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ABSTRACTS

GEOLOGY, MINERALOGY AND PROVENANCE OF DETRITAL CLAY MINERALS OF THE CONTINENTAL RIFT OF SOUTHEASTERN BRAZIL

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The Continental Rift of Southeastern Brazil (CRSB), of Cenozoic age, is an ENE-trending, elongate, narrow trough, about 1000 km long, which stretches from Curitiba (Paraná) in the WSW to Barra de São João (Rio de Janeiro) in the ENE (Fig. 1). The CRSB was formed as a result of late processes related to the break-up of Gondwana, separation of Brazil from Africa and the opening of the South Atlantic Ocean. In the early Tertiary, NNW-SSE regional extension, related to thermomechanical tilting of the adjoining offshore Santos Basin, reactivated ENE shear zones within the Precambrian basement leading to the generation of continental half-grabens. The continental sedimentary deposits in this rift are the most complete record of the Tertiary geological events in the onshore region of southeastern Brazil.

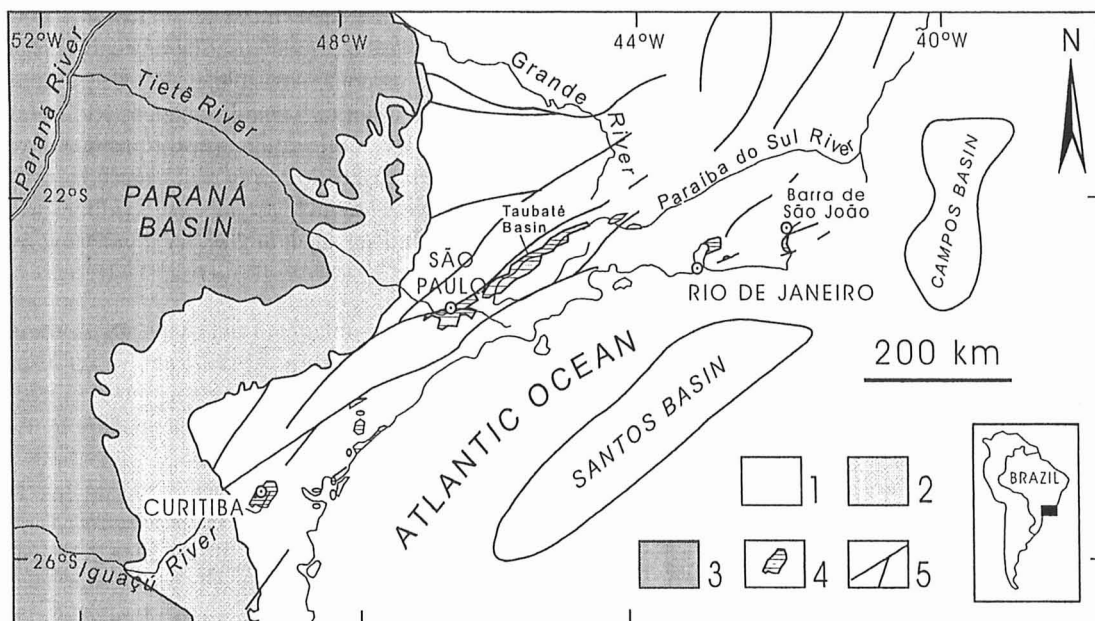


Fig. 1: Regional context of the Continental Rift of Southeastern Brazil (CRS): 1) Precambrian basement; 2) Paleozoic, and Mesozoic sedimentary deposits of the Paraná Basin; 3) Mesozoic flood basalts, Serra Geral Formation; 4) Tertiary basins and associated deposits of the CRSB; and 5) Precambrian shear zones, partially reactivated in the Mesozoic and Cenozoic.

The sedimentary filling, syn-tectonic to the NNW-SSE extension, is mainly represented by Eocene-Oligocene siliciclastic rocks (conglomerates, sandstones and mudstones) deposited in an alluvial fan system. Oligocene lacustrine claystones and shales are interfingered with the alluvial sediments in the central portion of the CRSB. The geology, mineralogy and provenance of these sedimentary rocks were studied, with emphasis placed on the characterization of clay minerals of the alluvial mudstones and lacustrine claystones and recognition of their possible source areas based on Nd isotopic signatures of whole rock and clay (finer than 2 microns) fraction from the central segment of the CRSB (Taubaté Basin).

Mudstones and claystones in the CRSB are massive and made up essentially of detrital smectite and interstratified illite-smectite (I/S). Mica and kaolinite occur in variable proportions and quartz and feldspar are the main sand-grained clasts in these rocks. The smectite and I/S are platy and relatively coarse-grained (plates coarser than 5 microns in diameter), with slightly undulated boundaries.

T_{DM} model ages obtained for whole rock mudstones and claystones of the central segment of the CRSB vary between ca. 1.8 and 1.9 Ga, indicating the Precambrian basement as the main source area. The analyzed clay fraction of lacustrine claystone also displays Proterozoic model age (ca. 1.9 Ga). Younger model age of ca. 1.3 Ga was obtained only for whole rock alluvial mudstone probably derived from mixed source areas, the Precambrian rocks, and Cretaceous alkaline massifs (which have T_{DM} model ages around 0.8 Ga).

At the end of the Late Cretaceous and beginning of the Paleogene the relief was low due to the development of the South American Planation Surface. In this geomorphologic context, the origin of the detrital smectite and I/S is attributed to chemical weathering processes, forming paleosols by the alteration of the Precambrian basement rocks of CRSB probably in the Early Tertiary. Cretaceous alkaline massifs may have contributed only locally.

The smectitic paleosols were transported into the continental half-grabens by mudflows in an alluvial fan system during the Eocene-Oligocene, passing laterally and upwards to lacustrine conditions, in the Oligocene.

Eocene deposits of the offshore basins, São Paulo Plateau and Rio Grande Rise show abundant detrital smectite, considered as supplied from emerged South American continent. Geological, mineralogical and geochemical data obtained for the smectitic clay minerals of the CRSB indicate that landmasses in southeastern Brazil probably acted as a major source area to the detrital clay sedimentation in western South Atlantic during this time.

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