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Reconstruction of multiple tectonic events in continental margins by integrated tectonostratigraphic and geochronological analysis: the Mesozoic to Paleogene Caribbean-South American interaction in northeastern Colombia

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Although the older record and successive tectonic scenarios experienced by a continental margin is commonly fragmentary, integrated field, petrological and geochronological analysis can reconstruct the long term tectonic evolution of continental margins and characterized major controls on the orogenic style.
We present new geochronological constraints from igneous and low to very low grade metasedimentary rocks from the Caribbean continental margin of northeastern Colombia (Guajira region) in order to reconstruct the different tectonic events recorded by the margin before, during and following the arc-continent collision with the front of the Caribbean plate.
Zircon U-Pb LA-ICP-MS geochronology results from leucogranites associated with garnet amphibolites, tonalites and volcanic rocks that made the continental basement of northeastern Colombia reveals and Early to Middle Mesozoic tectonic activity with peaks at ca. 220-230 Ma and 170-180 Ma. This magmatic record is related to a collisional belt link to the final agglutination of Pangea and was followed by an overimposed far field back-arc setting associated to the subduction of the Pacific (Farrallon) plate under the Pangea supercontinent. Muscovite and biotite Ar-Ar geochronology from basement rocks and low grade Mesozoic metasediments also reveals the existence of Middle Jurassic to Early Cretaceous thermal events link to the final opening of the proto-Caribbean ocean. The South American continental margin was subsequently affected by an arc-continent collisional event with the front of the Caribbean plate. This event is recorded by the growth of a Banda-type collisional melange that mixed South American continental margin sediments with mafic and ultramafic blocks of intra-oceanic arc origin, the formation of a coherent metasedimentary belt also made of South American margin sediments, and the mylonitization of the continental basement. Ar-Ar temporal constraints on the low grade metasedimentary rocks and detrital apatite fission track ages from younger sedimentary sequences suggest a Late Campanian age for this deformational event. Continuous convergence and the formation of a new subduction zone in the South American margin were responsible for the remobilization of inland extensional structures and the associated growth of an Early Paleocene mylonitic belt. During the Eocene the installation of a short duration magmatic arc and a widespread cooling event record the final installation of an oblique subduction setting.
We argue that the pre-collisional tectonic evolution of the South American continental margin have prepare a warm continental margin with significant weakness zone that determined an arc-continent collisional style characterized by frontal accretion of the South American plate over the intra-oceanic Caribbean domain, and in which the younger compressional and thermal events are link to the remobilization of older structures.