Public Abstract
First Name:Danielle
Middle Name:Denise
Last Name:Robinson
Adviser's First Name:Eric
Adviser's Last Name:Sandvol
Co-Adviser's First Name:
Co-Adviser's Last Name:
Graduation Term:FS 2009
Department:Geology
Degree:MS
Title:SEISMIC ANISOTROPY BENEATH THE SOUTHERN PUNA PLATEAU

The southern Puna plateau of northwest Argentina (25S to 28S) contains a number of anomalous features that are not present in the Puna-Altiplano plateau region to the north, including: 1) a distinctive spatial and geochemical pattern of volcanic material, 2) a high topography that did not occur from normal mountain-building processes, 3) an underlying slab that illustrates little seismic activity, and 4) a transitional dip between a steeper subduction zone segment to the north and a flat-slab to the south. These characteristics have lead to suggestions that a link exists between plateau uplift in this region and removal of the underlying lower crust and upper mantle, or delamination. This study is designed to test this hypothesis using seismic anisotropy to evaluate mantle flow beneath the southern Puna plateau that may be associated with these anomalous features. This study provides foundational research in a region where no previous seismic networks have existed.

As an initial interpretation of crustal and mantle structure, seismic shear-wave splitting measurements caused by anisotropic layers encompassing different flow regimes of the mantle were analyzed in an effort to infer flow patterns. Interpretations were completed by: 1) determining polarization directions and delay time magnitudes of split seismic shear-waves, 2) providing a depth constraint on the location of mantle anisotropy, and 3) searching for any localized splitting dependencies.

A total of 30 teleseismic and 88 local events demonstrated shear-wave splitting for 43 PUNA stations over a 16-month period. Results illustrate a very complex pattern throughout the southern Puna plateau. In general, trench-parallel splitting below the subducting slab occurs from retrograde slab motion and shifts to trench-perpendicular motion as the angle of slab subduction shallows. Slab flattening also seems to affect the mantle above the slab as splitting above the slab shifts from trench-perpendicular in accordance with tectonic plate motion to trench-parallel more towards the trench. A toroidal rotation pattern of splitting above the slab is also observed around the Cerro Galan volcanic ignimbrite region, suggesting a flow obstruction.

As a primary source of ignimbrite flare-ups, delamination is a possible cause of the toroidal splitting pattern detected in the southern Puna plateau. On a broader scale, the implication of a delamination event within the Puna could aid in understanding crustal and mantle evolution for similar studies of mountain-building systems including Tibet and the western US.