Analysis of Multiscale Ultrahigh Resolution (MUR) Sea Surface Temperature Data Sets

Robin Sehler
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Mentor: Dr. Jorge Vazquez
Co-mentor: Dr. Edward Armstrong
Project Outline

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Project Objective

• To determine which spatial resolution of satellite-derived MUR version 2 data best reflects ocean buoy sea surface temperatures:
  – 1 km spatial resolution (i.e. HIGH RESOLUTION)?
  – 9 km spatial resolution (i.e. LOW RESOLUTION)?
Background: MUR Version 2

• MUR is one of NASA’s newest SST products, developed by Dr. Mike Chin

• MUR combines data taken from both
  – Infrared radiation sensors (limited by cloud coverage)
  – Microwave radiation sensors (limited by resolution)
Background: GHRSSST

- The study is a part of an international effort by the Group for High Resolution Sea Surface Temperature (GHRSSST) to provide high resolution SST data in a uniform format and with a complete description of errors (e.g. bias, standard deviation)
- GHRSSST data includes both NASA/NOAA sensors which are used to create the MUR data:
  - Moderate Resolution Imaging Spectroradiometer (MODIS)-NASA
  - The Advanced Very High Resolution Radiometer (AVHRR)-NOAA
  - Advanced Microwave Scanning Radiometer - Earth Observing System (AMSRE)-NASA
Why is this the study of SST important?

• The National Oceanic and Atmospheric Administration (NOAA) has defined SST as an “essential climate variable” (ECV).

• In order to study climate change, scientists must have climate data that does not have a bias between buoy-derived SST and satellite-derived SST.
Methodology

Use three IDL validation codes to compare mean bias and standard deviations of low resolution and high resolution data over the period of April 1 – December 31, 2009, for the following oceanic regions

- Oceans surrounding North and Central America
- The California Coast (major region of upwelling)
- The Gulf Stream (major region of ocean heat transport)
North and Central America
North and Central America

NCAMERICA (Drifting Buoys)

STD (°C)

NCAMERICA (Drifting Buoys)

North and Central America
The California Coast
The California Coast

California Coast (Fixed Buoys)

![Bar chart showing bias and standard deviation for California Coast (Fixed Buoys) with different resolutions and seasons.](image)

- **Bias (°C)**
  - MUR V2 LowRes
  - MUR V2 HighRes

- **Standard Deviation (°C)**
  - MUR V2 LowRes
  - MUR V2 HighRes

Seasons:
- Fall
- Spring
- Summer
- Apr.-Dec.
The Gulf Stream
The Gulf Stream

Gulf Stream (Drifting Buoys)

Gulf Stream (Drifting Buoys)
Conclusion

• Over the entire NCAMERICA region, including the oceans off the coast of California and in the Gulf Stream, the higher resolution dataset has consistently smaller bias and standard deviation values.

• Off the coast of California, the largest biases and standard deviation values occur during times of upwelling.
Future Work

• Compare the high resolution and low resolution data sets using the same exact grids

• Look more carefully at the seasonal differences between HiRes/LowRes datasets in terms of their biases and standard deviations

• Better understand what is causing the bias to be +/- in certain geographic locations
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