

Application for a 2009 GSA Research Grant – Template
<http://geosociety.org/grants/gradgrants.htm>

Name: Nicholas Godínez

Project Title: The Miocene Comondú arc and influence on the formation of the Gulf of California near Loreto, Baja California Sur, Mexico

Project Supervisor: David Kimbrough

Academic Info (Department Address):

Clearly state the problem(s) to be addressed, the hypothesis or hypotheses to be tested, and the overall objectives of your proposed project. (1,000 character limit):

This project will investigate the age, petrology, and extent of batholithic rocks associated with the Miocene Comondú arc of Baja California Sur. The goals are to better understand the influence of arc magmatism on the position and history of Gulf of California rifting. The hypothesis is that Miocene Comondú-related batholithic magmatism may have produced a zone of warm, weak lithosphere that controlled the position and geometry of the Pacific-North American plate boundary (e.g. Fletcher et al., 2007). On land exposures of the Comondú Group comprise a thick sequence of arc-derived volcanics and volcanoclastics that crops out over much of southern Baja (Hausback, 1984, Sawlan, 1991). However, several small Miocene intrusive bodies in mainland Baja, together with recent discovery of ~20 Ma intrusives from an offshore island, and in dredge hauls from fracture zone scarps in the middle of the Gulf suggests the possibility of an extensive batholith underpinning the Comondú arc. This project represents the first attempt to fully characterize the nature and extent of Comondú intrusive rocks.

Discuss the previous work on your problem(s) that (1) places the project in a disciplinary and, if appropriate, regional context and (2) documents the importance of your project. (2,500 character limit):

In May 2008 Godínez participated in a month-long cruise in the Gulf of California aboard the R/V Atlantis led by chief scientist Dr. Peter Lonsdale at Scripps Institution of Oceanography. This cruise was designed to investigate the Neogene submarine record of magmatism related to the initiation and evolution of the Gulf of California by direct sampling from the ocean floor using the Jason 2 ROV. The Gulf of California was the 2000 focus site of the NSF's MARGINS Rupturing of Continental Lithosphere (RCL) program as an initiative for a decade-long effort to understand the geologic processes that operate during the formation of rifted margins and initiation of spreading. The idea for the on land geologic study proposed here was generated during the May 2008 cruise.

Buck (2004) recognized that the injection of magma melts during plate stretching plays a critical part in weakening the continental lithosphere to allow for rupture and in progressively focusing extensional strain into the axial part of the rupture zone, which eventually leads to sea-floor spreading. Investigation of the Red Sea rift clearly demonstrates the strong influence of magmatism on strain localization accompanying the

breakup of continental crust (Wolfenden et. al., 2005). The relationship of tectonics and magmatism during Gulf of California rifting is not as clear partly because so much of the thinned continental crust has subsided beneath the Gulf, and partly because of the lack of studies of the on land magmatic record. Although a lot of recent effort has gone into study of the on land post-subduction magmatic record in Baja California (e.g. Bellon et al., 2006; Calmus et al., 2008), there is virtually no detailed work on the intrusive parts of the Comondú arc rocks that immediately predate rifting. Although these rocks are not widespread, they are important as the possible on land record of a potential batholith root to the Comondú arc and study of these rocks provides a baseline for comparison with samples from the offshore record. Mapping and stratigraphic analysis in the Loreto region by McClean (1988) and Umhoefer et al. (2001) lay the groundwork for the study proposed here which along with the offshore correlation can provide important insight into the Gulf rifting history.

Concisely state how you plan to address your problem(s) and test your hypothesis or hypotheses (2,500 character limit):

Field Work:

Four weeks of field work will be conducted in the Loreto and Bahia Concepcion area adjacent to the Gulf of California where a lot of the margin geophysical work and submarine sampling has taken place. Godinez will use his own vehicle to conduct field work and he will have a field assistant with him. Field work will comprise sampling all known intrusives within the Comondú along with sampling and mapping of the volcanoclastic and sedimentary rocks of the group to constrain the bulk composition of the arc and for comparison with the intrusive rocks. McClean (1988) mapped several small intrusions and a host of dikes cutting the Comondú arc stratigraphy which will be the initial. The Bahia Concepcion region north of Loreto also contains possible Miocene intrusions which will be investigated.

Lab Work:

The lab work required will consist of I) preparing and examining thin sections from 30 representative Comondú arc rocks; the focus will be on intrusive stocks and dikes II) whole rock major and trace element concentrations will be determined by XRF at SDSU ~30 samples, III) zircon U-Pb dating by laser ablation ICPMS analysis, this work will focus on the intrusive rocks, but will probably also include work on some silicic volcanics in the Comondú to better constrain the intrusive vs extrusive history of the arc. The zircon mineral separation and mounts will be prepared at SDSU but the actual analyses will be done at the University of Arizona.

****References cited in proposal (2,500 character limit):***

Bellon et al., 2006 La Purisima field

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