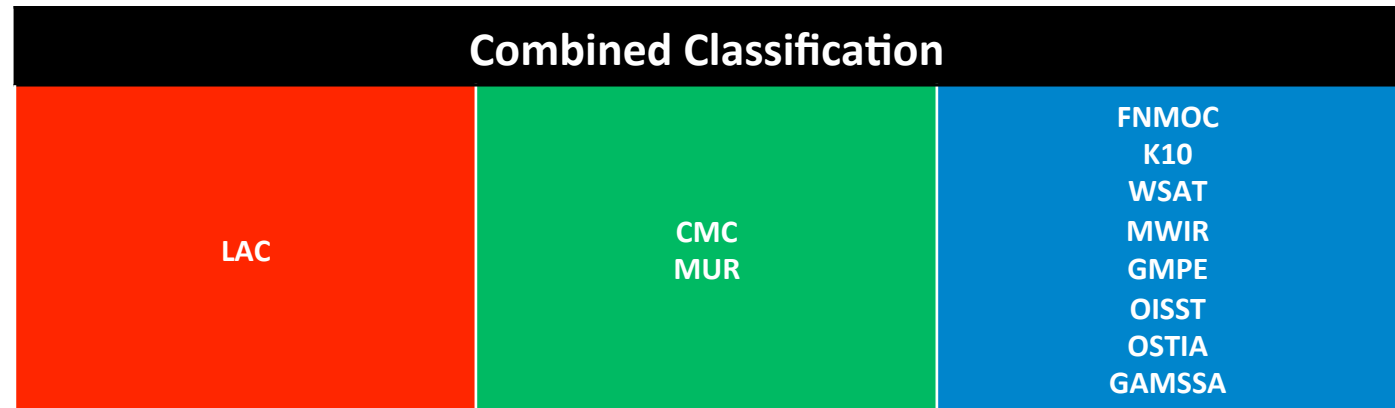
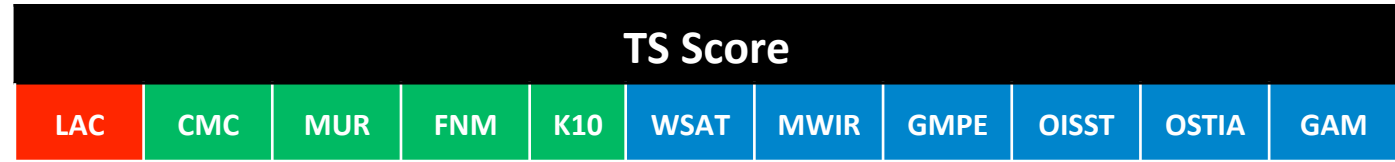
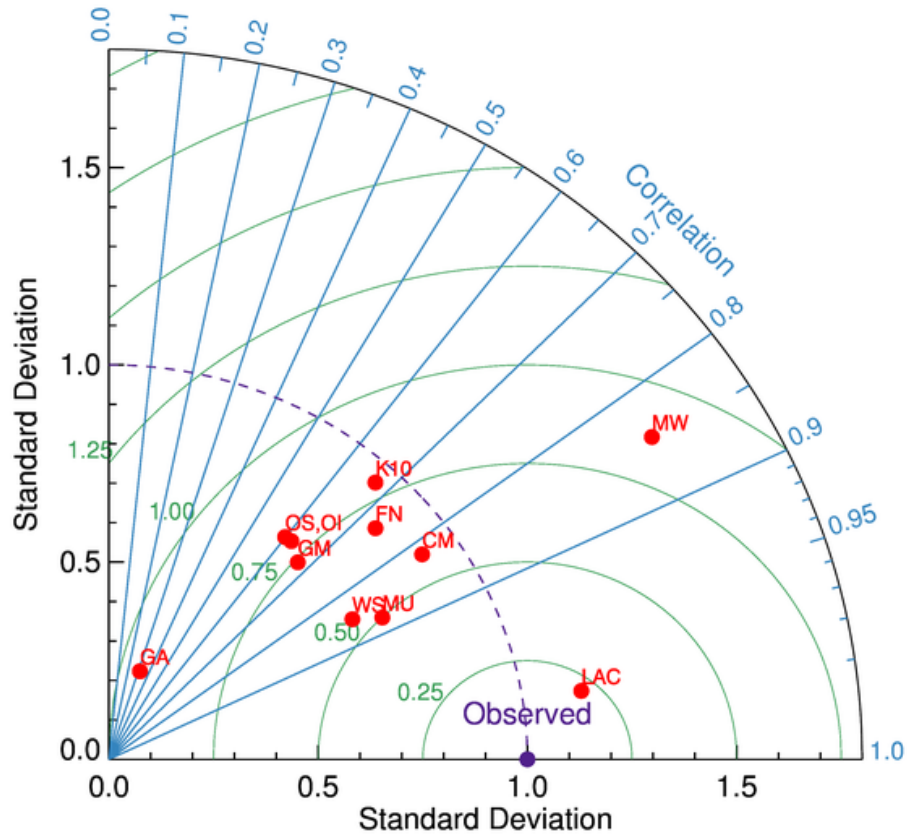


LOUIE01

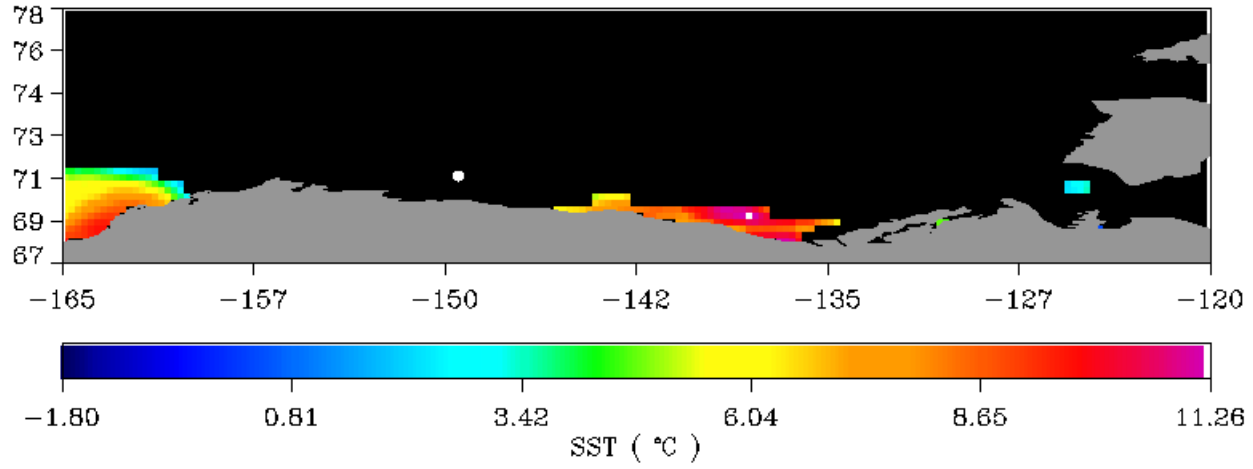


Storm and its aftermath

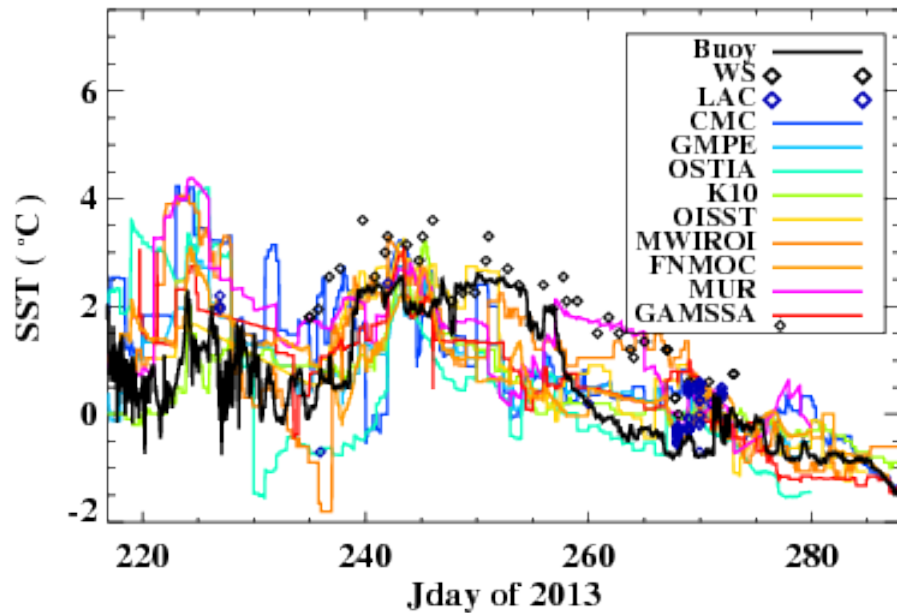
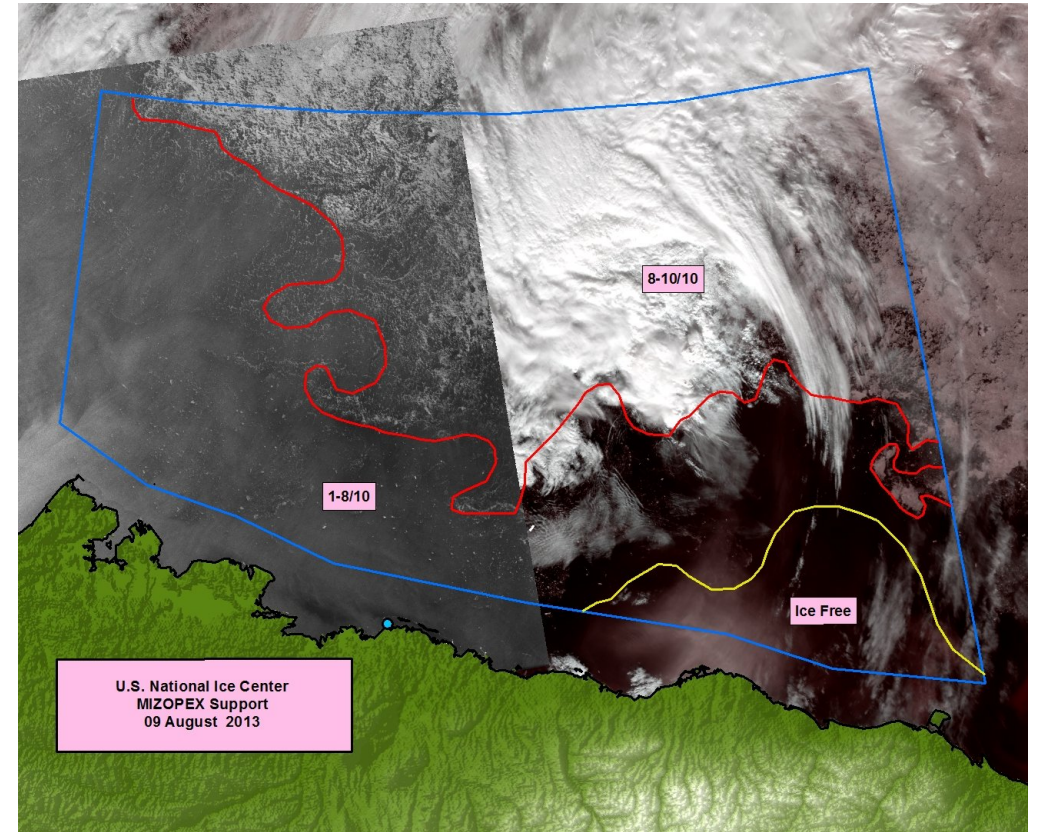
Taylor Diagram and Skill Scores for Satellite SSTs matched to LOUIE01 for the period before 9/16/2012



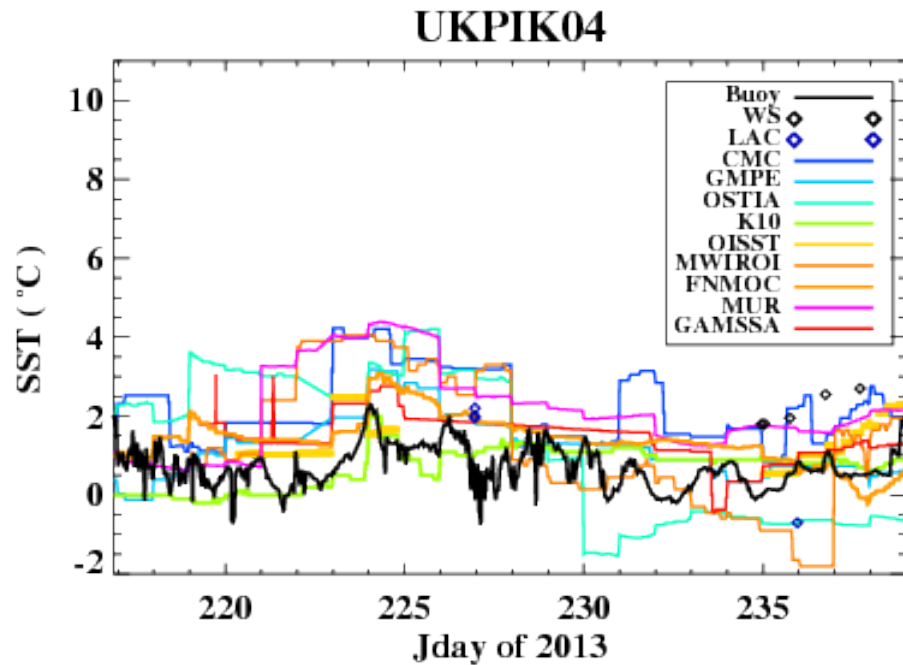
NOAA-NCDC OISST for 216



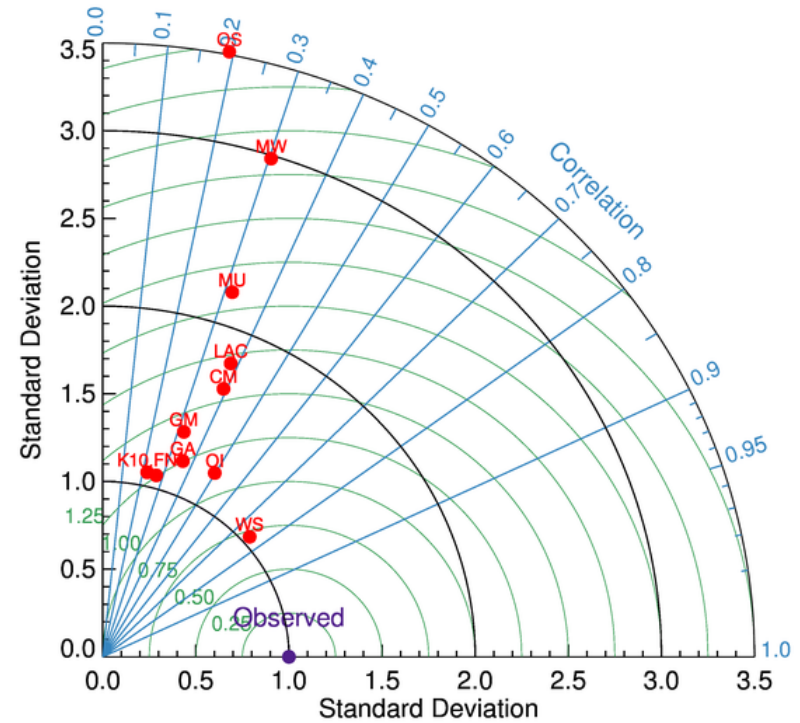
UpTempO Buoy UKPIK04, 2013



Taylor Diagram for Satellite SSTs matched to UKPIK04 during the MIZ

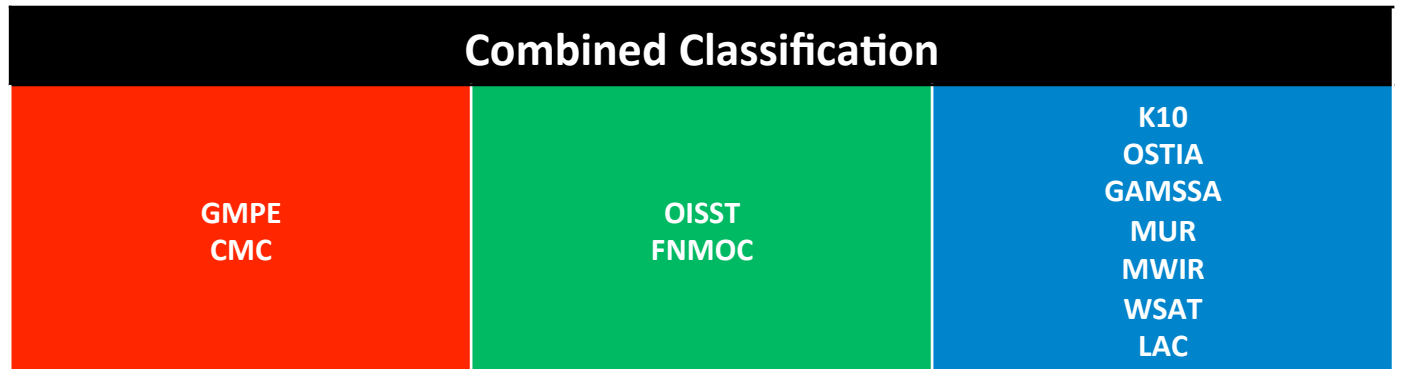
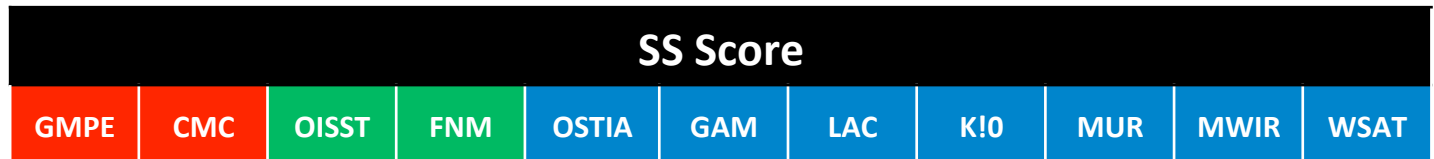
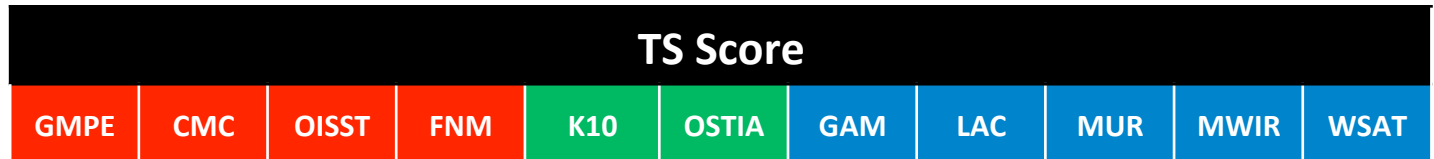
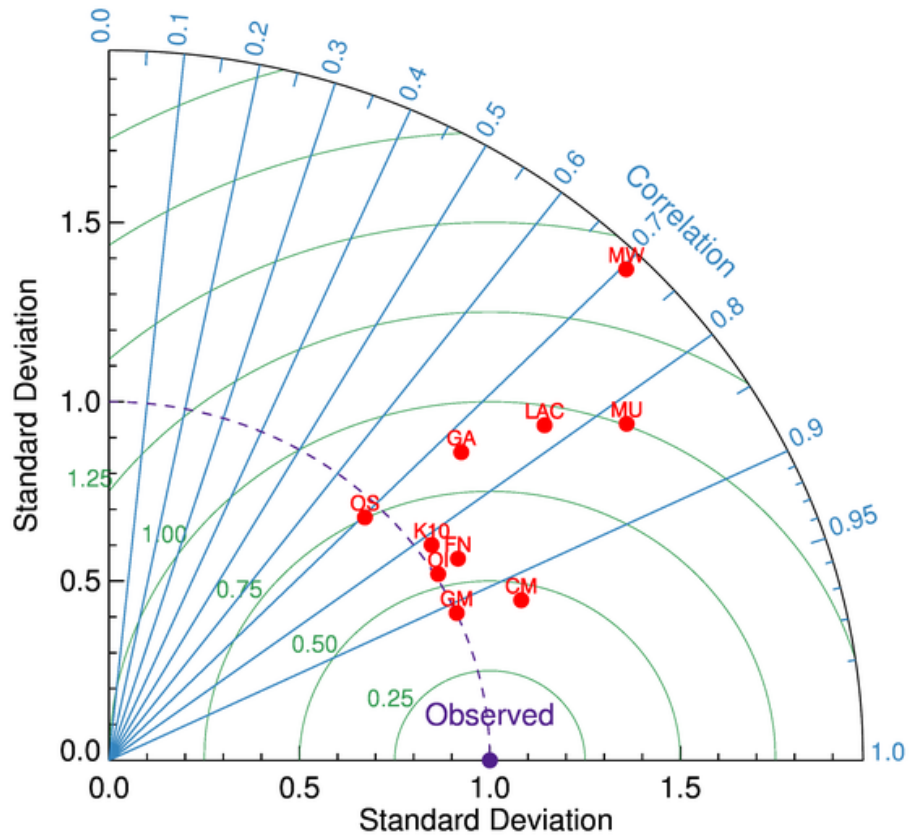


K10 SSTs is the only product that stands out during this regime



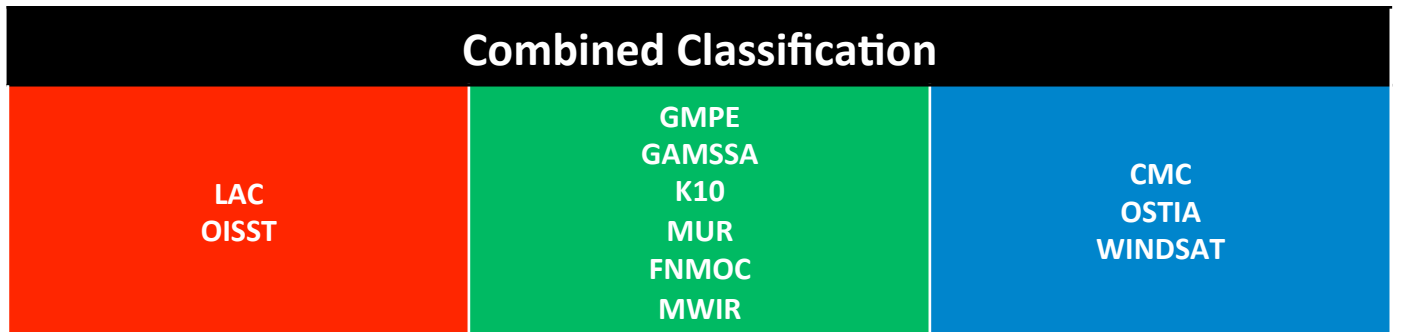
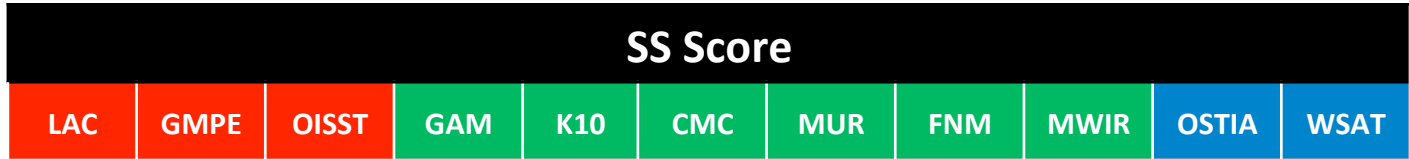
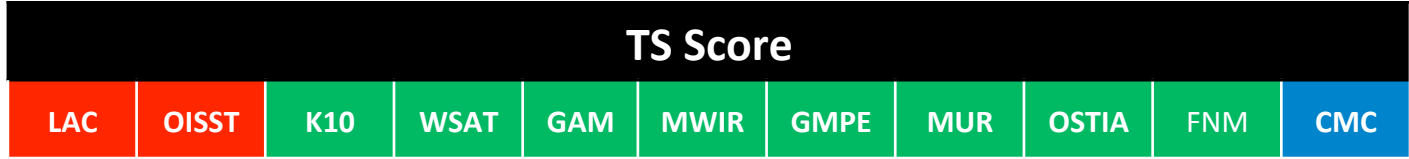
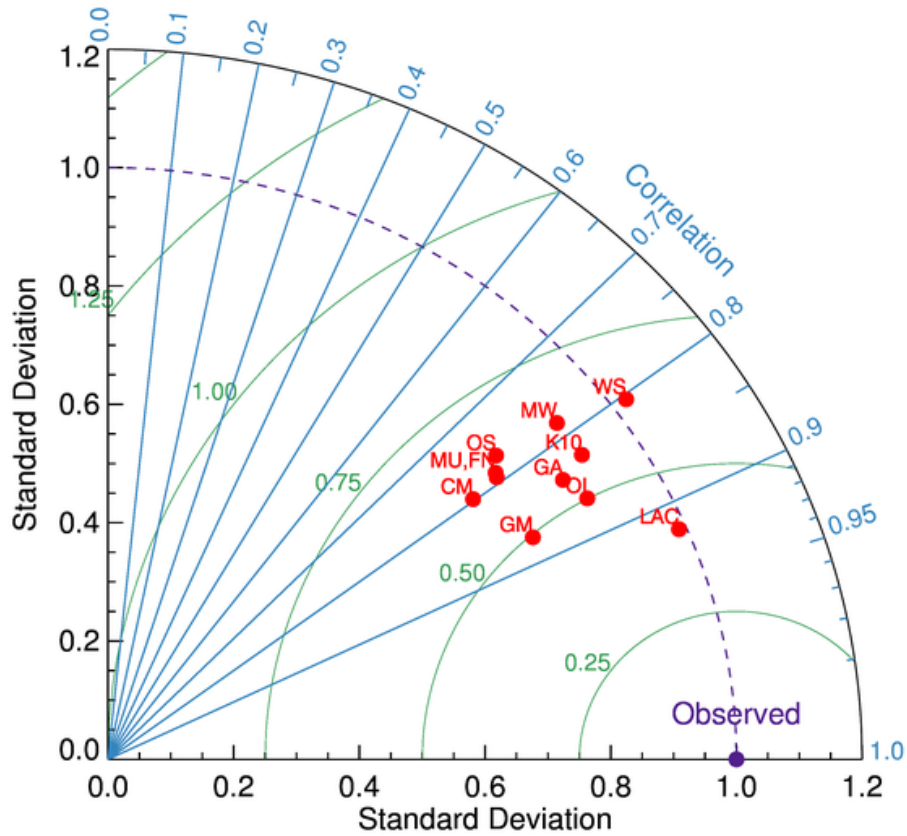
HIGH-LATITUDE BUOYS

Taylor Diagram and Skill Scores for Satellite SSTs matched to LOUIE02, LOUIE03, and HEALY06 for the 2012 Arctic Summer



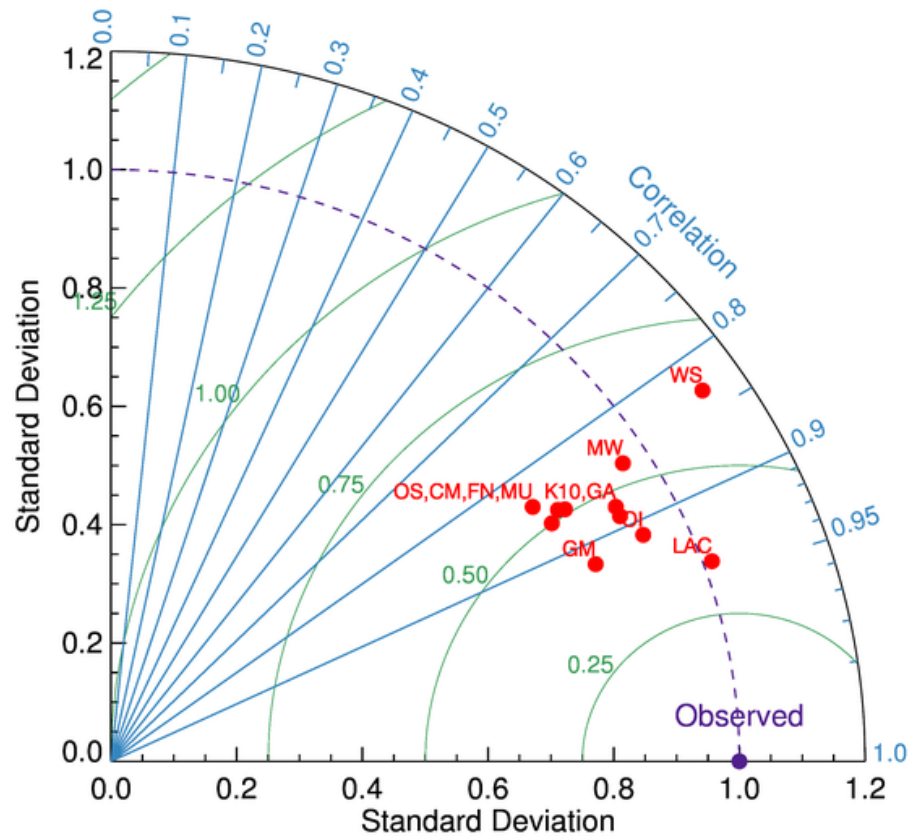
Coastal Buoys

Taylor Diagram and Skill Scores for Satellite SSTs matched to HEALY16, HEALY17, HEALY18, UKPIK04 (after MIZ) and LOUIE01 (after storm), 2012 - 2013



Coastal and High Latitude Buoys Combined

Taylor Diagram and Skill Scores for Matched Satellite SSTs. Excludes MIZ and Storm periods and GAMSSA 2012 SSTs.



TS Score										
LAC	OISST	GAM	K10	GMPE	MWIR	MUR	WSAT	FNM	CMC	OSTIA

SS Score										
LAC	GMPE	OISST	GAM	K10	CMC	MUR	FNM	MWIR	OSTIA	WSAT

Combined Classification		
LAC GMPE OISST GAMSSA K10	CMC MUR FNMOC MWIR OSTIA	WSAT

Overall Classification of L4 SST Products for High Latitude Applications

	LAC	CMC	OISST	GMPE	FNM	MUR	K10	GAM	MWIR	OSTIA	WSAT
Storm	Red	Green	Blue	Blue	Blue	Green	Blue	Blue	Blue	Blue	Blue
Hilat	Blue	Red	Green	Red	Green	Blue	Blue	Blue	Blue	Blue	Blue
Lowlat	Red	Blue	Red	Green	Green	Green	Green	Green	Green	Blue	Blue
Total	7	6	6	6	5	5	4	4	4	3	3

Red: Good Skill: 3 points, Green: Adequate Skill: 2 points, Blue: Poor Skill: 1 point