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RESEARCH STATEMENT – Cathy J. Busby, October 29, 2013

The unifying theme of my research is tectonics, mainly focusing on upper- to middle-crustal rocks; I also publish on volcanic, sedimentary, and structural processes. I have published two edited textbooks on Tectonics of Sedimentary Basins (1995 and 2012), taught numerous short courses on the topic (mostly with Ray Ingersoll, UCLA), and I was funded by the Spanish Ministry of Education for the second book (with Antonio Azor, University of Granada). I enjoy doing my own geochronological lab work, I work closely with geochemists and paleomagnetists, and I follow the literature on lower crustal rocks and mantle rocks. In short, I am an all-round field geologist who employs any lab techniques needed to solve the problem.

In the past year, I began moving into a whole new direction – that of ocean leadership. I was recently selected to be Co-Chief Scientist of a $22M dollar expedition, IODP Leg 350 (April –May 2014) in the rear part of the Izu-Bonin Arc, on the JOIDES Resolution. I am also involved in the IODP proposal for ultra-deep drilling to arc middle crust in the Izu-Bonin Arc, on the Chikyu (referred to as IBM-4). The IBM-4 drilling effort will take well over a year, involving multiple Chief Scientists, and will represent a huge opportunity for students (25% of the U.S. science staff on IODP is students). In addition, my Co-Chief Scientist on Leg 350, Yoshi Tamura, is at JAMSTEC, and I expect to become involved in their oceanographic projects in the near future. For the next decade, I plan to focus on marine geology, but I will continue land-based studies of field analogues and integration of on-land and offshore geologic data.

My published work in an on-land analog to the Izu-Bonin-Marianas Arc (IBM) is exciting a great deal of attention. This is because there are three IBM IODP expeditions scheduled for 2014, as well as a fourth IBM IODP proposal that seems poised for approval, mentioned above (IMB-4). The on-land analog we have been studying is the Cretaceous Alisitos Arc, a very well-exposed and well-preserved, intact oceanic arc crustal section in Baja California. Our previous work there (see 2006 paper) focused mainly on the upper crustal section, which is most relevant to the three scheduled expeditions, but our future work will interface with IBM-4, by studying the plutonic-volcanic connection there (NSF proposal pending, with Sue Debari of Western Washington University; see attached CV).

Another project I have recently begun is in the Western Cordillera on the western margin of the Altiplano in northernmost Chile (NSF proposal pending with Axel Schmitt of UCLA, and my former postdoctoral researcher, Graham Andrews, now at CSU Bakersfield). Our initial field, geochronological, and geochemical studies here have been generously supported by the geothermal industry (papers in prep). In this project, we are determining the location and timing of supervolcano eruptions, crustal shortening, and Altiplano uplift. Broader impacts of this work include involvement of minority (especially Hispanic) students at CSUB, and geologic context for five major geothermal projects being developed in the field area.

I view the Chilean research project as a continuation of my recent (2011-2013) NSF-funded project on Eocene to Miocene supervolcanoes and structures in the Sierra Madre Occidental (e.g. see 2013 paper with PhD student Bryan Murray). This is the largest silicic large igneous province on Earth, and hosts one of the largest and most productive epithermal precious mineral deposits on Earth. The early stage of this work was supported by the

gold industry, arranged by Denis Norton. Important results include demonstrating that: (1) extension preceded ignimbrite flareup; (2) extensional deformation and silicic magmatism controlled the mineralization; and (3) the Hf, O, and U-Pb isotopic composition of zircons is exceptionally uniform across this huge province, spanning 25 myr. These isotopic data indicate that the silicic large igneous province was generated by melting of young (Cretaceous) relatively primitive arc rocks, triggered by melting of new mantle asthenosphere formed by Cenozoic slab rollback.

The third project I am beginning will generate much-needed map and lab data in the Santa Rosalía basin, for comparison with published oceanographic data from the adjacent Guaymas rift basin in the Gulf of California. This NSF-REU (Research Experience for Undergraduates) proposal, with Tina Niemi of University of Missouri-Kansas City, fell just below the funding cutoff last year, so we are optimistic about its success this year. This REU site will provide undergraduate students with an unprecedented opportunity to develop both field and laboratory skills in basin analysis and tectonics, in a setting that is geologically interesting, economically important, and culturally diverse.

The Baja Basins REU project forms part of my biggest project of the past decade – the arc-rift transition in the Walker Lane belt. I have gotten four NSF awards for this project in the past decade, in addition to smaller grants. The Walker Lane is the northern extension of the Salton Sea-Gulf of California transtensional rift, where the process of continental rupture has not yet been completed, and rift initiation can be studied on land. It forms the eastern margin of the Sierra Nevada microplate, also referred to as the future plate boundary. I have published 14 papers on this topic in the past six years, most of them long and data-intensive. With Keith Putirka (CSU Fresno), I organized a Penrose Conference on this topic in 2010, and we have been guest editors of a *Geosphere* theme issue on the topic for the past three years, with 26 papers published so far. Additionally, I have been involved in geothermal research in the Salton Trough. The Walker Lane–Gulf of California transtensional rift is a highly accessible and geologically diverse, spectacularly well-exposed field area that attracts the interest of many students.

PDFs of all of my publications are posted on my website at www.geol.ucsb.edu/faculty/busby