

Sea Surface Temperature products for weather and seasonal forecast systems

Dr Adrian Hines, Met Office

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This presentation covers the following areas

- Met Office use of SST products
- SST products for Numerical Weather Prediction
 - User requirement
 - Use and impact
- SST products for seasonal forecasting
 - User requirement
 - Use and impact
- SST products for climate applications
- Summary





- SST data for use in NWP system need to be:
 - Robust \Rightarrow operational support
 - Timely \Rightarrow dedicated production resources
 - Complete coverage ⇒ in situ; IR and MW; gridded analysis; global; including lakes
 - Stable over time \Rightarrow robust to new and failing satellites
 - High resolution \Rightarrow 25km or higher
 - Accurate and unbiased $\Rightarrow \le 0.6^{\circ}$ K r.m.s. and $\le 0.1^{\circ}$ K bias; bias correction
- MyOcean SST analysis product (OSTIA) meets these requirements



NWP – OSTIA impact

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Using OSTIA rather than low ulletresolution SST reduces forecast errors - example from August 2007

> Temperature (K) at 850 hPa: Analysis Northern Hemisphere (CBD area 90N -18.75N) Averaged from 17/8/2007 12Z to 31/8/2007 12Z



Forecast Range (hours)

Northern Hemisphere mean temperature error at 850hPa. Reduced by use of OSTIA.

TEMPERATURE (K) at 925hPa, Week Beginning 070811 Min: -5.37 max: 4.1 mean: -0.2 RMS: 0.85 SD:0.82



NWP temperature errors at 925hPa. Linked to errors in low resolution SST analysis.

> Difference between OSTIA and low resolution SST analysis.

Ref: Donlon et al, 2012: The Operational Sea Surface Temperature and Sea Ice Analysis (OSTIA) system. Remote Sensing of Environment, 116, 140–158.



- SST data for use in seasonal system need to be:
 - Robust \Rightarrow operational support
 - Stable over time \Rightarrow robust to new and failing satellites
 - Unbiased \Rightarrow bias correction, diurnal warming removed
 - Comprehensive \Rightarrow in situ; IR and MW satellites; global
 - Suitable for use in analysis alongside other data types (e.g. profile data) ⇒ observed data rather than analysis
- MyOcean observation products meet these requirements



Seasonal – SST data use

- SST anomaly in Nino 3.4 region is an important forecast variable
- Accurate initialisation of SST and subsurface ocean structure required
- Forecast plume captures observed evolution of SST anomaly
 - Example: GloSea4 seasonal forecasts from August 2010

Ref: Arribas et al. 2011: The GloSea4 **Ensemble Prediction System for** Seasonal Forecasting. Monthly Weather Review, 139, 1891-1910.





SST products for climate use

- SST data for use in climate applications need to be stable over time
 - Requirements have been stated as stability of < 0.05°K over a decade and accuracy of 0.1°K
 - Challenge to meet the stability requirement given changes in observation platforms
- OSTIA reanalysis is an attempt to produce SST with suitable long-term stability
 - Complementary to existing long-term datasets e.g. HadISST
 - Higher resolution, more complete data usage
- Will become increasingly important as satellite era time series lengthens



Summary and future needs

Met Office

- Summary
 - Weather, seasonal and climate applications require accurate, reliable SSTs
 - For use alongside other high quality data sets
 - MyOcean products meet the requirements and are in routine use
- Future look
 - Continuity of data sets is important
 - Consistent long-term record required
 - Increasing move towards "seamless" forecasting
 - Coupled forecasts across all timescales
 - Will continue to require high quality SST data for
 - Initialisation of coupled models
 - Understanding ocean-atmosphere coupling exchanges
 - Need for consistent real-time, delayed mode and reanalysis data sets



Questions and answers