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Temporal and compositional evolution of silicic volcanism in the Paraná-Etendeka Province in south Brazil as markers of progressive crustal modification by voluminous basaltic magmatism

Monday, 8 January 2018

Salon Maule (Hotel Quinamavida)

Valdecir A Janasi, Liza Polo, Natasha Sarde Marteleto, Letícia Freitas Guimarães and Adriana Alves, USP University of Sao Paulo, São Paulo, Brazil

Abstract:

Mapping of the Upper Cretaceous volcanic successions of the Paraná-Etendeka Province in the central portion of the Torres “Syncline”, south Brazil, allowed the definition of a stratigraphic column, with three main cycles, all involving significant volumes of silicic magmas, within a short (1-2 Myr) time interval. The first unit evolves from a thick package of contaminated pahoehoe basalts (Gramado-type) to the Caxias do Sul Dacite (CSD), which is characterized by high *liquidus* T (~1,000°C), moderate to low H₂O contents (1.5-2 wt%) and slightly oxidizing character (~FMQ+2) (as estimated from plagioclase-melt geothermometer and Eu²⁺/Eu³⁺ in plagioclase oxybarometer), and is underlain by an andesite flow. A second unit, laying above the CSD or directly above the Gramado-type basalts, comprises an andesite-dacite association (Barros Cassal unit) which is inferred as laterally correlative to a rubbly pahoehoe basalt-andesite sequence of regional expression (Vale do Sol Fm.). The Santa Maria Rhyolite is the uppermost unit, often resting discordantly over the previous units, or over sandstones and volcanoclastic sediments (the Jacuí Group), and consists of a thick (up to 200 m) package of monotonous platy rhyolites, with thin interleaved (2-5 m) glassy layers. These rhyolites have abnormally high *liquidus* T (~1,000°C), low H₂O contents (≤1 wt%), and are more reduced (~FMQ).

The silicic volcanics are products of mixing and assimilation of melts from a granitic crust by ascending basalt. Elemental and isotope (Sr-Nd) geochemistry constrain this crust to be relatively “young” (non-cratonic), resulting from convergent tectonics at the end of the Neoproterozoic. Heating of this relatively dry (granitic), but otherwise fertile crust, resulted in strong contamination of the first basalt magmas, and led to the generation of moderately hydrated and oxidized hybrids (dacites and andesites). Further melting of this crust was only possible at extremely high temperatures required by dry granitic melting, and produced reduced, water-poor Santa Maria rhyolites, reminiscent of A-type granites. These extreme compositions seem to have been ineffective in mixing with basalt melts at depth, and may have inhibited near-surface fragmentation, resulting in expressive volumes of lavas and low-explosivity deposits.