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Thermochronological constraints on geological evolution of the Argentine and Uruguayan Passive Continental Margin

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“Passive” continental margins are valuable geo-archives that store geological information of pre- syn-, and post-rift tectonic and thermal history processes. The elevation of “passive” continental margin along the South Atlantic varies from more than 1,000 m a.s.l. to less than 50 m a.s.l. Causes of such strong variations in topography are still in debate and under examination. Whereas the South Atlantic “passive” continental margins (SAPCM’s) in Brazil, Namibia, and South Africa are mainly high-elevated margins (up to 2,000 m a.s.l.), the SAPCM in Argentina and Uruguay is of very low elevation. Low-temperature thermochronology has been applied at the two NW-SE-trending mountain ranges Sierras Septentrionales and Sierras Australes in Argentina and along the SAPCM of Uruguay. In Argentina, the low-temperature thermochronological (LTT) data (< 240 °C) indicated that the Upper Jurassic to Lower Cretaceous opening of the South Atlantic has not completely thermally reset the surface rocks (). The LTT archives apatite and zircon still revealed information on the pre- to post orogenetic history of the Gondwanides and the Mesozoic and Cenozoic South Atlantic geological evolution. The corresponding t-T models report a complex subsidence and exhumation history with variable rates since the Ordovician. Based on the LTT-data and the numerical modeling we assume that the NW-SE-trending mountian ranges received their geographic NW-SE orientation during the syn- to postorgenetic history of the Gondwanides.
Along the uruguayan coast the Apatite fission-track (AFT) ages indicate cooling phases during Permian to Jurassic time. Whereas further inland the thermochronological data closer to the Parana Basin show ages of the Early Paleozoic up to Late Paleozoic time. The AFT-data of Uruguay do not indicate a significant Post-South Atlantic-rift reactivation of onshore Precambrian to Palaeozoic fault and shear systems as has been happened in Brazil and Argentina (). However, pre-rift tectonic movements along the Precambrian fault and shear systems could be proven. Furthermore, computer based numerical modelling using the software code HeFTy tests the influence of a possible Parana magmatic event with volcanic rocks reaching towards the recent coast. The t-T evolution of all samples allows a magmatic volcanic sheet of up to 1.5 km on top of the Precambrian basement.