2004 Ocean Sciences Meeting
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HR: 16:00h
AN: **OS12C-07**
TI: **Ocean Satellite and Data Assimilation Monitoring of Heat Stress Conditions in Coral Reef Ecosystems**

AU: *** Fuckar, N S**
EM: *nevensf@ocean.tamu.edu*
AF: *Texas A&M University, Texas Sea Grant, College Station, TX 77845*
AU: **Bayler, E J**
EM: *Eric.Bayler@noaa.gov*
AF: *NOAA/NESDIS/Office of Research and Applications, 5200 Auth Road, Camp Springs, MD 20746*
AU: **Strong, A E**
EM: *Alan.E.Strong@noaa.gov*
AF: *NOAA/NESDIS/Office of Research and Applications, 5200 Auth Road, Camp Springs, MD 20746*

AB: Coral reefs are marine ecosystems with profound biodiversity and significant economic relevance to many tropical and subtropical maritime countries. Modern era observations show, in essence, a declining trend in the well-being of reefs on the global scale. In addition to a broad spectrum of biogeochemical and anthropological stresses, weather and climate variability have the capability to exert a critical influence on reef ecosystems. A number of satellite-derived products demonstrate successful application of ocean remote sensing techniques in monitoring global coral heat stress events. Marked examples are NOAA/NESDIS Coral Reef Watch (CRW) operational products based on the sea surface temperature (SST) satellite data: the bleaching HotSpot anomaly (SST component above climatological maximum) and the Degree Heat Week (DHW - HotSpot anomalies accumulated in time). They can track the frequency and magnitude of accumulated heat stress conditions that may lead to coral bleaching (the loss of symbiotic algae) and possible mortality hence severely disrupt the balance of a reef ecosystem. Ocean data assimilation products, particularly those that rely crucially on satellite data, can yield further insight in global temperature-induced stresses on coral reefs by providing continuous output of upper ocean subsurface thermal structure. To that purpose we use second-generation global ocean data assimilation results produced in near-real time by the Estimating the Circulation and Climate of the Ocean (ECCO) consortium (a partnership between teams at NASA/JPL, Scripps and MIT). At the core of this assimilation system is the MIT general circulation model combined with a dual Kalman filter and adjoint assimilation schemes that employ altimeter data as the primary observations (satellite SST data is also incorporated). This study demonstrates useful monitoring and early warning capabilities of CRW's operational products for coral bleaching events at many sites around the world. The use of the HotSpot and DHW analysis methodologies on fields derived from the ECCO system outputs, such as heat content of the euphotic zone and mixed layer, show potential for improved operational understanding and application of CRW's products. These analyses further reveal global ocean mechanisms (e.g. Rossby waves, etc.) that contribute to hear stress events on coral reefs.

DE: 4255 Numerical modeling
DE: 4275 Remote sensing and electromagnetic processes (0689)

DE: 4572 Upper ocean processes
DE: 4815 Ecosystems, structure and dynamics
SC: OS
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