TERRA NOSTRA

Schriften der GeoUnion Alfred-Wegener-Stiftung – 2019/1

25th LATIN-AMERICAN COLLOQUIUM

HAMBURG · SEPT 18–21 · 2019

1919 2019

100 JAHRE WISSENSWERFT

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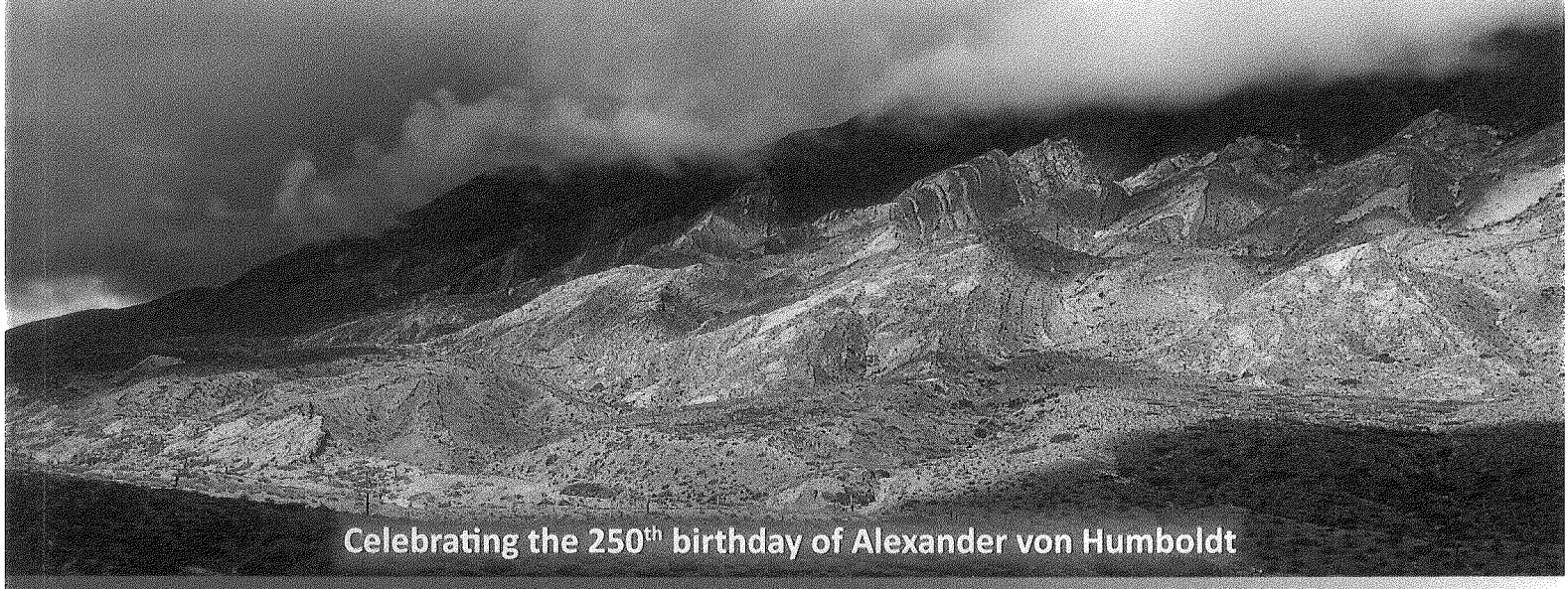

Celebrating the 250th birthday of Alexander von Humboldt

25th Latin-American Colloquium of Geosciences

Hamburg, Germany
September 18 - 21, 2019

Program and Abstracts

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Edited by Ulrich Riller & Paul Göllner

tsunami sciences were not enough to diminish the impact of these two great earthquakes and their coupled tsunami events. As a consequence of these recent devastating tsunamis, Chile calculated 156 victims and Japan nearly 13,000. In order to avoid the future impact of natural disasters in Chile, in 2011 the National Science Foundation of Chile (CONICYT) launched a competitive call to create the first center for interdisciplinary studies of disaster risk reduction. This competitive application call was aimed to develop the scientific basis for an efficient and effective transference of the new knowledge of hazard-risk sciences to the public. After seven years in its development, CIGIDEN (National Research Center for Integrated Natural Disaster Management) has become a key component of the disaster mitigation strategy of Chile. CIGIDEN is a consortium formed by four Chilean Universities in which participate geoscientists, engineers, sociologists, psychologists, urban planners, journalists and anthropologists. In the present contribution we present key lessons for Disaster Risk Reduction Strategies learned from studying the most recent earthquakes, which occurred in Chile, the 2010 Mw 8.8 Maule Earthquake, the 2014 Mw 8.1 Iquique earthquake and the 2015 Mw 8.3 Illapel Earthquake. We reviewed the most important scientific milestones, which have been developed with an interdisciplinary perspective for disaster risk reduction. Key aspects revisited in this contribution are: How to generate earthquake scenarios using the existing observation methodologies in subduction zones. What are the key parameters of earthquake scenarios for substantial tsunami impact reduction. What is the role of coastal geomorphology for assessing tsunami impact. What are the still pending aspects in reducing the number of tsunami victims. How we can efficiently and effectively transfer hazard science to stakeholders and communities.

Ages and internal structure of plutons in the Dominican segment of the Caribbean Island Arc

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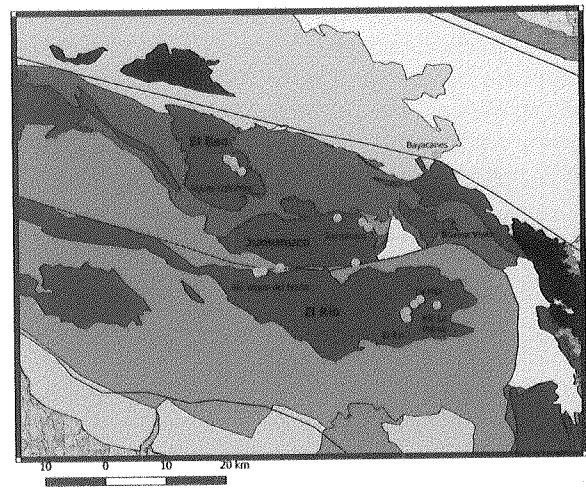
One of the main processes governing the crustal evolution of the Caribbean is the magmatic activity of the Great Caribbean Island Arc. On the Greater Antilles, the Cordillera Central of Dominican Republic is one of the outcrop areas for studying the plutonic basement of the Caribbean Island Arc. We present zircon U-Pb ages of 18 rock samples from the El Río, El Bao and Jumunuco plutons. The samples range from diorites to peraluminous granite with the majority being tonalites. The results show a contemporaneous emplacement of the three intrusions in the midst of the Cordillera Central between 90 and 80 Ma. However, ages of the El Bao pluton overlap at about 86 Ma, whereas the rocks of El Río and Jumunuco pluton display a wider range. In the El Río pluton, the biggest and structurally most complex of the three studied intrusions, the measured zircon ages are in agreement with the relative age relations observed in the field.



The main sequence of intrusion is marked by early tonalites that are later followed by younger granodiorites and granites and approximately concurrent dioritic rocks. Besides, the distribution of ages throughout the El Río pluton points to an early emplacement of tonalites in the northern part and subsequent intrusion of magmas to the south. The ubiquitous occurrence of mixing and mingling structures between mafic and felsic rocks and the lack of a correlation between zircon age and differentiation indices point to a continuous replenishment of magma reservoirs in the studied intrusions. The occurrence of voluminous plutons of ages between 90 and 80 Ma in the Cordillera Central constrains that the main activity of magmatism in the Dominican segment of the arc took place in this phase. The absence of inherited zircon older than 100 Ma furthermore indicates its nearly exclusive oceanic evolution in the Cretaceous. The ages of the dated rocks fall into the Upper Cretaceous phase of arc magmatism in the Great Caribbean Arc and are comparable to other intrusions along the Greater Antilles.

The Quaternary Payún Matrú caldera, andean back-arc of the Southern Volcanic Zone: insights into its caldera-forming eruption deposits

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The Quaternary Payún Matrú caldera is located in the back-arc of the Southern Volcanic Zone of the Andes,

western Argentina, and represents the main volcanic edifice of the Payún Matrú Volcanic Field (PMVF). The PMVF is located within Payenia, a volcanic province characterized by alkalic basaltic volcanism. The PMVF presents the homonym caldera along with the Payún Liso volcano and 220 basaltic monogenetic cones. Payún Matrú has a long-lived pre-caldera stage where a shield-like edifice has been built. The syn-caldera stage is represented by the Pleistocene Portezuelo Ignimbrite and the resulting caldera depression of 8.5 km in diameter. Afterwards the caldera event, volcanism continued mostly along the caldera rim.

We present stratigraphic sections, facies analysis and mineralogical studies of the Portezuelo Ignimbrite, in order to determine pre-eruptive conditions, onset of collapse and eruptive history of the caldera-forming eruption deposits. The extra-caldera Portezuelo Ignimbrite shows different facies, being most of them massive or eutaxitic and massive lapilli tuff facies, deposited by dense pyroclastic density currents. Fall deposits are found only restrained to the caldera margin, suggesting the lack of a sustained eruptive column at the onset of eruption. Massive tuff facies are found at the topmost deposits south of the caldera, and indicates the development of a co-ignimbritic plume as the pyroclastic density currents wanned. Four distinct juvenile clasts were recognized on the basis of color, shape, size, vesicularity and crystallinity. These are: gray fiamme, light gray pumice, dark gray pumice and black juveniles. Whole-rock chemical analyses of gray fiamme and black juveniles have a similar trachytic composition, while the mineralogical composition of juvenile clasts reveals some differences, specially in feldspars. On the basis of discontinuity surfaces and the juvenile clasts population of the ignimbrite, several eruptive units were defined. Given the absence of lithic breccias, the onset of collapse is suggested by a change in the juvenile clasts population in the topmost eruptive unit, which presents dark gray and light gray pumice together with black juveniles. The sequential appearance of different juvenile clasts suggests a zoned magma chamber, in terms of crystal content and mineralogical composition.

Andean exhumation and erosion across the Pampean flat-slab transition

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The temporal and spatial evolution of Andean orogeny between 30°S and 35°S during the Neogene is traditionally linked to the development of the Pampean flat-slab in the late Miocene. To a first order, the geographic coincidence of the Pampean flat-slab, topography, total crustal shortening and the west to east sweep of magmatism comes together in what appears to be appears to all but a foregone conclusion. Yet, a spate of recent studies including foreland basin deposits, bedrock and detrital thermochronology, cosmogenic nuclide-derived erosion rates and other geomorphic observations squarely call the simple flat-slab linked, eastward-stepping deformation model into question. Observations from a series of previously published studies, combined with new detrital thermochronology data make the case for spatially continuous rock uplift in the Frontal Cordillera and Precordillera prior to the onset of the flat-slab at in the Late Miocene. Data from cosmogenic nuclide concentrations of sediment in rivers that drain catchments throughout this segment of the Andes show overall higher erosion rates on the eastern flanks of the range despite steeper slopes and an order of magnitude increase in precipitation on the western side of the range. This result demonstrates that tectonically controlled rock uplift, not climate or vegetation, exerts a first order control on modern erosion rates in this segment of the Andes. On both sides of the Andes there is a prominent, and symmetric, spike peak in erosion rates centered at 33.75°S latitude, where catchment-wide erosion rates rates exceed 400 m/Ma. Extremely young, non-volcanic detrital zircon (U-Th/He) data from the Tunuyán and Arroyo Grande catchments, along with independently derived estimates of surface uplift strongly suggest this is not a transient signal confined to modern erosion rates. On the whole, our analysis supports the notion that more mass is fluxed through the eastern flank of the Andes, even south of ~33°S where the orogen narrows and crustal shortening abruptly decreases.

Palynofacies and maturity offshore Suriname – implications for the petroleum system

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Former DEA and their partners drilled an offshore exploration well located 120km off the Suriname coast in the Suriname-Guyana Basin. This passive, continental-margin-style sedimentary basin is considered to comprise all elements required for a promising hydrocarbon province. These Cretaceous to Tertiary aged successions are characterized by interbedded sands and shales, deposited in a variety of marine and non-marine environments, and marine carbonates.

In the present study the presence of an Upper Cretaceous petroleum system is tested with potential source rocks of Cenomanian to Turonian age and intercalated turbiditic sandstones. Besides detailed palynofacies information in terms of palaeoenvironment, the maturity is assessed by means of spore coloration index