REGIONAL FUSED SEA SURFACE TEMPERATURE SYSTEM FOR THE GULF OF MAINE

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1. INTRODUCTION

Sea surface temperature (SST) is one of the most important variables in ocean and climate dynamics. High-resolution SST fields are crucial for estimating upper ocean circulation and air-sea fluxes such as heat transfer. To meet these critical needs, SST products are often constructed by combining measurements from a variety of sources to produce an analysis with improved resolution and quality. Geostationary satellites, such as NOAA Geostationary Operational Environmental Satellite (GOES), provide a continuous stream of environmental data, which can be used to retrieve SST fields with high frequency. Combining observations from geostationary and polar-orbiting satellites allow one to produce a synthesized product with high spatial and temporal resolution. Here we introduce the product that represents a regional application of such combination over the Gulf of Maine region [1].

2. GULF OF MAINE SST SYSTEM

The system combines SST estimates from the geostationary and polar-orbiting satellites to produce a synthesized product with high spatial and temporal resolutions. The SST fields are derived using measurements from the geostationary operational environmental satellite (GOES) and analyses from the real-time global sea surface temperature (RTG_SST) and the ocean surface temperature and ice (OSTIA) systems (Figure 1). GOES SST retrievals are derived from brightness temperatures of GOES imager mid-wavelength infrared channel 2 at 3.9 μm and long-wavelength channel 4 at 10.8 μm using AER cloud mask detection algorithm [2]. This algorithm has been implemented into a prototype near-real time production system that, since May 2007, has produced SST fields four times per day on a 4-km grid. The fused SST is computed as a weighted average of data sources, with weights being inversely proportional to the errors of each data constraint. In situ SST from 10 NOAA and 10 GoMOOS buoys that transmit data in real time are used to assign time-varying weights, computed at every run of the system. This system also provides daily validation data constructed by collocating estimated SST values with in situ measurements from GoMOOS and NOAA buoys. The average bias in the domain from May to August 2007 is found to be 0.02 ±0.8°C. There is a slight trend in the bias that increases with each month (Figure 2). Analysis of the system output and in situ observations revealed significant amplitudes of high-frequency variability in the region. The ability of the system to resolve high-frequency signals in the area has important implications in modeling efforts through improving estimates of heat flux and specifying accurate boundary conditions in ocean models, estimating diurnal variability of the system, which is necessary in simulation of tidal fronts, diurnal vertical migration patterns, etc.

3. REFERENCES

Figure 1: Example of data sources and fused SST analysis on May 2, 2007 (in degree C)

Figure 2: SST analysis bias averaged over domain