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30 Myr eruptive history of the Rio Grande Rise and the prolonged role of the Tristan-Gough mantle plume in the South Atlantic

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The Rio Grande Rise (RGR), an oceanic plateau located in the South Atlantic Ocean, is thought to have formed together with the Walvis Ridge by the interaction of the Tristan-Gough mantle plume with the Mid-Atlantic Ridge (MAR). We present new $^{40}Ar/^{39}Ar$ geochronology from a broad portion of RGR including from the poorly sampled northeastern RGR and one age for the São Paulo Plateau (SPP). The SPP is 103.0 Ma and is age progressive with respect the older Paraná flood basalts and RGR, suggesting SPP's formation might also be attributable to the Tristan-Gough mantle plume. Ages from RGR range from ~84 to 54 Ma indicating that it erupted over at least a 30 Myr period and together with the Valdivia Bank (old Walvis Ridge). Unlike the Walvis Ridge, no simple age progression exists throughout RGR indicating that Tristan-Gough plume-generated volcanism on the South American plate is more complex than on the African plate. Plate reconstructions and seafloor model ages show volcanism was centered at the MAR but includes on and off axis volcanism on both the South American and African plates. Much of the complexity in the RGR exists in the northeast where two groups of ages exist, some older on axis and some younger off axis. Some of this seemingly off axis volcanism could have been located at the boundary of a proposed microplate east and west of the MAR in the current reconstruction model [1]. This microplate may have lasted until ~65 Ma during which a southward motion of the Tristan-Gough plume moved volcanism off the ridge axis and onto the African plate. This movement of the plume to an intraplate setting is responsible for the cessation of volcanism on the South American plate around 54 Ma and the diminished flux that results in seamount formation instead of more widespread plateau construction.

[1] Sager, W.W., et al., 2021. Geochemistry Geophysics Geosystems, 22(3).