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Oroclinal bending in Northern Iran: new constraints on the age of South Caspian subduction and extrusion tectonics

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We report paleomagnetic results from Alborz, Ala-Dagh, Binalud and Kopeh-Dagh mountain chains (northern Iran), with the aim of reconstructing the rotation history and the origin of curvature of these orogenic chains. The analyzed deposits are the sedimentary successions of the Shurijeh (Cretaceous) and Upper Red Formation (Miocene). Paleomagnetic results indicate that this mountain chain system originated as a linear mountain belt that progressively acquired its present day curvature through opposite vertical axis rotations along its strike. The curvature of the arc was entirely acquired after the middle-late Miocene, which is the age of the youngest investigated sediments (Upper Red Formation). Overall, our paleomagnetic data indicate that the mountain chains in North Iran can be considered an orocline.

Our results define, for the first time, the rotational history of the entire Northern Iran curved mountain belt, and enable us to reconstruct the paleogeographic and tectonic evolution of northern Iran in the framework of Arabia-Eurasia continental deformation. The kinematics inferred by the pattern of paleomagnetic rotations is at odds with the present day kinematics of northern Iran, characterized by the westward extrusion of the South Caspian block, and by a left lateral shear between Central Iran and the central and western sectors of the Alborz Mts. By integrating paleomagnetic data with stratigraphic, thermochronological, structural and GPS information, we propose that the initiation of South Caspian subduction and the activation of westward extrusion of South Caspian block occurred diachronously and that the initiation of the present-day kinematics of northern Iran was quite recent (Lower Pleistocene, $\sim$2Ma).