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The behaviour of the Doce river sediment plume, Brazil, prior and after an ore dam accident: observational and modelled data results

Fabiola Amorim[1] and **Martinho Marta-Almeida**[2]
[1]CT, Federal University of Espírito Santo, Brazil
[2]CESAM, University of Aveiro, Portugal

The Doce River (-19.6o; -39.8o), with a watershed of 83.400 km2 and an annual net discharge of 1300m3s-1, represents one of the biggest rivers in Brazil. Along its 853 km there are 228 counties, which are supplied with its waters. The mouth of the Doce River is located at the estuary of Regência, an almost pristine area known by its beaches and where many fishermen get their subsistence. The adjacent continental shelf is narrow (~35km) and is part of one of the most important South Atlantic ecosystems, the archipelago of Abrolhos, which together with the Vitoria-Trindade ridge presents a complex bathymetry, which forces the meandering of the southward Brazilian current and the formation of the Vitoria eddy. Among the Brazilian rivers, the Doce river presents the highest net concentration of suspended particulate matter (SPM, 386,25 mg l-1) and the associated plume extends far north or south depending of the continental shelf preferential flow. The mean shelf circulation is southwards during the spring/summer seasons, presenting a complete reversal during the autumn/winter seasons or during events a cold front passages, becoming northwards. The Brazilian western boundary currents flow at the slope, and to the north of 22oS the circulation between 100-3000 m of the water column is roughly northward. On 5th November 2015 an accident involving a rupture of one of the ore dams of SAMARCO, a Brazilian mining company joint-venture between Vale and the English-Australian BHP Billiton, released 55x106 m3 of toxic-mud into the Doce riverbed. Seventeen days later the mud reached the ocean increasing significantly the SPM concentration of the Doce river plume. Based on a historical (2007-2014) dataset (SPM, currents, tides, waves) collected at numerous stations at the Abrolhos Bank and a realistic numerical simulation performed with the regional ocean modeling system (ROMS) we were able to investigate the seasonal behavior of the plume of the Doce river and infer its influence in the Abrolhos region prior and after the SAMARCO dam accident.

fnamorim@gmail.com

Behavioral Response of Hermit Crabs (Clibanarius digueti) to Dissolved Carbon Dioxide

Hannah Maier
Biosphere 2 REU, University of Arizona, USA

CO_2 induced ocean acidification is currently changing the population dynamics of marine organisms. As a result of ocean acidification, marine organisms expend extra energy on modifying behaviours. The current rate of ocean acidification will deplete the marine food chain that much of the world relies on as their major food supply. The purpose of this study was to understand whether and how ocean acidification affects the behavior of hermit crabs Clibanarius digueti. We hypothesized that an increase in carbonic acid would modify grazing and individual movement, because an increase in acidification alters the normal chemical composition of the water and potentially the niche occupancy of *C. digueti*. A model tidal pool experiment consisting of two tanks (control and treatment) inhabited with seven living *C. digueti* was set up in the Ocean Biome of Biosphere-2. Each tank was also provided with uninhabited shells: two *Turbo fluctuosa* and four *Cerithium sp*. Gaseous CO_2 was dissolved into a treatment tank and measured as dissolved CO_2 by using a sodium hydroxide titration method. Additionally, water conditions were characterized for UV- light and temperature.

Two trials were run in this experiment with tanks and treatments interchanged in each trial. We assessed whether increased CO_2 affected hermit crab shell change rate. We found that shell changes only happened among *C. digueti* placed under increased CO_2. The information from this analysis will allow us to assess whether ocean acidification affects basic behavior in hermit crabs, which could later affect population dynamics. Bringing together all of this information will allow us to measure the effects of climate change on the behavior of C.Digueti.

hannamai@umich.edu