Free Activity for Students

As part of SSAGI 2026, undergraduate and graduate students from Uruguay invite South American peers to a complimentary morning field trip along the Montevideo coast. Transportation from the symposium venue is provided. The excursion will be held on April 14 and 15, with 14 participants per day. Please register online by March 31.

FIELD GUIDE: Geology of the Punta Gorda Basement (Plaza Virgilio)

XIV South American Symposium on Isotope Geology

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GENERAL GEOLOGICAL FRAMEWORK

The geology of the Río de la Plata Craton in Uruguay, one of the oldest and most stable nuclei of the South American platform, is located in an intraplate setting on the passive margin of the South Atlantic. This craton consists of a complex mosaic of crustal blocks amalgamated during the Precambrian, whose deep architecture—largely covered by sedimentary cover—has been revealed through the integrated use of geological mapping, geophysics, geochronology, and high-resolution geochemistry (Basei et al., 2024; Peel et al., 2025, and references therein).

Within this framework, the Piedra Alta Terrane (Figure 1) represents the Paleoproterozoic core of the craton in southwestern Uruguay and records an orogenic cycle linked to the development and maturation of a magmatic arc system between ca. 2.20 and 2.05 Ga (Sánchez Bettucci et al., 2010; Basei et al., 2024). The integration of field, geochemical, and isotopic data documents the transition from a juvenile intra-oceanic arc to a mature continental arc with crustal thickening, accompanied by TTG-affinity magmatism, amphibolite-facies metamorphism, and the subsequent intrusion of late- to post-orogenic plutonic suites and mafic dyke swarms (Basei et al., 2024; Peel et al., 2025).

Recent geophysical results support this view of a rigid lithospheric block with an overthickened crust, with thicknesses of 38 to 41 km and physical properties consistent with a dominant granite-gneissic composition (Rodríguez Kacevas et al., 2024). The presence of high-velocity anomalies in the lower crust, interpreted as mafic underplating, directly links the deep evolution of the Piedra Alta Terrane to major Paleoproterozoic flare-up magmatic episodes and to subsequent mafic magmatism (Basei et al., 2024; Rodríguez Kacevas et al., 2024).

The coastal region of Montevideo (Figure 2) provides an exceptional window into this history, exposing a Paleoproterozoic orthogneissic basement, high-grade metavolcano-sedimentary belts, and Mesoproterozoic mafic and lamprophyric magmatism (Muzio et al., 2021 and references therein; Peel et al., 2025). These outcrops enable linking outcrop-scale observations with regional models of arc evolution, juvenile crustal growth, and structural reactivation, thereby constituting a natural laboratory for examining Precambrian rocks (Rapalini et al., 2013; Rodríguez Kacevas et al., 2024).

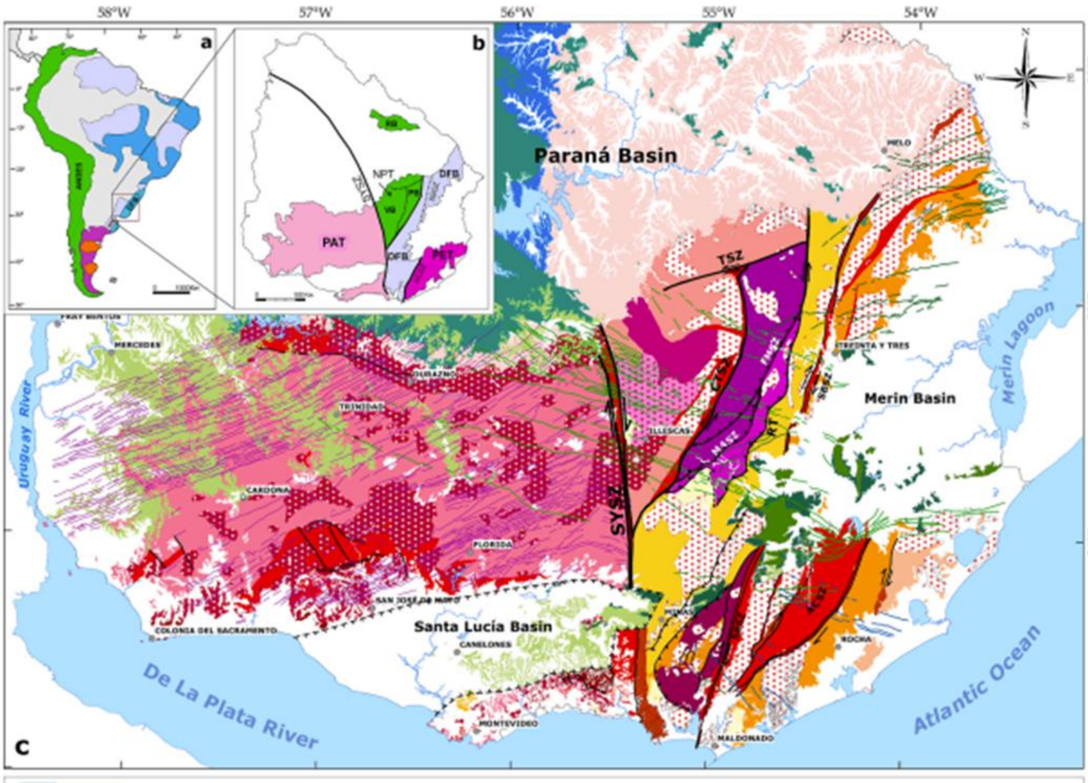

Figure 1. Simplified geological map of Uruguay showing the distribution of the main Precambrian terranes and metamorphic belts (including the Piedra Alta Terrane), from Sánchez Bettucci et al., 2021.

Figure 2. Location of the outcrops to be visited, Punta Gorda Coast. Each point marks a different lithology. (1) Orthogneisses. (2) Amphibolites. (3) Lamprophyre Dykes

1. Objectives

- The main objective of this field excursion is to examine in detail the Paleoproterozoic basement exposed at Punta Gorda (Plaza Virgilio) and to understand its role within the Southern Belt of the Piedra Alta Terrane, Río de la Plata Craton.

- Specific goals are: (i) to identify in the field the central lithological units (Punta Carretas orthogneisses, Montevideo Formation amphibolites, Mesoproterozoic lamprophyre dykes), (ii) to relate their petrological and structural features to the Transplatense (Trans-Amazonian) Orogenic Cycle, and (iii) to discuss the magmatic and tectonic evolution from a juvenile island arc to a mature continental arc and later extensional regimes.

2. Logistics

- The activity consists of a morning field trip along the coastal outcrops near Plaza Virgilio (Punta Gorda, Montevideo), and the transport is provided from and back to the SSAGI 2026 symposium venue. The field excursions will take place on April 14 and 15, and participants may choose to attend on either day.

3. Itinerary and Stops

- The excursion follows the coastal path at Punta Gorda, visiting three key outcrops that expose: (1) orthogneisses of the Punta Carretas unit, (2) amphibolites of the Montevideo Formation, and (3) Mesoproterozoic lamprophyre dykes.

- The approximate walking time between stops is 5–10 minutes, allowing time for detailed observation, sketching, and discussion at each site.

Stop 1: Orthogneiss Basement

-A fine- to medium-grained orthogneisses showing compositional banding defined by alternating felsic (quartz–feldspar) and mafic (biotite) layers, interpreted as part of the Punta Carretas orthogneiss suite.

- Discussion topics include: high-K calc-alkaline affinity, TTG-like geochemical signatures, U-Pb zircon ages of ~2.20 Ga, and positive εHf(t) values that indicate juvenile crustal growth during the Transplatense Orogenic Cycle.

Stop 2: Amphibolites of the Montevideo Formation

- Participants will observe tabular bodies and enclaves of fine- to medium-grained amphibolite, composed mainly of hornblende and plagioclase. Foliation is marked by amphibole alignment and sharp contacts with the surrounding orthogneiss.

Stop 3: Lamprophyre Dykes (Muzio et al., 2021)

- Subvertical melanocratic lamprophyre dykes cross-cutting both the orthogneisses and amphibolites, locally showing vesicles and amygdales that indicate shallow emplacement and significant prior exhumation of the basement.

4. Regional and Evolutionary Context

- The Punta Gorda section records the evolution from a juvenile island arc (amphibolite protolith) to a thickened mature continental arc (TTG-like orthogneiss protolith) during the Rhyacian (2.20–2.05 Ga), followed by collision, amphibolite-facies metamorphism, and development of an E–W structural trend.

- Later Mesoproterozoic lamprophyric magmatism (1.4 Ga, Muzio et al., 2021) reflects extensional conditions affecting the already stabilized and exhumed Río de la Plata Craton, providing a key snapshot of long-lived continental crustal evolution in southern Uruguay.

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