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Evolution of the volcanic arc system of the Neoproterozoic Araçuaí confined orogen, Eastern Brazil

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The Araçuaí orogen (SE Brazil) together with its counterpart located in Africa, the West Congo belt, represent a confined orogenic edifice, which evolved inside an embayment shaped into the São Francisco–Congo palaeocontinent. This embayment was partially floored by oceanic crust, as indicated by the occurrence of Late Cryogenian to Ediacaran ophiolite slivers from the central to southern sectors of the orogen. The orogenic evolution lasted from the Early Ediacaran up to the Cambrian–Ordovician boundary, and produced an enormous amount of igneous rocks, presently exposed from shallow to deep crustal levels along an area over 350000 square km. Part of these rocks, which range in composition from gabbro to monzogranite, with the predominance of tonalite to granodiorite, depicts an expanded medium- to high-K calc-alkaline trend. Showing epsilon Nd values from -5 to -13, U-Pb crystallization ages from 630 Ma to 585 Ma, and zircon grains inherited from the Rhyacian basement, these rocks represent the roots of a continental volcanic arc, developed in association with an east-directed subduction. U-Pb data from metamorphic overprinting on zircon crystals from arc plutonic rocks constrain the collisional deformation between 585 Ma and 560 Ma, with a peak around 575 Ma. Despite of the regional deformation under amphibolite to granulite facies, substantial parts of arc plutons remained preserved, showing igneous textures and structures. The arc assemblage also includes a volcanic-sedimentary succession with pyroclastic and volcaniclastic rocks, ranging in composition from dacite to rhyolite with a medium-K calc-alkaline signature, metamorphosed under upper greenschist to amphibolite facies. These volcanic rocks yielded zircon U-Pb crystallization ages around 595-585 Ma, and are interpreted as intra-arc deposits. The volcanic-sedimentary unit grades eastwards into a succession of turbiditic metawackes, which shows lithochemical and isotopic evidence of arc provenance, and represents marine deposits of the proximal back-arc basin. An extensive unit of sillimanite-garnet-cordierite paragneiss with intercalations of cordierite granulite and calc-silicate rock (metamarl) occurs farther to the east. Showing wacke-pelite protoliths, arc provenance, and detrital zircon ages from 630 Ma to 590 Ma, this unit can be interpreted as marine sedimentation in the distal back-arc basin. A wacke-pelite succession with thin intercalations of metamarl and thick conglomerate lenses, metamorphosed under lower greenschist to amphibolite facies, occurs to the west of the volcanic arc. Lithochemical attributes of metawacke samples, as well as U-Pb ages of detrital zircons extracted from these rocks indicate the magmatic arc as their sedimentary source, and flysch-type sedimentation in the fore-arc domain.