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

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Overview:

The focus of this project is to better understand short-term variability in sedimentation within a 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 in 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 our goal is to achieve a better understanding of how short-term variability in ocean and terrestrial processes impact stratigraphy in an effort to improve stratigraphic interpretation of ancient continental shelf strata.

Progress:

Over the past reporting period we have continued to make substantial progress towards achieving our project goals. In June 2018 we collected more than 90 surface sediment samples from beaches, coastal dunes, coastal cliffs, and streams throughout the coastal watershed. These samples will be analyzed to determine elemental and mineralogical compositions of potential sediment source areas to compare to the composition of the offshore deposits analyzed in the cores. Many of these samples have been analyzed by 2 undergraduate students to characterize the samples in terms of their Quartz, Feldspar, and Lithic (QFL) composition, and all the samples have been prepped for x-ray fluorescence (XRF) analyses to measure elemental composition. The XRF analysis will be performed by a new undergraduate student who started working on this project in June 2019. In addition to the surface sample analyses, we are mostly complete with the analyses of the offshore cores. Moving forward we will be completing the analyses of the source samples soon, and then the project will move into the bulk of the data analyses phase. During this phase of the project we will look to combine the results from the terrestrial surface samples with the data from the offshore sediment cores to create an overall understanding of changes in sediment processes in this system over time.

Research Impacts:

This project continues to have had a significant impact on a number of students who have participated in the project. There have been a total of 9 students who have participated in this project in some capacity, 8 of these students were undergraduates. In total, 6 students have worked on sample analysis in the lab for this project, 4 received funding, 3 of these students also used the project as the basis for their undergraduate theses, and the 2 students that were not funded worked on this project for their undergraduate theses. The additional 3 students participated in the fieldwork component of the project. In total, 7 of the students involved in this project have participated in the fieldwork that was funded through this award. These students helped to collect cores offshore, or surface samples from the watershed, and 1 student participated in both fieldwork campaigns. The five students that worked on this project for their undergraduate thesis 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. In addition, one of these students presented their work from this project at the American Geophysical Union's (AGU) 2018 Fall Meeting, one of the largest annual scientific conference for Earth and space scientists.

As for myself as PI, this project continues to be valuable scientifically and in terms of pushing my research program to the next level. This project has allowed me to continue to financially support 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. I also have just recently submitted 2 more abstracts for conferences based on this work that will allow us to present our terrestrial sample results for the first time to the broad scientific community. Additionally, we are pleased to report that we have also just published our first manuscript based on this project in a peer-reviewed 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. This project has also provided a wealth of both samples and data that will provide opportunities for undergraduate student work for years to come. Therefore, this project will continue to provide opportunities to train the next generation of geoscientists far beyond the life of the award.