

# Preface

The Argentine Association of Geomorphology and Quaternary studies was founded and established during the decade of the 1990s. Then, it was the optimistic effort of a small group of Argentine geologists, geographers, paleontologists, and archeologists who were expecting to generate their own space in the Earth Sciences of Argentina, where the dialogue about landscapes, landforms, as well as recent paleoclimates and paleoenvironments would be open among scientists of various concurrent disciplines. As expected, the beginnings were very difficult, until a reduced group of geomorphologists and Quaternary specialists found out that symposia, field trips, and finally, multidisciplinary congresses were the most appropriate means to improve the frequency of academic encounter of researchers in these sciences. Many countries in the world have autonomous societies for Geomorphology and Quaternary Sciences, which are then linked to the International Association of Geomorphologists (IAG) and the International Union for Quaternary Studies (INQUA), respectively. In Argentina, due to the limited number of specialists, most of them working simultaneously in both these fields of knowledge, the congruent decision was to support just only one organization, incorporating in it specialists of both areas, so as to better concentrate the valuable efforts of its members.

The Argentine Congresses in Geomorphology and Quaternary studies are held every three years. The first congresses took place in the cities of Mar del Plata, Tucumán, Córdoba, La Plata, and Río Cuarto where, in all cases, prestigious universities hosted the meetings. Finally, the 6th Argentine Congress of Geomorphology and Quaternary Studies was held in Ushuaia, Tierra del Fuego, in April 2015. Ushuaia is the southernmost city in the world, over 3000 km south of Buenos Aires, the national capital city.

This was certainly a historical fact in academic terms. This was the first time a national congress in any discipline of the Earth Sciences was held in Tierra del Fuego, and the southernmost place on Earth where a congress as such, organized by a national association, had taken place. The immense distances that separate Ushuaia from the rest of Argentina and thus, the higher costs of air fare, were some of the difficulties faced by the organizers. The Association had accepted the

proposal to organize the 6th Congress, during the previous congress in the city of Río Cuarto, Córdoba, in October 2011. That was certainly an expression of confidence by the congress members toward the Ushuaia organizing committee, who voiced later their gratitude to all participant colleagues. The Congress received the support of the Centro Austral de Investigaciones Científicas (CADIC), the Ushuaia branch of CONICET, the National Research Council of Argentina, the National Agency for Science and Technology (ANPCYT), the Argentine Minister of Science and Technology, and the academic backing of the Asociación Geológica Argentina, the Asociación Paleontológica Argentina and the Asociación Argentina de Sedimentología.

The main aim of this congress was to contribute to the progress of Geomorphology and Quaternary Studies, in all disciplines, integrated to the other Earth Sciences but closely related to the Natural and Social Sciences. Besides, the Congress provided the right environment to discuss aspects of the relationship with production, prospection, and use of natural resources, the rational treatment of waste, the protection and management of the environment, climatic change, and the availability of appropriate techniques for these purposes.

The Congress developed thematic sessions, with oral and poster presentations, most of them in plenary sessions to favor the multidisciplinary analysis of core subjects. Almost 200 participants from many different Argentine provinces and neighboring countries such as Uruguay, Chile, Brazil, and Paraguay registered, and more than 200 abstracts were reviewed by a Scientific Committee and later published in a dedicated volume which was made available to the participants upon registration.

Four distinguished foreign colleagues accepted our invitation to offer high impact lectures during the Congress. They were Dr. John Clague (Simon Fraser University, Vancouver, Canada; former INQUA President), Dr. Rene Barendregt (Lethbridge University, Alberta, Canada), Dr. Michael Smith (Kingston, London, United Kingdom, founder-editor of the "Journal of Maps"), and Dr. Piotr Migón (Wrocław University, Poland, founder-editor of the series "Geomorphological Landscapes of the World", by Springer Verlag Publishers), who did it as the official representative of the International Association of Geomorphologists (IAG). In all cases, our guest lecturers cover their own travel expenses, a fact that deeply compromises our permanent gratitude.

Since most of the participants have never been in Tierra del Fuego before, intra-Congress and post-Congress field trips were organized to expose the geological features, landscapes, and environments of the island to the Congress attendants. The Beagle Channel, the Fuegian Andes, Lake Fagnano and the Magellan Transcurrent Fault, the passage from the Scotia Plate to the South American Plate, the Austral Basin, and the dry steppes of northern Tierra del Fuego were visited and their features discussed in the field.

As President of the Organizing Committee, I would like to deeply thank all the colleagues at CADIC that worked indefatigably to make this event possible: Andrea Coronato, Juan Federico Ponce, Marilén Fernández, Romina Onorato, Mónica Salemmme, Fernando Santiago, Soledad Schwarz, Jimena Oría, María Laura

Villarreal, María Soledad Candel, Lucas Turnes, Ramiro López, Diego Quiroga, Mauricio González Guillot, María Laura Borla, Leonardo Ramírez Viturro, and Pau Montero Estaña. To all of them, my eternal gratefulness.

The great Charles Darwin, the first naturalist, geologist, paleontologist, glaciologist, and anthropologist who visited Tierra del Fuego in 1833–1834, was in this island during his famous voyage on board of the HMS Beagle, under the command of Captain Robert Fitz Roy. Hopefully, Darwin's spiritual legacy has steered our visitors to appreciate the immensity, complexity, and exceptionality of the Fuegian landscapes, its past and present ecosystems, and the fascinating history of human occupation of these extreme lands which started 11,000 years ago.

This volume presents 11 papers which were carefully selected by the Scientific Committee, for their scientific quality and topical and methodological variety. In summary, these papers belong to several different disciplines, representing the ample diversity of the science community that participated in this Congress.

The first chapter of this book, by Emilia Aguilera and colleagues, is devoted to the different landscapes developed on ignimbrites in Argentina, mostly in Patagonia where these pyroclastic rocks are common. The nature of these landscapes on ignimbrites is directly related to the degree of welding of the ash-flow tuffs, and the scale of analysis, from single micro-landforms to huge, extensive, complex landscapes. The landscape characteristics are also strongly related to the age of the pyroclastic units and the exposure time of their outcrops.

Soledad Schwarz and Piotr Migoń analyzed the relationship of landscape and tourism, science and leisure, the nature of geotourism, and the educational relevance of regionally changing landscapes. Using field notes and data, different Fuegian landscapes were studied and their features identified. It is worth mentioning that sections of this paper were prepared and elaborated actually during the post-Congress field trip and original field sketches, with notes in Polish, were underwritten by Professor Migoń by means of ad-hoc files.

Soil and Geomorphology relationships were carefully studied by Pablo Bouza and colleagues, as a by-product of a technical survey done in a uranium mining district in Central Patagonia. Many dissimilar landscape units have been recognized; most of them of Quaternary age but some others as old as the Late Mesozoic. The soils developed on these landscapes were wisely and sensibly described and their pedological and geochemical characteristics scientifically considered.

The hydrology of coastal environments in Buenos Aires province was investigated by Silvina Carretero and Eduardo Kruse. The availability of water resources is highly valuable in these coastal environments, since most of the coastline is used for touristic purposes, not only as summer beaches, but also for week-end recreation all year around. The human intervention on the coastal dune systems, the best source for fresh water, has endangered the water supply to the ample beaches and growing towns. Two neighboring localities were tested for water availability and degradation of the coastal dune systems.

Diego Sebastián Fernández and María Elena Puchulu presented a detailed study about available, quantitative technologies to predict landsliding hazards in north-western Argentina. Abrupt slopes, lack of vegetation, and frequent seismic activity

favor recurrent landsliding. Different landslide susceptibility models are presented and their performance was evaluated using statistical techniques. Comprehensive and profound sensitivity analysis of the models was performed in order to evaluate how the errors associated with input factors affect model results.

The landscapes of southernmost Patagonia, north of the Magellan Straits, have been studied by Elizabeth Mazzoni to investigate their characteristics from a scenic point of view and their possibilities as touristic resources. The immensity and emptiness of the Santa Cruz province tablelands is in strong contrast with the coastal and mountain landscapes. Individual landforms and extended landscapes are discussed in terms of slope, vegetation cover, resident and migrant fauna, acting geomorphological processes, and age and cultural resources.

Karina Echevarría and colleagues have investigated the flash flood hazard in the Sierras Pampeanas of the province of Córdoba, studying piedmont basins which lack appropriate water and sediment discharge data. The importance of this study is linked to the nature of these mountain ranges, some of them being the most populated mountain environments in Argentina. These ranges are characterized by impervious bedrock, steep slopes, poor soils, sparsely vegetated basins, and strong, seasonally concentrated rainfall, which are visited by millions of tourists all year around, but mostly during summer holidays.

The nature and dynamics of deflation hollows or pans and saline, shallow lakes in northern Tierra del Fuego are discussed by María Laura Villarreal and Andrea Coronato, who have analyzed the geomorphological and morphometric characteristics of these landscapes under temperate/cold and very dry climate. The shape, size, perimeter, and density of the studied pans are examined, as well as the landforms developed in their periphery. The dry steppes of northern Tierra del Fuego are the home of the “roaring fifties”, very fast and strong winds which are the dominant geomorphological agents in the region; this paper evaluates their powerful influence on landform development.

The study of epibiosis on brachiopods along a large extent of the Patagonian coasts has been conducted by Gisela Morán and colleagues. Epibiosis is the association between two or more living organisms belonging to the same or different species as a result of surface limitation. This property is of high interest in paleoecological studies of both recent and fossil organisms. Though Quaternary brachiopods are rare, they provide an ideal biogenic substrate for studying paleoecological questions relating to encrusting biotas. The absence of encrusting biotas on the Holocene shells of this study is attributed to the fact that many of these individuals are younger age and of smaller size.

The Quaternary of the Laguna de los Pozuelos basin, located in the Puna, the region including the high Andean plains of northern Argentina, was investigated by María Camacho and Julio J. Kulemeyer. This district is located at very high elevation close to the Argentina–Bolivia border. Puna is a unique environment of the Central Andes, with complex and varied sedimentary and stratigraphic features. This is a large “altiplano”, a high altitude tableland characteristic of the Central Andes. The depression occupies a morphostructurally low area, bearing extensive shallow salt lake systems. Climatic and tectonic adjustment at the end of the Last

Glaciation Maximum reduced them to ephemeral lakes that survived during the entire Quaternary.

Margarita Osterrieth and colleagues have investigated calcium biomineralizations associated with bioclastic deposits in coastal pedostratigraphic sequences of the southeastern Pampean plains. The biomineralization process is genetically controlled, and it is the result of the metabolic activity of different organisms, either microorganisms, plants, and animals. The Quaternary pedosedimentary sequences of the southeastern coast of Buenos Aires province evolved from bioclastic and loess sediments. These biomineralizations play an important role in the development of soils, and they are very good indicators of paleoclimatic and paleoenvironmental characteristics.

The future of Geomorphology and Quaternary studies in Argentina and South America is quite promising. Every year, more and more papers dealing with these disciplines are published, both in regional and in international journals. We do hope that the present book will be a benchmark in the progress of Geomorphology and Quaternary studies in this region and the appreciation of their advancement and evolution at the international scenario. From Puna to Tierra del Fuego, from the Andes piedmont to the Buenos Aires coastal environments, from flash floods to ephemeral lakes, this book was intended to show the assortment and complexity of Argentina climates and environments, and the state of our knowledge at the beginning of the twenty-first century.

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