Geochronology (U-Pb, Ar/Ar, AFT, ^{10}Be) of Terre Adélie - insights for the geological history of East Antarctica

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In this contribution, we synthesize recent geological works undertaken on Terre Adélie during the GEOLETA and ArLita programs. The Terre Adélie Craton displays a long geological history emphasized by 2 high grade metamorphic events during the Neoarchean (2.6-2.4 Ga, M1) and Paleo-Mesoproterozoic (1.7-1.5 Ga, M2). Some greenschist facies sheared metagranites found as moraine boulders document an early, possibly collisional, greenschist facies metamorphism, located in the interior of Terre Adélie. This greenschist event has been dated by in-situ U-Pb on titanite at 1745 ± 7 Ma for the first time in 2021. The trace of this event can be evidenced in the core of zircons dated in the Dumont D'Urville Basin. At the scale of the Mawson continent, this event is related to (1) a possible block accretion and/or growth of an active margin above an oblique subduction zone since 1.75 Ga until 1.6 Ga, followed by (2) a large-scale hot-spot event responsible for the permanence of high-grade metamorphism (700-800°C) along the Terre Adélie Coast at 1.6-1.5 Ga. This deep crustal evolution is followed by a marked erosion during the Late Palaeozoic Ice Age, recorded by Apatite Fission Track thermochronology. These data show cooling of the Proterozoic Terre Adélie Craton below ~120°C between 350 and 300 Ma, suggesting >4 km temperate glacial erosion. This evolution is ascribed to a dynamic erosion of glaciers in this time range while the south pole was in a similar position as today.

Afterwards, a null erosion occurred in the Mesozoic and less than 2 km erosion is recorded during the major glaciation of the Cenozoic. Finally, the Quaternary history is recorded by cosmogenic dating of moraine boulders. Based on glacial flux maps, the origin of the boulders may be located ~400 km upstream. ^{10}Be datings of boulders cluster within the last 30 ka. Cosmogenic ages from the Lacroix Nunatak suggest a main deglaciation after the Younger Dryas at ca. 10 ka, while those of Cape Prud'homme mostly cluster at 0.6 ka, in agreement with an exhumation of boulders during the Little Ice Age.

Mots-Clés : Subglacial incision, deglaciation, exhumation, U-Pb and Ar-Ar dating, Fission-Track dating, Cosmogenic Nuclide dating.

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