PRF Grant Number: #57809-UNI8

Grant Title: *Reconstructing Neogene Paleogeography and Forearc Basin Evolution of Southern Cascadia using Detrital Mineral Geochronology*

Principal Investigator: Dr. Melanie J. Michalak, Department of Geology, Humboldt State University

Describe briefly the progress of the research and the impact of the research on your career and that of the students who participated in the project during the reporting period.

Progress of the research:

PI Michalak conducted field sample collection trips with students B. Roberts, D. Christensen and E. Chandler, (3 undergraduate students) during the 2017-2018 academic year as part of this research and the students' independent thesis projects, required for their B.A./B.S. degrees. Two students received academic units for their projects, one of which was successfully completed May 2018, the other is scheduled for completion December 2018. PI Michalak also took all students enrolled in her geochronology course (an upper division level course with 19 students in Fall 2017 and 12 students in Fall 2018) on field excursions to collect Neogene sedimentary units for provenance descriptions, and samples for detrital zircon U-Pb geochronology. Roberts and Christensen (undergraduate students working directly on this research) and T. Team and D. Otillio (working on aspects related to this research) submitted accepted abstracts to the 2017 GSA Fall Meeting in Seattle, WA, and presented their preliminary research in poster form. PI Michalak presented an oral presentation at the GSA Fall Meeting in Seattle, WA. These abstracts are listed below: (*denotes HSU undergraduate student).

*Christensen, D., *Chandler, E., Michalak, M. (2017) Using qualitative clast, sand and soil descriptions to investigate Tertiary gravels of the Klamath Peneplain erosional surface in Humboldt County, Northwestern California, Geological Society of America Abstracts with Programs. Vol. 49, No. 6 doi: 10.1130/abs/2017AM-299279 Poster.

Michalak, M., and Hourigan, J., (2017) Dynamic topography of Southern Cascadia recorded in provenance of Plio-Pleistocene forearc deposits, Geological Society of America Abstracts with Programs. Vol. 49, No. 6 doi: 10.1130/abs/2017AM-299438 Oral presentation.

*Otillio, D., and Michalak, M., (2017) New petrology and geochronology of the West China Peak Complex of the Ironside Mountain Batholith, Klamath Mountains, CA, Geological Society of America Abstracts with Programs. Vol. 49, No. 6 doi: 10.1130/abs/2017AM-299414. Poster.

*Roberts, B. and Michalak, M., (2017) Provenance analysis of the Plio-Pleistocene Prairie Creek Formation, Humboldt County, CA, Geological Society of America Abstracts with Programs. Vol. 49, No. 6 doi: 10.1130/abs/2017AM-298931 Poster.

*Team, T., Michalak, M., (2017) Petrographic and geochronologic study across a 10km transect of the Canyon Creek Pluton, Klamath Mountain Province, NW California, Geological Society of America Abstracts with Programs. Vol. 49, No. 6 doi: 10.1130/abs/2017AM-300070. Poster

PI Michalak traveled with HSU undergraduate students D. Christensen, B. Roberts, D. Otillio and T. Team to the Laser Ablation Geochronology facility at University of California-Santa Cruz over a four day period; January 8-11 2018, to provide students with hands-on experience collecting mineral chronometer age data for their projects. PI Michalak's colleague Dr. Jeremy Hourigan (PI of laboratory) met with students and PI Michalak and explained how *in situ* laser ablation ICMPS geochronology is conducted and students were able to analyze their data in real time.

This work in the first year has produced >1200 new detrital U-Pb zircon ages (~12 samples) of publishable quality, most of which were sampled by and analyzed by undergraduate students, as well as new unit descriptions, and structural data. Unfortunately (or fortunately) all students working on an aspect of this project for their coursework during the 2017-2018 academic year graduated and were employed during the summer of 2018, and were not able to work on the grant for the summer of 2018. However, two new undergraduate students (B. Puleri and S. Allen) have commenced work starting 9/1/2018 on the grant, and have committed to working through Summer

2019. In addition, D. Christensen was recruited by PI Michalak to carry on the research work as an MSc student, who is currently supported by the grant, and will receive tuition support Spring 2019 and Fall 2019.

Impact of research on PI career:

This research has had four primary impacts on the PI's career. First, it has supported field work, analyses, and conference travel to collect and disseminate preliminary findings, which we are compiling to publish at least one manuscript in an international journal that will be of broad interest to scientists working in onshore and offshore regions of the southern Cascadia forearc. Second, the work has maintained PI's collaboration with the UC-Santa Cruz geochronology facility and Dr. Jeremy Hourigan. In the reporting period, four students visited this facility, which allows PI Michalak to expand her teaching impact outside what is available or offered within HSU (a small, rural unversity). Third, the research questions posed by this work have allowed PI Michalak to recruit students, (such as D. Christensen, new MS student), and involve every student in her upper division geochronology course (offered every Fall semester) in some aspect of this research. Finally, this research has allowed PI Michalak to form new collaborations with other institutions, with whom she has submitted additional major external grant proposals. One of these, through the National Science Foundation, has funded PI Michalak (and co-PI Susan Cashman, HSU), to acquire a binocular light microscope used for mineral picking for HSU, which will positively impact this research as well as undergraduate and graduate research. Now all students supported by this grant will be able to conduct mineral picking sample preparation at HSU, increasing efficiency and broaden impact. These contributions reflect positively on PI Michalak's record for the Retention, Promotion and Tenure process, whose current standing is Assistant Professor, pre-tenure. PI Michalak received the HSU McCrone Promising Faculty Scholar Award in April of 2018.

Impact of research on students:

In the reporting period, one student has received salary or stipend (D. Christensen), and two additional students (B. Puleri and S. Allen) are identified for support in the 2018-2019 academic year. Four additional students (B. Roberts, T. Team, D. Otilllio and E. Chandler) were supported with conference travel (part from this grant, part from HSU Geology Deparmental funds) to attend and present at the 2017 Fall GSA meeting. Four students (B. Roberts, T. Team, D. Otilllio and D. Christensen) and PI Michalak travelled to the UC-Santa Cruz geochronology facility to learn hands-on instrumental and collect publishable data, an experience that influenced T. Team and D. Christensen to pursue further graduate studies. In the reporting period, D. Christensen, T. Team, D. Otillio and E. Chandler have received BA or BS degrees from HSU. Morever, of those four students, one is employed by the Americorps of California Watershed Stewards Program, and two (D. Christensen and T. Team) have opted to pursue graduate studies. D. Christesen was recruited by PI Michalak to apply to the HSU MS program and has commenced her MS work. T. Team is currently applying to MS and PhD programs nationally.

Three of these students have won external or internal awards during the reporting period. D. Christensen and D. Otillio are 2017 Geological Society of America On To the Future awardees, which provided mentorship and partial funding to attend the 2017 GSA Fall meeting. T. Team won the HSU Best Senior Thesis Award. D. Christensen was accepted to the prestigious SAGE (Summer of Applied Geophysical Experience) program.