NOAA'S GLOBAL HIGH RESOLUTION SATELLITE SEA SURFACE TEMPERATURE BLENDED ANALYSIS

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INTRODUCTION

The National Oceanic and Atmospheric Administration's (NOAA) office of National Environmental Satellite Data and Services (NESDIS) generates an operational daily global high resolution satellite sea surface temperature (SST) blended analysis. True global SST coverage requires an analysis incorporating satellite-borne instrument measurements. The production of an accurate SST analysis depends on merging the data from these sources in order to capture the best of each sensor.

Sea surface temperatures influence air-sea exchange processes and are a key parameter in many environment and process models. SSTs are measured from in situ observations (moored and drifting buoys, ships) and satellites. An SST analysis incorporating satellite-borne instruments is a true global analysis. Each instrument has its own strengths and weaknesses, depending on the sensor type, platform, orbit, etc. The production of an accurate SST depends on merging the data from these sources and accounting for the differing measurement methods and accuracies while maintaining as much of the information in the observations as possible to capture the best of each sensor.

This new daily SST analysis (operational June 2008) combines Geostationary (GOES-E/W, MT-SAT and Meteosat) SST and POES and MetOp (AVHRR) data into a single high-resolution (0.1°×0.1°) product. This resolution was chosen to approximately match the Nyquist sampling criterion for the mid-latitude Rossby radius (~20 km) to ensure the preservation of mesoscale oceanographic features such as eddies and frontal meanders. The methodology employs a rigorous multi-scale optimal interpolation which approximates the Kalman filter, together with a data-adaptive correlation length scale to ensure the balance between detail preservation and noise reduction. The new analysis has proven a significant success, even when compared to other products which purport to be

of similar or higher resolution. Operational Microwave SST products (e.g. AMSR-E SSTs) will be incorporated into this analysis to obtain SSTs in areas of persistent cloud.

ALGORITHM DESCRIPTION

Operational SST retrievals from NOAA's GOES and POES satellites are used to produce a daily global, high-resolution SST Analysis. The method employs a recursive estimation algorithm which emulates the Kalman filter, with a rapid multiscale OI algorithm used for the update step (Fieguth et al., 1998, 2002). This approach preserves fine-scale structure in SST estimates and allows geophysical realistic treatment of land-sea boundaries. a useful approximation, offering a computationally efficient method for interpolation of extremely large datasets.

The analysis uses the daily operational ice mask (5 arc minute) generated by NCEP/EMC/MMAB for screening the input satellite data. Ice identified within the analysis relaxes the temperature of the individual pixel to climatological salinity.

An appropriate spatially-varying bias correction with respect to the RTG analysis is estimated and applied to each of the other contributing datasets. This bias is updated by taking a weighted average of the bias estimate and the observed bias of the observations with the RTG analysis for the current day.

VALIDATION

The NESDIS daily global high resolution SST analysis (satellite only) was initially validated against drifting buoys for selected regions of the globe.

REFERENCES

Fieguth, P.W. et al., ``Mapping Mediterranean altimeter data with a multiresolution optimal interpolation algorithm'', J. Atmos. Ocean Tech, 15 (2): 535-546, 1998.

Khellah, F., P.W. Fieguth, M.J. Murray and M.R. Allen, `Statistical Processing of Large Image Sequences", IEEE Transactions on geoscience and remote sensing 14 (1), 80-93, 2005.

Merchant, C.J., A.R. Harris, Toward the elimination of bias in satellite retrievals of sea surface temperature Comparison with in situ measurements, Geophys. Res, 1999.