Motivation

- Heat and moisture exchange between the ocean surface and atmosphere plays an integral role in short-term, regional numerical weather prediction (NWP) and forecasting for situational awareness.
- Many current sea surface temperature (SST) products lack both spatial and temporal resolution to accurately capture small-scale features that affect heat and moisture flux.
- The SPoRT sea surface temperature (SST) composite product has been generated for over 10 years in various forms. The latest version (2016) covers the northern hemisphere up to 80°N at 2-km resolution. The product is currently provided to a number of end users in their decision support systems (DSS). It is run twice daily to capture diurnal changes in SST.
- Provides resolution and timeliness to potentially improve regional NWP forecasts and situational awareness.

Methodology and Product Updates

- Current input data
  - Moderate resolution Imaging Radiometer Suite (MODIS) (Aqua and Terra)
  - United Kingdom Meteorological Office-Operational SST and Sea Ice Analysis (UKMO-OSTIA) from the Group for High Resolution SST project archive at JPL, PO-DAAC
  - NESDIS-GOES/POES SST (NOAA)
- New input data
  - Visible Infrared Imaging Radiometer Suite (VIIRS) which at 750m resolution has been added to the composite product as an additional high-resolution source (also mitigates risks associated with the age of MODIS)
- VIIRS and MODIS are 7-day collections that are acquired and processed in near real time. The most recent daily NESDIS and OSTIA global analyses are used (nominally the field from the previous day).
- Final Weighted SST value at each grid point is determined by latency and by input type (e.g., resolution)
  \[
  \text{Final Weighted SST} = (\text{SST} / \text{dL}) \times rF \quad (1)
  \]
  \[
  \text{dL} = \text{number of days latent,}
  \text{rF} = \text{input type / resolution factor}
  \]
  \[
  \text{where, 'rF' \ VIIRS/MODIS = 1.0, NESDIS-GP = 0.5, OSTIA = 0.01}
  \]
- The VIIRS and MODIS SSTs are given the most weight due to the higher spatial resolution and desire for the product to be an observation-driven analysis.
- An example of 7-day MODIS and VIIRS weighted fields and the final product are shown in Fig. 1.

- While the VIIRS field has more data partially due to a 30% wider swath than MODIS, there are also different criteria for data quality between them. The SPoRT SST product only uses the data flagged as highest quality. Satellite-based IR retrievals (MODIS, VIIRS, etc.) of SSTs are limited in areas in and near clouds, sea-ice, sun-glint, and other less common conditions.

- Product is provided to the NWS in netCDF ready to use in their Advanced Weather Interactive Processing System (AWIPS) DSS (Fig. 3).
- Used by the Alaska Ice Desk in their daily operations (netCDF)

- Acquired by WorldWinds, Inc. (GRIB-2) and distributed as part of commercial products used by fishermen (Fig. 4) and other users; repackaged by Baron, Inc. for use by TV weather community and Baron Hurricane Index product

- Available in NRT for Weather Research and Forecasting (WRF) Environmental Modeling System (EMS) for users to download and replace as lower boundary in model for better resolution of gradients (GRIB-2; Fig. 5)
- Used by select NWS WFOs for local modeling and by ESRL for sea ice modeling applications

Applications

- Ingested by SPoRT website and MSFC Earth Science Office Web Mapping Service (WMS) (GeoTIFF; Fig. 2) and available for automated download for:
  - NOAA nowCOAST to make available as a data layer
  - U.S. Coast Guard to identify areas of high iceberg potential

Summary

- The SPoRT SST composite is a reliable and robust high-resolution product generated twice per day in near real time.
- It incorporates highest quality data satellite data from infrared imagers and global analysis from NESDIS and UKMO.
- Recent updates to the product include the inclusion of VIIRS data to extend the life of the product beyond the MODIS era.
- It is used by a number of users in their DSS.

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