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Linking Decadal-Scale Changes in Continental Shelf Sediment Accumulation to Variability in Ocean and Terrestrial Processes

Dr. Joseph A. Carlin, Ph.D., Dept. of Geological Sciences, California State University, Fullerton

Overview:

The focus of this project is to better understand short-term variability in sedimentation along the continental shelf. Through this project we are looking to characterize the processes, both on land and within the ocean, that drive changes in sediment delivery to the shelf, deposition along the shelf, and preservation within the stratigraphic record. To accomplish this, we have focused this project on Monterey Bay, CA. We have employed a two-phase approach where we are working to characterize shelf sedimentation by collecting and analyzing sediment cores offshore, and also collecting and analyzing surface sediment samples from different potential source areas along the coast and throughout coastal watershed. Through this project we hope to achieve a better understanding of how short-term variability impacts stratigraphy, in an effort to improve stratigraphic interpretation of continental shelf strata over a geologic time scales.

Progress:

Over the past reporting period we have both initiated this project as well as made substantial progress. In July 2017 we collected 9 sediment cores from throughout the study area. Over the course of the year, these cores have been analyzed primarily by two undergraduate student researchers funded through this project. The analyses include characterizing the physical sediment properties, determining elemental and mineralogical components, and determining the age of different sediment layers from short-lived radioisotopes. Collectively, the analysis of these cores is ~80% complete, with the students continuing to work on these cores. Additionally, in June 2018 we also completed field work to collect surface samples from terrestrial environments along and the coast and throughout the coastal watershed. We collected more than 90 samples from different environments throughout the Monterey Bay region. Currently, two additional undergraduate students have begun analysis of these samples, and this work is on-going. In total, at the end of this first project year, we have completed all of our field work to collect samples, and have made significant progress on much of the analytical work.

Research Impacts:

This project to date has had a significant impact on a handful of students who have participated in the project. There have been a total of 6 students who have participated in this project in some capacity, 5 of these students were undergraduates. Two of these undergraduate students were funded through this project, with these two students participating in the field work in 2017 to collect sediment cores, and they have led the analysis of these cores in the lab. For these students, this project has served as the basis for their undergraduate thesis, one of which has been completed with the other near completion. These students have also presented their research at local research symposiums on campus and in the community, giving these students the valuable experience of communicating their science to a broad audience. Overall for these 2 students, this project has given them valuable experience of what it is like to do research, taught them important analytical skills, and given them practice in scientific communications.

The other students involved in the project have been volunteers, but they have gained either valuable field work experience, have used this project to guide their undergraduate thesis, or both. Two students (1 undergraduate and 1 graduate) also participated in field work to collect the sediment cores offshore. While their time investment in the project may have only been 1 week, the impacts were significant. One of these students developed an interest in marine geological field work as a result of this experience and has since actively pursued other similar opportunities, while the other student utilized this experience to add to her resume, which has been helpful as she pursues potential employment opportunities once finished with her masters. Finally, 2 other undergraduate students have just starting working with this project beginning in the summer 2018. These students are volunteers, but the research will serve as the basis for their theses. In the short time that they have been involved, I have seen growth in their analytical skills, and confidence in their ability to communicate their science. They will continue to work on this project over the coming year, presenting their research at our departmental research symposium in the spring of 2019.

As for myself as PI, this project has already been valuable scientifically and in terms of pushing my research program to the next level. This project has allowed me to hire students to work in my lab, which has boosted productivity and given me the opportunity to learn how to manage student employees. As a result, the lab as a whole has been much more productive than when I was depending on volunteers alone. The project has also allowed me to make strides scientifically that will serve me as I approach tenure. From this project I have been able to present the results at a couple of scientific conferences, sharing this research with colleagues in the field. We have also just

completed our first manuscript based on this research that will be submitted for review for publication in a scientific journal. Overall, this project has been the primary catalyst in moving my research program beyond the start-up phase. Because of this project the lab is now constantly generating new data every week, training and involving undergraduate students in research, and producing sound scientific results that we are disseminating broadly to the general scientific community.