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# Imaging the Subduction Factory: The TUCAN Broadband Seismic Experiment in Central America

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In order to understand how the Subduction Factory processes trench inputs into volcanic arc outputs, we make direct observations of its interior. The TUCAN (Tomography and other observations Under Costa Rica And Nicaragua) experiment deployed 48 broadband seismographs in the Central America Focus Site in 2004-6. This Nugget shows results from three kinds of imaging in Nicaragua, where arc output features globally significant geochemical signatures of subduction. The migrated receiver function image (A) shows a strong P-S conversion from what appears to be the top of the subducting plate to 200 km depth, the first time a steep slab has been imaged with these kinds of signals. The sharp velocity contrast at the top of the plate migrates from below the seismicity to above it near 80 km depth, perhaps reflecting metamorphism and development of a low-velocity fluid-rich layer atop the slab. Seismic attenuation (B), a proxy for temperature, indicates a typically hot wedge beneath arc and backarc, quantitatively consistent with temperatures and water contents inferred from primitive lavas and melt inclusions (Plank et al., 2007)*. The ratio of P to S velocities, $V_p/V_s$ (C), shows a somewhat different pattern, near-normal values for much of the wedge but a narrow, high-$V_p/V_s$ column ascending nearly vertically from the slab to the volcanic arc. Since this pattern differs from that of $1/Q_s$ or $1/V_p$ alone, this anomaly cannot be purely due to temperature. The presence of partial melt could produce such an effect, and given the relationship between $1/Q_s$, $V_p/V_s$ and the location of the arc, this seems likely. Thus, we are imaging separately but in one place the wedge geometry, temperature structure and melt distribution across the subduction factory, one of the major goals of MARGINS.

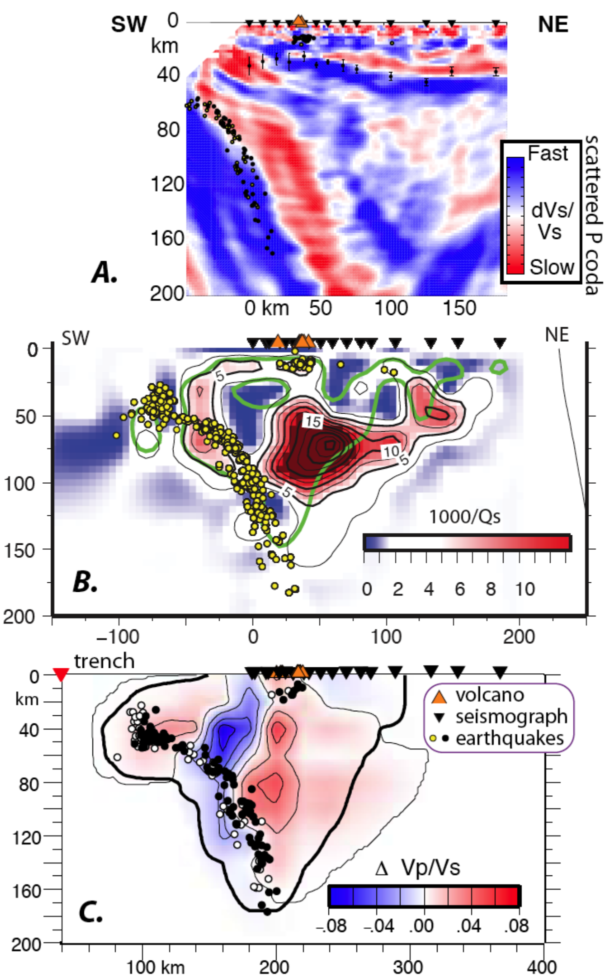


*Figure: Three seismic images of the Nicaragua Subduction Factory. (A) 2D receiver function migration (MacKenzie, 2008), using approach of Rondenay et al. (2001)*. Image shows S-wave velocity variations needed to generate scattered wavetrain, such as Moho and top of subducting plate. (B) S-wave attenuation as $1000/Q_s$, from tomographic inversion (Rychert et al., 2008), at 1 Hz. 1/Qs responds to temperature and indicates high-temperature region beneath and behind arc. (C) $V_p/V_s$ anomalies from regional travel-time tomography (Syracuse et al., 2008). In regions of high temperature, high $V_p/V_s$ may indicate presence of melt, perhaps showing a vertical melt column beneath volcanic arc.*

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*References listed in appendix A.