

## Fifty years of Plate Tectonics in the Andes: Past challenges and future perspectives

V-A. Ramos<sup>1</sup>

<sup>1</sup>Instituto de Estudios Andinos - Universidad de Buenos Aires

A milestone in the knowledge of plate tectonics in the Andes was the pioneer proposal of John Dewey of 1969, where he presented for the first time the “Andean-type” model. This proposal on the Andes was challenged by Robert S. Dietz in 1970, where he proposed that the South American plate encountered the oceanic trench in the East Pacific in Cretaceous times, and the overridden island arc produced the Andean fold and thrust belt. The increasing knowledge of the subduction mechanics through the contributions of Jack Oliver, Bryan Isacks and Peter Molnar in the early seventies, the process of crustal thickening in the plate tectonic model of David James in 1971, together with the ideas of Bill Dickinson of K-h correlation between potash content of andesites and depth to Benioff zones, led Paul Gansser to propose the first plate tectonic classification of the Andes in 1973. The recognition of the different segments with very different geologic and tectonic attributes, including igneous and metamorphic rocks, was so robust that after many years, it became a classical division of the Andes. The evolution of the tectonic regimes and associated processes was related to global variation in spreading rates as early as 1973 by Reynaldo Charrier to explain periods of compression and extension, as well as Jean Claude Vicente, who recognized evidence of these periods of contraction and extension in the Andean geology. The occurrence of segments with different tectonic settings was related to flat-slab subduction by Muawia Barazangi and Isacks in the late seventies. Subsequent geologic studies of these segments by Teresa Jordan and others in 1983, showed the tectonic evolution from normal to flat-slab subduction in different contributions up to 2002. The existence of a large high plateau in the central Andes was explained by Isacks in 1988 due to thermal uplift and removal of the lithospheric mantle, a seminal proposal that led to an important series of geophysical tests for confirmation. Sue Kay, Beatriz Coira, and coworkers together with David James and Selwin Sacks in 1999, identified the processes related to the steepening of the oceanic slab, delamination and volcanic flare up. The recognition of these processes, mainly through petrological and geochemical studies led to Sue Kay and coworkers to identify the magmatic evidence of delamination, crustal erosion by subduction and crustal thickening. The occurrence of old ophiolites in different sectors of the Andes, led us together with Constantino Mpodozis, to recognize a complex array of terranes of Paleozoic age, that have built the present basement of the Andes. This fact, together with the accretion of oceanic island arcs and plateaux in the northern Andes during Meso-Cenozoic times, showed the complexity of the “Andean-type” model early proposed by Dewey. New seismological approaches permitted Susan Beck and collaborators a better understanding of the mechanics of delamination, ablative subduction, and other new processes related to the orogenic uplift of the Andes. A new series of challenges is currently opening up in the understanding of the geological evolution of the Andes based on new technologies and recently developed study methods.