Compound-specific $\delta^{18}O$ of triterpenols: rationale, first results and issues

JÉRÉMY JACOB[1], THIERRY BARIAC[2], CHRISTINE FLÉHOC[3], MICHAEL ZECH[4], CLAUDE LE MILBEAU[1], AMAËLLE LANDAIS[5], EMILIE DESTANDAU[6]

[1] ISTO, UMR 7327 du CNRS/INSU, Université d'Orléans, BRGM, Orléans, France

[2] IEES Paris, UMR 7618 UPMC-CNRS-INRA-IRD-Paris 7-UPEC, Paris, France

[3] Bureau de Recherches Géologiques et Minières (BRGM)

[4] Institute of Geography, Technical University of Dresden, Germany

[5] LSCE, Université de Versailles Saint-Quentin, CEA-CNRS, Gif-sur-Yvette, France

[6] ICOA, UMR 7311 du CNRS, Université d'Orléans, Orléans, France

The D^{18}OLE project aims at developing the determination of $\delta^{18}O$ values of triterpenols in order to reconstruct past atmospheric O_2 (O_{2atm}) $\delta^{18}O$ values and evaluate changes in the Dole Effect over the Cenozoic. Cultivation of *Panicum miliaceum* with varying H_2O and CO_2 $\delta^{18}O$ values showed that oxygen in miliacin, a C3-oxygenated pentacyclic triterpene, derives from respired O_2, in agreement with biogeochemical observations and consistant with modeled isotope fractionation factor. $\delta^{18}O$ values of triterpenols preserved in the fossil record should thus allow estimating the long-term evolution of O_{2atm} $\delta_{18}O$ values.

The first challenge consists in affording a robust determination of sterols and triterpenols $\delta^{18}O$ values by GC-Py-irMS. The low O/C ratio for these compounds constitutes an analytical challenge. First results acquired on miliacin and friedelin display large peaks by gas chromatography, preventing acceptable reproducibility. A second issue is the current lack of international lipids standards with known $\delta^{18}O$ values.

The fractionation factor between O_{2atm} and O in triterpenols will be determined by cultivating vascular plants and algae under controlled atmosphere with known O_2 $\delta^{18}O$ values. Finally, $\delta^{18}O$ values of triterpenols will be determined in a set of lignites and lacustrine sediments that cover two major climatic crisis of the Cenozoic : the Paleocene-Eocene Thermal Maximum and the Eocene/Oligcene boundary.