

EGU22-9325

<https://doi.org/10.5194/egusphere-egu22-9325>

EGU General Assembly 2022

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Geodiversity and Geoheritage of sandstone landscape: Cerro Colorado, Córdoba, Argentina

Gabriella Boretto^{1,2}, Marcela Cioccale¹, Sandra Gordillo³, Claudio Carignano^{1,4}, and Andrea Recalde⁵

¹Universidad Nacional de Córdoba, Facultad de Ciencias Exactas, Físicas y Naturales, Córdoba, Argentina

²Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Centro de investigaciones en Ciencias de la Tierra, (CICTERRA).

³Universidad Nacional de Córdoba. Facultad de Filosofía y Humanidades. Museo de Antropología, Córdoba, Argentina. Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICET). Instituto de Antropología de Córdoba (IDACOR), Argentina.

⁴Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Instituto de Estudios Avanzados en Ingeniería y Tecnología (IDIT).

⁵Universidad Nacional de Córdoba, Facultad de Filosofía y Humanidades, Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Instituto de Estudios Históricos/Centro de Estudios Históricos (IEH/CEH). Córdoba, Argentina.

The Cerro Colorado Cultural and Natural Reserve is located on the north-eastern slope of the Sierras Pampeanas, Córdoba mountain sector, Argentina (30° 05' S 63° 55' W). This locality is well known for the impressive archaeological legacy recorded in rock art, almost 4200 painted and engraved motifs preserved inside sandstone shelters, made from ca. 400 AD until the arrival of the Spanish conquerors in the XVI century. While previous research in the study area has focused mainly on archaeological sites, this work describes the sandstone landforms diversity. In this sense, some of the most geodiversity sceneries on Earth are supported by sandstones, solely or dominating over other rock types, and protected by different institutions as UNESCO. This study aims to characterize the geodiversity of Cerro Colorado by documenting the variety of sandstone morphologies and understanding their possible process origins within a global context. This contribution offers theoretical and applied knowledge that is of interest to different areas of environmental reconstruction and geoarchaeological research. The methodology includes 1) field survey and data collection, 2) sandstone landform inventory, 3) the estimation of the morphological component of geodiversity through the geomorphodiversity index (Gml). ALOS PALSAR DEM at 12.5 m spatial resolution was used as primary data. $Gml = S + A + Dv + Ch + Cv + TPI + TWI + TRI$; where, S: slope, A: aspect, Dv: deep valley, Ch: horizontal curvature, Cv: vertical curvature, TPI: topographic position index, TWI: topographic wetness index, TRI: topographic roughness index. The Gml was carried out on SAGAGIS through Rao's Q diversity index tool. The landforms are the results of the weathering and erosion processes caused by regional climate changes throughout the geological past (from the Mesozoic to the present day). The Gml considers five classes. The very low and low classes predominate in the study area (55%). The very low diversity refers to plains and eroded short sandstone hills connected with planation surfaces, pavement, and massive domes. The low range is associated with undulating and smooth

sandstone shapes. The medium class shows undulating surfaces and the transition to moderately-strong slopes (8-14°). The high diversity is characterized by the middle slopes (14-20°), dominated by cavernous forms as tafoni and caves carved on the cliffs and standing out the presence of tors and rock balance. The very high class comprises steep slopes and deep valleys related to the highest sandstone heights (880 m.a.s.l.). The shelters (high class) contain native rock art paintings which conservation requires geomorphological knowledge to prevent degradation. The sandstone geodiversity of Cerro Colorado is one of the most attractive assets of the central Argentina region. Moreover, taking into account the pre-Hispanic archaeological legacy, this site presents a unique geomorphological and cultural heritage. Hence, the reserve needs special attention for geotourism promotion, scientific and educational uses, world heritage. This contribution allows (i) bridging the relationship between human interaction and sandstone landscapes which research line has not been developed yet for the study area, and (ii) considered an integrated management plan for geocultural conservation.