Application of stratigraphic frameworks and thermochronological data on the Mesozoic SW Gondwana intraplate environment to retrieve the Paraná-Etendeka plume movement.

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Since plate tectonics has been linked to material flow in the Earth's mantle, it is commonly accepted that convective motion in the sublithospheric mantle results in vertical deflections and horizontal plate motion on the Earth's surface. Those mantle flow-driven vertical deflections are recognized through significant signals and traces in the sedimentary records (unconformities and missing sections). Recently, Friedrich et al. (2018) introduced an event-based plume stratigraphic framework that uses such signals in the stratigraphic record to detect the geological evolution near, and on the Earth's surface in areas of interregional scale caused by mantle plume movement. Information about these dynamic processes is stored in geological archives, such as (1) stratigraphic records of sedimentary basins and (2) thermochronological data sets of igneous, metamorphic, and sedimentary rocks.

For the first time, this research combines these two geological archives and applies them to the Mesozoic SW Gondwana intraplate environment to retrieve the Paraná-Etendeka plume movement prior to the Paraná-Etendeka LIP. We compiled 18 stratigraphic records of the major continental and marine sedimentary basins and over 35 thermochronological data sets including >1300 apatite fission-track ages surrounding the Paraná-Etendeka Large Igneous Province to test the event-based plume stratigraphic framework and its plume stratigraphic mapping to retrieve the timing and spatial distribution of the Paraná-Etendeka plume.

The plume stratigraphic mapping, using the stratigraphic records is suitable to demark a possible plume center, plume margins and distal regions (Friedrich et al., 2018). Thermochronological data reveal centers of a significant thermal Paraná-Etendeka plume influence. Both archives show significant signals and traces of mantle plume movement well in advance of the flood basalt eruptions. Our LTT data combined with stratigraphic records are modeled successfully with respect to a viable mantle plume driven thermal evolution and therefore, we suggest that thermochronological data, in combination with stratigraphy records have the potential to retrieve...
the Paraná-Etendeka plume movement.