Tracing meteorite terrestrial weathering effects on rare earth elements (REEs) distribution: implications for meteorite weathering related to climate

H. POURKHORSANDI[1,2], M. D'ORAZIO[3], P. ROCHETTE[1], M. VALENZUELA[4], V. DEBAILLE[2], J. GATTACCECA[1]

[1]AMU/CNRS, CEREGE, Aix-en-Provence, France (hamed.pourkhorsandi@ulb.ac.be). [2]Laboratoire G-TIME, ULB, Brussels, Belgium. [3]Dipartimento di Scienze della Terra, Università di Pisa, Pisa Italy. [4]Servicio Nacional de Geología y Minería, Santiago, Chile

Following their fall to Earth, meteorites experience weathering. During this process, their mineralogy and chemical composition can be deeply modified [1]. In this study, we focus on REE modifications, owing to their importance in studying meteorite petrogenesis and provenance. Our goal is to observe the effects of weathering on REE composition of the most common meteorite types, the ordinary chondrites (OCs). Meteorites from Atacama (Chile) and Lut (Iran) deserts were selected. Microscopic observations to study the alteration mineralogy were conducted. Then, the REE concentrations and Nd isotope compositions of the samples were measured using ICP-MS and MC-ICP-MS.

Our data show the modification of REE distribution during weathering [2]. LREE/HREE ratio is typically higher than one and most of the desert meteorites show elevated ∑REE contents. Despite being heavily weathered at the microscopic scale, meteorites from Lut have less modified REE compositions than those of the moderately weathered meteorites from Atacama. Higher REE modification in the Atacama OCs than those from the Lut desert is interpreted as the longer interaction of Atacama meteorites with the terrestrial environment in a drier climate. Hydrated secondary mineralogy actually prevents the progression of alteration inwards because of higher volume, hence acting as a barrier. An important outcome of this study is that even "fresh-looking" meteorites can be chemically altered character [2]. We will also discuss the implications of terrestrial weathering on the Nd isotope systematic in those samples. These samples are being used in cosmochemical studies and a special care should be taken into account while working with them.

References: [1] Al-Khatiri *et al.* (2005) *MAPS* **1239**:1215–1239. [2] Pourkhorsandi *et al.* (2017) *MAPS* **52**:1843–1858.