

Field Training Course and Workshop of the Sam-GeoQuat Group

*"From the Pampean Ranges to the North Pampa:
Tectonic and climatic forcing on the Late Quaternary
landscape evolution of Central Argentina"*

(INQUA Focus Group on Quaternary Geology
of South America) - TERPRO Commission of INQUA

Central Argentina, 14-18 October 2013



First Circular

The **Field Course** is open to young researchers from South American countries (PhD students & Post-Docs). Fieldwork activities will include a 5 days intensive trip along four Argentine provinces (San Luis, Córdoba, Santa Fe and Entre Ríos), from the Eastern Pampean Ranges through the North Pampa Plain to the Parana Fluvial Belt. The trip will follow a ca. 1,100 km geological transect that allow discuss in situ outcropping Quaternary sequences and landforms.

The **Workshop of the Sam-GeoQuat Group** will be held in **Miramar city** (Cordoba province), on the afternoon of 16 October, 2013. The indoor program will consist of invited plenary lectures (members of the Group), talks by participants and roundtable discussions.

Sponsored mainly by: *The International Union for Quaternary Research (INQUA)*

http://www.terpro.org.ar/quaternary_geology.htm

Organizing committee:

The Field Course will be coordinated by experienced workers in the region, who are active participants of the *SAM-GeoQuat Group*:

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Dr. Carlos Costa (*Universidad Nacional de San Luis, San Luis. ARGENTINA*)

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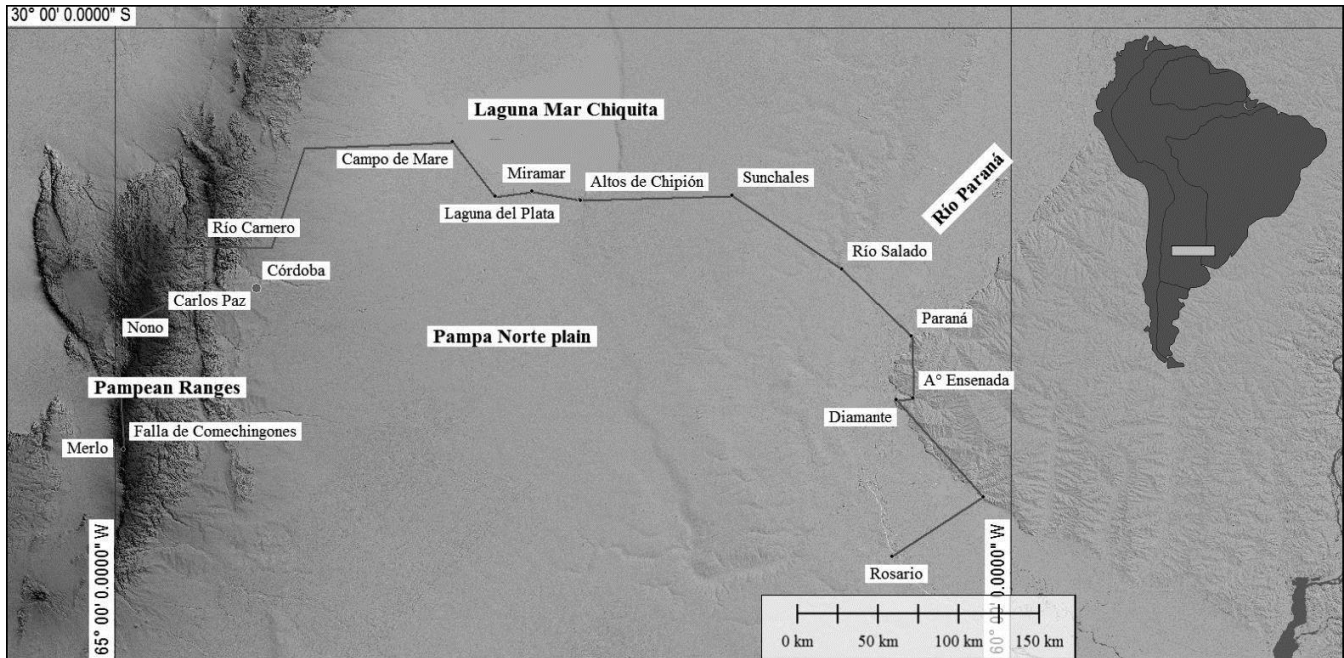
Geological setting

The area comprises a key region of the extra-Andean South America (SA). There, Quaternary deformation is the result of ongoing flat-slab subduction of the Nazca Plate beneath the SA Plate, which gives rise to a compressive setting for almost all the Quaternary structures known. The subduction geometry led to the involvement of the broken foreland adjacent to the Andean orogen in the Neogene deformation in certain latitudinal segments, as in the central-western Argentina, represented by the **Pampean Ranges**. This gave rise to different interactions between internal and external processes. The Sierras Pampeanas are basement blocks that have been uplifted and tilted during the Neogene. These blocks are bounded by west-verging reverse faults. Such marginal faults are usually located at the western hillslope and constitute the Neogene uplifted front of the ranges, where Quaternary deformation is concentrated. In general, block uplift has resulted in a gentle tilting to the east and formation of a classic asymmetrical topographic profile transverse to their N-S elongation, highlighted by the remnants of an erosional paleosurface. Recent studies have suggested that prehistoric earthquakes (Late Pleistocene-Holocene) related to these faults, which typically have long-term recurrence intervals, have been larger than once thought (Costa et al., 2006, and cites herein). In the first part of the trip, trenches performed in the western front of the **Sierras de Comechingones** reveal extensive Holocene reverse faulting. They are well suited for discussing the interactive nature of different processes and problems related to a Quaternary tectonic landscape. Morphotectonic characteristics of a 1st order range front will be discussed there. The history of planation surfaces of the Pampean Ranges will be presented in selected sites across the Altas Cumbres of the Sierra de Córdoba, including recent chronological data. Late Quaternary outcropping sequences of the piedmont area will be discussed (alluvial-aeolian sequences).

At the distal part of the foreland basin, expressions of the landscape of the **Pampa plain** can be analyzed from the point of view of the neotectonic activity and the dominant surficial processes. A representative area of the intraplate region, evidenced by the presence of regional N- S tectonic lineaments, will be crossed. Structural analyses and the identification of geomorphologic units and topographic features along the trip will allow describe the morphostructural domains of a key area of North Pampa (see the map below). The main components of the Late Quaternary in the plain are: alluvial megafans, loess-paleosol sequences, dune fields, wetlands and lacustrine sequences.

The **Quaternary tectonic depression occupied by the Mar Chiquita lake** and large shallow lakes aligned in the distal area of the Dulce alluvial fan will be visited. The surface information, also with that obtained by means the interpretation of data from research sedimentary cores, as well as geophysical data, will be discussed in the field. Key limnogeological advances on the Mar Chiquita (the largest lake in Argentina) will be presented. Paleolimnological records indicated that the 20th century hydrological variability was highlighted and amplified by distinctive fluctuations of lake levels, river discharges and surfaces of flooded low plains across the Pampas. Taken account that lake records can provide unique archives of both earthquakes and volcanic activity, the interaction between tectonics and limnogeology could be important there. The outcropping Late Quaternary pedosedimentary sequences of the southern margins of the lake will be discussed. The last part of the excursion will be dedicated to the analyses of the neotectonic influence on a representative sector of the plain. Lateral variations between wetlands facies and typical

loess deposits mark discontinuities which are correlated with the linear features and drainage disruptions observed in the flat landscape of Pampa. New geomorphological and sequential stratigraphical data of the Salado del Norte River valley will be presented. Finally, stops on the left elevated margin of the great fluvial valley of the **middle Paraná River** (the second river in the continent) and its **complex Holocene delta** will permit discuss neotectonics, sea level changes and climatic driven processes on the Late Quaternary environmental evolution of the region.



Targets and aims of the Field Course:

This field course provides training in geological field observation. The main task will be to stimulate multidisciplinary field discussions and to encompass all the different disciplines supplying data to the Quaternary research, the adaptation of common criteria for the use of all the information on the analyses of the landscape evolution and the application of new laboratory techniques. As the group is travelling, a series of evening talks will take place.

Objectives:

- (1) To bring together experts, PhD students, postdoctoral research fellows and young researchers from South America, thereby facilitating research training at the PhD level and to offer the opportunity for field demonstrations.
- (2) To enhance and to extend the integrated analysis of the role of the tectonics and the climatic changes on the landscape evolution of the region, especially for the target time spanning the last interglacial-glacial cycle. It will consider the Late Quaternary sedimentary archives in broader analysis of climate variability (geological proxy records).

- (3) To provide a methodological guide to reconstruct some specific terrestrial processes mainly from the resulting interdisciplinary discussions in situ.
- (4) To bring field active specialists together and interested in the Quaternary period and to allow young researchers with different backgrounds to meet (especially in the field), to interact and exchange data and interpretations and also discuss common and new methodological approaches for studying geological processes along a particular tectonic setting to advance on the stratigraphical (sequence stratigraphy and event stratigraphy), geomorphological, sedimentological, geochronological and paleoenvironmental assessment.
- (5) To discuss and interlink fluvial, deltaic, lacustrine, colluvial, aeolian and pedological records of the region, because of their value in registering comparatively rapid response to tectonic and climate influences.
- (6) To discuss dating techniques- numerical methods (radiocarbon, exposure dating with cosmogenic nuclides, OSL) and accessibility to international laboratories.

Some questions to discuss in the Field Course: Can we read the record of past tectonic and climatic events in the Late Quaternary landscape of the region? Can we interpret landforms or sedimentary sequences of such zones in terms of tectonic or climatic forcing? How much coupled are the landscape and stratigraphic responses to the Quaternary tectonic and climatic events? How far can we afford to distinguish between them or to favor any dominance?

Preliminary schedule of the Field Course:

Beginning of the excursion: 14 October (8:00 hs.), from Villa de Merlo (San Luis province).

DAY 1, 14 October: Western front of the Sierras de Comechingones revealing extensive reverse faulting and planation surfaces (Pampean Ranges) -San Luis and Córdoba provinces-

Stop 1: Trench performed in Merlo. Stop 2: Trench performed in Nono. Crossing of the Altas Cumbres (M.Clavero-Carlos Paz): planation surfaces (explanations on the bus and intermediate stops). Stop 3: Villa Carlos Paz section of the fault systems of the Sierras Chicas de Cordoba.

Overnight: Ciudad de Villa Carlos Paz.

DAY 2, 15 October: Eastern piedmont of the Pampean Ranges (Sierras de Córdoba) and tectonic depression of Mar Chiquita –Córdoba province-

Stop 4: Carnero River Profiles. Stop 5: Campo de Mare (field dunes of the SW coast of the Mar Chiquita lake). Stop 6: Profiles of the Laguna del Plata (SW coast of the Mar Chiquita Lake).

Overnight: Ciudad de Miramar.

DAY 3, 16 October: Tectonic depression of Mar Chiquita-Córdoba province-

Stop 7: Mar Chiquita lake and profiles of the S coast of the lake. Stop 8: J. Cortes. Profiles of the sunken block of the Tostado Selva fault. Stop 9: Segundo River profile.

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Overnight: Ciudad de Miramar.

DAY 4, 17 October: North Pampa -Tostado Selva fault scarp, San Guillermo elevated block and Rio Salado del Norte valley –Córdoba and Santa Fe provinces-

Stop 10: Altos de Chipi6n– trench in the Tostado Selva fault scarp. Stop 11: profiles of the Cañada Sunchales. Stop 12: Profiles of the Salado del Norte fluvial Valley. Stop 13: Río Salado del Norte profiles.
Overnight: Ciudad de Paraná.

DAY 5, 18 October: North Pampa – Left margin of the Paraná River valley –Entre Rios province-

Stop 14: Geomorphological view of the large Paraná fluvial valley. Parque Villa Urquiza de Paraná. Stop 15: Paraná River cliff in La Juanita area. Stop 16: Profiles of the Ensenada River mouth, Diamante. Stop 17 Profiles near the Ander Egg waterfall. Stop 18 (Rosario-Victoria bridge): view of the middle Holocene Paraná Delta landforms.

End of the excursion: 18 October (19:00 hs.), Ciudad de Rosario (Santa Fe province).

Language

The Field Course will be offered in Spanish. Individual support in English may be provided upon request.

Participation to the Field Course

Linkages with the framework of doctoral and post- doc programs of argentine universities is being sought in order to establish stronger roots with the engagement and training of young scientists. The Course is competitive and will be limited to a max. of 20 participants, due to logistic reasons.

Learning outcomes-evaluation

The Field Course will only be approved after personal participation in all field activities and all exercises and approval of a final test on the topics discussed in the course. Certificate of attendance for all participants and assessment qualifies for credits towards PhD.

Support application

Grants provided by the TERPRO Sam-GeoQuat Group for PhD students and early-career scientists (less than ten years after their PhD) from South American countries are available. Grant applicants are requested to submit a few lines of motivation and a Cv including also the list of publications.

Deadline for grant applications: 30 July, 2013.

Registration fee: the cost will be provided in the second circular (July, 2013)

The registration fee will include accommodation during the field excursion (room sharing), breakfast, lunch and dinner, excursion and teaching material. Transportation to Merlo (SL) and from Rosario (SF) will be not included. Payment conditions will be informed to the definitive participants.

Deadline for registration: 30 August, 2013. Registrations received after such date will be considered only if the maximum number of participants has not been completed.

Contact

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