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South American tectonics: An introduction

This Special Issue gathers a series of contributions derived from presentations at the 1st Symposium on South American Tectonics (Atecsud) held in Santiago de Chile (Universidad de Chile) in 14–16 November 2016 and organized by the South American Tectonic Association. This symposium was developed through three axes, one dedicated to Proterozoic and Paleozoic tectonics, a second dedicated to Mesozoic to Cenozoic tectonics and finally a last dedicated to seismo- and neotectonics in South America and the analysis of its thermal regime and orogeny-scale morphology.

Specific subjects cover a wide variety of topics and regions of Argentina, Chile and Brazil (Fig. 1), varying from structural analyses, U/Pb dating of detrital zircons in different rocks to determine source areas, magnetic data to indirectly determine heat flow and gravity data to determine flexure in vast areas of the continental crust, analyses of seismic lines, analogue and numerical modeling, geochemical and neotectonic analyses.

The Basement evolution branch covers a series of works focused mainly on Brazil and on the Andes and adjacent foreland regions. In particular, the work of *Pestilho* et al. is located on the onshore Potiguar Basin and constitutes a petrographic study of the sedimentary facies of Cretaceous reservoir rocks deposited as a hyperpycnal flow controlled by a fault system. Diagenetic evolution of the reservoir rocks indicates that hydrocarbon charge occurred prior to the regional uplift. The work of *Lyra* et al. is focused on an AMS study on postorogenic granites in southern Brazil associated with the last stages of evolution of a Braziliano-Pan African deformational belt. Lyra et al. highlight the role of shear zones as channels for this post-orogenic magmatism. The work of *Fonte-Boa* et al. is a study focused on the internal domain of the Araçuaí-West Congo orogen in southeast Brazil using geophysical tools and detailed mineralogical analysisanalyses. Their analyses indicate a high-grade progressive metamorphic path related to the collisional stage followed by a retrograde process related to the thermal event during the post-collisional stage. The work of *Ariza* et al. constitutes a detailed analysis of the different deformational processes that occurred in the Argentinean Western Precordillera region using field, remote sensing and magnetometric data. They identify distinct deformational styles associated with the Late Devonian, Early Permian and Neogene deformation phases that built this complex mountain range. The work of *Fuentes* et al. is a petrological and geochemical study of the metabasic rocks of the Chañaral mélange, a Neopaleozoic accretionary prism exposed on the northern Chilean coastal zone for which the magmatism had not been fully characterized before. These volcanic lenses show indicators of interaction with water, and they are interpreted as synsedimentary. Additionally, their chemistry implies an enriched mantle that is compatible with an asthenospheric anomaly that is interpreted as compatible with forearc deformation with continental overriding of a plume-like feature. Finally, the work of *Heredia* et al. constitutes a review of the basement evolution in the central segment of Argentina and Chile. This work redefines the Chilenian-Cuyanian microcontinent as a composite block that experienced a parauchtochtonous drift and final docking in Late Devonian-Early carboniferous times.

The Meso-Cenozoic evolution in the Andes branch is the main body of this special issue. Among these works, *González* et al. tackle a rather controversial subject: the tectonic setting of Triassic magmatism in northern Chile. Based on the petrography, elemental and isotope geochemistry of Norian-Carnian volcanic and plutonic rocks the authors propose a subduction setting model and a mixture of depleted mantle and continental crust as the sources of the Triassic igneous activity.

The work of *López* et al. constitutes a thorough revision using U/Pb dating of the volcano-sedimentary sequences cropping out in northern Chile. Their study includes the precise dating of key units in the context of the Early Andean system, such as the Sierra de Miranda Beds and the La Negra Formation. They determine main peaks in magmatic activity as well as gap stages that characterize the Northern Chile Mesozoic to Cenozoic arc. *Gianni* et al. review the dynamics of the Cretaceous arc in Patagonia and its relation to the early deformational phases that affected the Patagonian fold and thrust belt. Then, they relate a series of single slab shallowings that were proposed in previous works to only one flat subduction zone with dimensions similar to the largest flat slab segments on Earth. Additionally they link K/Tc transgressions in Patagonia to dynamic subsidence acting on the leading edge of this flat slab applying viscosity models. The work of *Iannelli* et al. focuses on geochemistry of latest Cretaceous volcano-sedimentary sequences exposed on the highest Andes of Mendoza. Their study assigns these series to the diachronous collision of the Farallón-Antarctica ridge against the South American border in Late Cretaceous-Eocene times producing a series of slab windows. These windows are associated with a syn-extensional mantle-derived series of interrupted arc activity. The work of *Jara* et al. analyzes the mechanics of inversion of a rift that experienced differential extension taking as an analogue the Eocene-early Miocene Abanico Basin affecting the axial Andean zone. The work of *Fennell* et al. constitutes a numerical model applied to explain that stage in Andean evolution characterized by extensional relaxation interrupting momentarily the Andean Growth in late Oligocene times, whose structure was analyzed in the previous contribution. This stage has attracted the attention of scientists for years since it coincides with an increasing perpendicular-to-the-trench convergence velocity between the plates. Modeling shows that this extensional stage can

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Fig. 1. Location map of regions analyzed in this Special Issue.

be explained by an accelerated roll back at the time when the leading edge of the subducting slab reaches the 410 km mantle discontinuity, and slab pull forces combine with accelerated convergence. The work of *Martínez* et al. analyzes the synorogenic depocenters associated with the eastern flank of the Chilean Precordillera through the analysis of seismic information at the latitudes of the Salar de Punta Negra determining two synorogenic prisms from the Late Cretaceous to the Pliocene. The work of *Rubilar* et al. analyzes the structure of the eastern flank of the Chilean Precordillera at the latitudes of the Salar de Atacama using seismic lines and highlighting the mechanics of deformation associated with the inversion of Triassic, Oligocene extensional structures and the flux of Miocene salt.

Finally, the last part of this issue is dedicated to works using seismo- and neotectonic tools as well as geophysical datasets aimed to explain the present mountain morphology and associated deformation and seismicity. Among these, the work of *Correa-Otto* et al. analyzes the major intraplate seismicity registered in the Neuquén Basin in the last 40 years with a local seismic network, discussing its origin. The work of *Sagripanti* et al. is a review of the main neotectonic deformational systems that characterize the Southern Central Andes. This work establishes a plausible relationship between the locus of asthenospheric anomalies associated with a complex picture of a branched plume and the development of neotectonic deformations in the upper crust. *García* et al. connect Elastic Thicknesses computed from gravity data in the Central Andes to the different styles that characterize the Subandean and Santa Bárbara systems and the density contrasts that characterize their basement. The work of *Sánchez* et al. demonstrates by using magnetic data that the present heat flow above the Chilean-Pampean flat subduction zone is more heterogeneous than previously thought. Additionally, a heat flow map shows a direct

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correlation with elastic thicknesses determined using gravity data.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jsames.2018.01.006.

Verónica Oliveros*
Departamento Ciencias de la Tierra, Universidad de Concepción, Casilla 160-C, Concepción, Chile

Andrés Folguera
Instituto de Estudios Andinos Don Pablo Groeber, FCEN – Universidad de Buenos Aires – CONICET, Argentina

César Arriagada
Departamento de Geología, Universidad de Chile, Chile

María De Fátima Bitencourt
Universidade Federal do Rio Grande do Sul, Institute of Geosciences, Porto Alegre, Brazil

* Corresponding author.
E-mail address: voliveros@udec.cl (V. Oliveros).

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