



**HAL**  
open science

## Silicium isotopes as a proxy of weathering processes during the PETM

Setareh Rad, Isabelle Basile-Doelsch, Florence Quesnel, Christian Dupuis

► **To cite this version:**

Setareh Rad, Isabelle Basile-Doelsch, Florence Quesnel, Christian Dupuis. Silicium isotopes as a proxy of weathering processes during the PETM. Goldschmidt Conference 2009: CXchallenges to our volatile planet, Jun 2009, Davos, Switzerland. pp.A1066. hal-00740723

**HAL Id: hal-00740723**

**<https://hal-brgm.archives-ouvertes.fr/hal-00740723>**

Submitted on 10 Oct 2012

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## Silicium isotopes as a proxy of weathering processes during the PETM

SÉTAREH RAD<sup>1</sup>, ISABELLE BASILE-DOELSCH<sup>2</sup>,  
FLORENCE QUESNEL<sup>1</sup> AND CHRISTIAN DUPUIS<sup>3</sup>

<sup>1</sup>BRGM, 3 avenue Claude-Guillemin, 45060 Orléans Cedex 2,  
France (s.rad@brgm.fr, f.quesnel@brgm.fr)

<sup>2</sup>UPCAM, CEREGE, Europôle de l'Arbois, 13545, Aix en  
Provence Cedex 4, France (basile@cerege.fr)

<sup>3</sup>Géologie GFA, Faculté Polytechnique, rue de Houdain 9,  
7000 – Mons, Belgium (Christian.Dupuis@fpms.ac.be)

The end of the Paleocene epoch (55.5 Ma) was marked by an abrupt episode of global warming ("Palaeocene/Eocene Thermal Maximum"; PETM) coincident with a large perturbation to the global carbon cycle. Because the PETM might represent an analogue in the past of the present anthropogenic accelerated emission of greenhouse gases, it has attracted a good deal of interest with both data collecting and modeling efforts. Most of the studies focused on ocean records through sediments, we propose here one of the first study on continental records during the PETM. We focus our study on silcretes sampled in north of France, rocks present on the Paleocene-Eocene boundary and on the silicification formed in the porosity during weathering processes.

Stable isotopes of Si have been used as proxies for understanding the Si cycle and its variations in the past. Here we analyzed silicon isotopes of in situ quartz using a new-generation secondary ion mass spectrometry apparatus. Secondary phases as overgrowths on primary detrital quartz and microcrystals of quartz have been measured. Our results are very unexpected: although detrital quartz present same values than in other silcretes, secondary phases present very homogenous signatures far from very negative values that can be reached (-8‰ in [1, 2]). It seems that the origin of silicium is not local as both primary and secondary phases are within the same range. The isotopic fractionation link to the dissolution/precipitation phase during weathering processes is -1.5‰. The lack of a strongly <sup>30</sup>Si-depleted reservoir with negative isotopic values seem to show a low intensity of alteration during the PETM in continental context.

[1] Basile-Doelsch *et al.* (2005) *Nature* **433**, 399–402.

[2] Basile-Doelsch (2006) *Journal of Geochemical Exploration* **88**, 252-256.

## Dissolved iron isotopes in the Southern and Equatorial Pacific Oceans

A. RADIC<sup>1\*</sup>, F. LACAN<sup>1</sup>, C. JEANDEL<sup>1</sup>, F. POITRASSON<sup>2</sup>  
AND G. SARTHOU<sup>3</sup>

<sup>1</sup>LEGOS (CNRS/UPS/IRD/CNES), Observatoire Midi  
Pyrénées, F-31400, Toulouse, France

(\*correspondence: Amandine.Radic@legos.obs-mip.fr)

<sup>2</sup>LMTG (CNRS/IRD/UPS), Observatoire Midi Pyrénées,  
F-31400, Toulouse, France

<sup>3</sup>LEMAR (CNRS/IRD/UBO), Institut Universitaire Européen  
de la Mer, F-29280, Plouzané, France

Iron is a fundamental element linking ocean biogeochemistry and climate. Iron isotopes are a very promising tool for the study of the iron oceanic cycle, notably for tracing its sources to the ocean and for studying its speciation.

Several studies reports iron isotopic data in the marine environment (plankton tows, pore waters, aerosols, seafloor or marginal seas [1-3]). To link these isotopic data together and to fully study the iron isotope marine cycle, we need to document the central reservoir in the marine environment: dissolved iron in seawater.

So far there are only very few available data of dissolved iron isotopic composition in the open ocean [4]. This work will present the first isotopic data of dissolved iron from full depth profiles in the Equatorial Pacific Ocean (EUCFe 2006) and in the Atlantic sector of the Southern Ocean (Bonus-GoodHope 2008), as well as from the Kerguelen Area (Southern Ocean, KEOPS 2005).

These results will be discussed in terms of iron sources to ocean. Potential applications of this new tracer for studying internal oceanic processes, such as biological uptake, will be discussed.

[1] Bergquist & Boyle (2006) *EPSL* **248**, 1-2 54-68.

[2] Severmann *et al.* (2006) *GCA* **70**, 8 2006-2022. [3] De

Jong *et al.* (2007) *Analytica Chimica Acta* **589**, 1 105-119. [4]

Lacan *et al.* (2008) *Geophys. Res. Lett.* **35**, 24 L24610.