Physical oceanography of coral reefs and other shelf-break ecosystems - a joint CIMAS/KML/NOAA effort

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Three collaborations between AOML's Coral Health and Monitoring Program (CHAMP), CIMAS, Nova Southeastern University (NSU), Univ. South Florida (USF), Florida Inst. of Oceanography (FIO), and Keys Marine Lab (KML) represent an area of potential collaboration between AOML and SEFSC in terms of fisheries monitoring: coastal turbidity tracking via satellite; oceanic upwelling impacts on reef thermal stress and nutrient fluxes in south Florida; and postdoctoral research to expand a "heat budget model" of thermal variability from specific sites in the Florida Keys, to wider areas of the reefs and fisheries of Florida and the US Gulf of Mexico and Caribbean. Results from FY13 and FY14 of the turbidity project were presented to managers in three jurisdictions in early 2014 - southeast Florida, American Samoa, and Commonwealth of the Northern Mariana Islands. On upwelling, as of June of 2014 CIMAS researchers had analyzed sea temperature from about 30 reef monitoring sites in SE Florida – offshore of the Florida Keys, Miami-Dade, Broward, Palm Beach, and Martin Counties. A pattern of periodic summer upwelling in the northern Florida reef tract was found, with implications for the ability of reef-building corals to migrate northward in a changing climate. Hollings Scholar Dan Coleman of Tulane participated in this project in May-August 2014. Finally, postdoc research by one CHAMP team member, Lew Gramer, began in Dec. 2013 building on his Ph.D. research on horizontal convection; this is a daily pattern of cross-reef circulation tied to both sea-surface heat flux and seafloor slope in neighboring waters (see Figure). This work on small-scale ocean dynamics and their impact on marine ecology will encompass broader areas of the Florida reef tract, and other protected shelf-break ecosystems in the U.S. Gulf of Mexico and Caribbean.

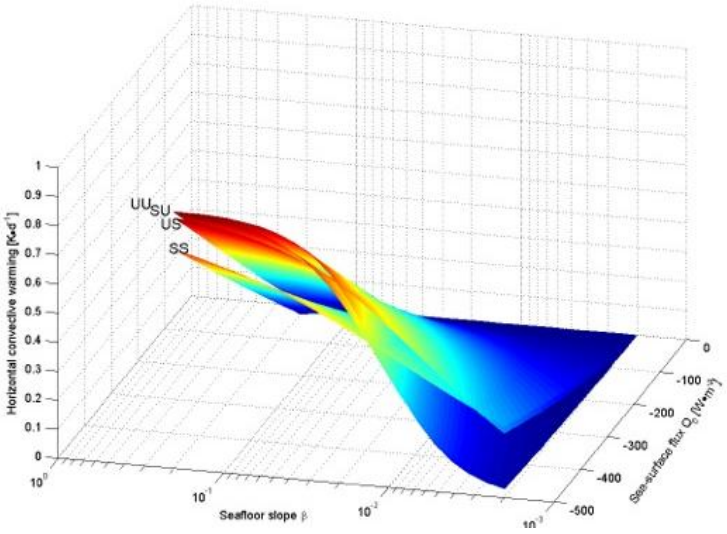

Figure: Predicted horizontal convective warming ($K \cdot day^{-1}$, vertical axis) of a reef-crest or slope, as a function of sea-surface cooling ($W \cdot m^{-2}$, axis into page) and slope of neighboring seafloor, β.