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Variable magmatic features of Oligocene-early Miocene Patagonian magmatism as result of subduction-induced mantle dynamics

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New geochemical and geochronological data reveal that late Oligocene-early Miocene time is a break point in the evolution of Andean magmatism. The Patagonian Andes registered the onset of arc volcanism since the late Eocene forming part of the El Maitén Belt, whose development was driven by the subduction of the Farallón/Nazca plates beneath the Andean margin (Rapela et al., 1988). New data indicate that during the Oligocene El Maitén Belt show a change from tholeiitic to calc-alkaline compositions, reflecting a more mature stage in arc evolution. Toward the early Miocene, Andean arc magmatism turned into basic tholeiitic lava flows, which intercalate with marine deposits, suggesting their development under extensional tectonics (e.g., Bechis et al., 2014). These rocks resemble E-MORB-like and OIB compositions with primitive mantle sources, which strongly contrast with previous arc products. By this time, a global plate reorganization event would have caused an increase in convergence rates, accelerated roll back and a more orthogonal subduction geometry, triggering a widespread magmatism and the development of extensional basins in the upper plate (e.g., Fennell et al., 2018; Lonsdale, 2005; Muñoz et al., 2000). Records of volcanic associations with arc signature during the early Miocene can be found only in the western slope of the Andes, suggesting the retreat of the volcanic front toward the trench (e.g., Encinas et al., 2016; Muñoz et al., 2000). The proposed model suggests that slab rollback would have caused vigorous mantle convection allowing the coexistence of arc related magmatism with deep-sourced intrusions.

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