

The SUGAR experiment: an upcoming active-source seismic experiment of the South Georgia Basin to examine the relationship between extension, magmatism and pre-existing structures

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The upcoming Suwannee Suture and GA Rift basin (SUGAR) experiment will involve acquiring and analyzing an active-source seismic refraction data to image the crustal structural of the South Georgia basin and better understand the interplay of extension, magmatism and pre-existing structures in shaping the evolution of eastern North America. We are looking for students to participate in the field program; the first part of the experiment is planned March 2014. We would also welcome scientific or educational collaborations.

Some of the most important unresolved questions in plate tectonics concern the formation and rupture of continents. How does the accretion of terranes contribute to the construction of continental lithosphere? What processes enable continental lithosphere to rupture? Repeated accretion and rifting events through the Paleozoic and Mesozoic fundamentally modified eastern North America. Hundreds of kilometers of exotic terranes were added to North American during the most recent orogeny (Alleghenian orogeny, ~290 Ma), notably the large Carolina terrane in the SE US. Wide-spread extension followed beginning at ~230 Ma, which lead to the formation of a series of large rift basins along eastern North America. But rupture did not occur until 30-40 m.y. later, coincident with the arrival of the Central Atlantic Magmatic Province (CAMP), one of the largest known igneous events in Earth history. The South Georgia Basin was at the center of all of these major geologic events involved in building the eastern North American continent. It is the largest of the failed Mesozoic rift basins that formed during the breakup of Pangea. It straddles the Suwannee suture, the only well-defined remnant of the Alleghenian suture that joined North America and Gondwana, forming Pangea. The South Georgia Basin also lies at the center of the Central Atlantic Magmatic Province (CAMP).

We plan to undertake an active-source seismic refraction study of the South Georgia Basin (Fig. 1) to image the crustal structure of this rift system, characterize the crustal expression of the Alleghenian Suwannee suture, understand the roles of sutures and other pre-existing structures on localizing deformation and magmatism during post-orogenic extension, and quantify the regional distribution and volumes of CAMP magmatism. We will acquire wide-angle seismic refraction data along two ~300-km-long profiles oriented roughly NE-SW and crossing the South Georgia basin, the Suwannee suture and the mapped region of sills (Fig. 1). We plan to use a combination of 2000 lb and 1000 lb shots along each of these profiles as the sources. Shots will be spaced at ~20-25 km. Each line will be densely instrumented with single-channel ReKtek 125A seismometers ("Texans") spaced at ~250 m, yielding a total of 1200 seismometers along each profile. We will also acquire seismic refraction data in a 100x100km box centered on the basin along the eastern profile to constrain the 3D distribution of magmatic intrusions in the basin and upper crust here. The western profile will be acquired in March 2014, and the eastern profile in box will be acquired in spring 2015.

We are looking for students to participate in the first part of this experiment in March 2014. This is a unique opportunity to gain field experience in collecting geophysical data, and there will be a series of evening lectures on continental breakup, the exciting geology hidden under the Georgia coastal plain and how we can image geology with active-source seismic data. We will cover all your travel and subsistence costs. Even if you are only able to join us for part of the experiment, we may still be able to use your help. We also welcome collaborations for scientific and educational purposes that complement our effort, including add-on projects, etc.

Check out our website: www.ldeo.columbia.edu/~djs/sugar

To apply to participate, send your resume, availability and a paragraph describing your interest in the project to Donna Shillington (djs@ldeo.columbia.edu)

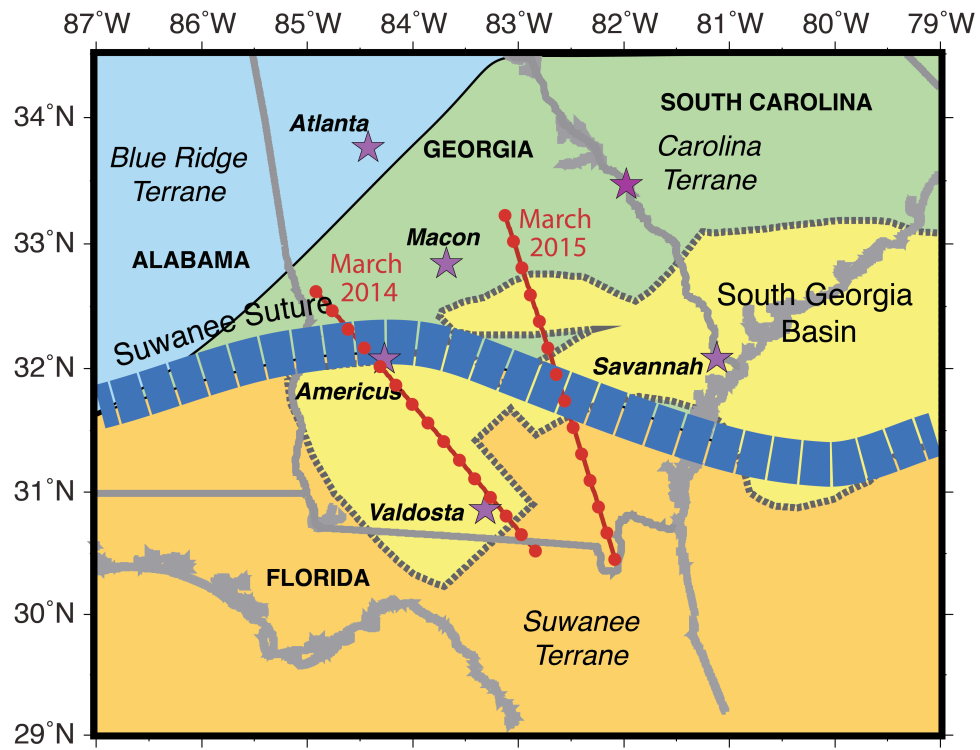


Figure 1: Map showing simplified depiction of tectonic structures in Georgia and the planned SUGAR experiment.