Introduction

The NOAA ¼ daily optimum interpolation (DOI) sea surface temperature (SST) dataset, described in Banon et al. (2016):
- has a ¼° (~25 km) spatial resolution suitable for examining mesoscale or greater, and
- has a temporal resolution (1-day) that allows study of processes that are affected by temperature variations on a daily or greater scale.

DOISST was selected by the Climate Data Records program (Bates et al., in press) as a consistent and sufficiently long satellite-based record to detect long term trends and examine climate-related processes.

This foundational dataset has broad applicability, as demonstrated by three use cases shown here.

1 Coral Bleaching Heat Stress

Heat stress is conducive to coral bleaching (Fig. 1). An ongoing global bleaching event is in its third year (Fig. 2). Has heat stress increased as a result of the recent climate change?

NOAA Coral Reef Watch (CRW) examined the 34 years of DOISST data for answers, based on the algorithm used in CRW’s near-real-time satellite bleaching heat stress monitoring (Liu et al., 2014).

Significant increase in severe stress is seen not only in the intensity (Fig. 3) but also spatial coverage (Fig. 4).

2 Marine Mammal Management

DOISST has been used successfully in habitat-based models of the distribution and abundance of cetaceans (whales, dolphins, and porpoises) in both the central and northeastern Pacific (Fig. 5–7). For many species, SST serves as an effective proxy for unmeasured underlying ecological processes linking cetaceans to their prey.

Using DOISST, the models successfully captured variability in cetacean distribution at seasonal and interannual time scales. Such models can provide a foundation for dynamic ocean management, especially in the face of long term temperature change.

3 Future SST Projections

The fifth phase of the Coupled Model Intercomparison Project (CMIP5) provides estimates of future SSTs (Taylor et al. 2012) under different scenarios (called representative concentration pathways or RCPs; Van Vuuren et al., 2011). Simulations of the historic period are also done to compare model performance against current observations.

For RCP6.0 (medium stabilization scenario), average SST could increase up to ~7 °C by the end of this century (Fig. 8). To match the higher resolution required by ecological applications, model SSTs can be "adjusted" using the difference between model SSTs and DOISST for a common period (e.g., 1982–2011, Fig. 9).

References

