



## **Climatic and tectonic controls on lacustrine microbial and metazoan buildups from the Oligo-Miocene Limagne Basin (Massif Central, France)**

Adeline Roche (1), Emmanuelle Vennin (1), Anthony Bouton (1,2), Nicolas Olivier (3), Irina Bundeleva (1), Aurélien Virgone (2), Aurélie Watinne (4), Jean-François Deconinck (1), Eric C. Gaucher (2), and Pieter T. Visscher (5)

(1) University of Bourgogne Franche-Comté, Biogéosciences, France (adeline.roche@u-bourgogne.fr), (2) TOTAL, Centre Scientifique et Technique Jean Féger, France, (3) University of Blaise Pascal, Clermont-Ferrand, Laboratoire Magmas et Volcans, France, (4) AREVA R&D Paris, France, (5) University of Connecticut, Department of Marine Sciences, United States

The Oligo-Miocene lacustrine deposits from the Limagne Basin display noteworthy microbial and metazoan buildups associated with carbonate and siliciclastic sediments. They form an appropriate analogue for understanding the lacustrine hydrocarbon reservoir systems, especially microbial-dominated lakes in general. In addition, the Limagne Basin related to extensive system shares numerous geodynamical and sedimentological characteristics with Cretaceous “pre-salt” deposits (e.g. normal fault system framework and volcanic activity).

The highly diversified and abundant lacustrine microbial and metazoan buildups display five main macrofabrics (flat, cauliflower, dome, cone and column) ranging from several cm up to several meters. They are mainly composed of microbial structures associated in the largest ones with caddisfly pupal cases. The study of Chattian (Oligocene) and Aquitanian (Miocene) deposits led to propose two depositional models corresponding both to low-gradient margins. Buildups are included in the same sedimentary cycle evolving from lacustrine to palustrine deposits. The lacustrine deposits indicate a rise of the lake-level related to humid conditions, while the palustrine deposits testify of a drop-off of lake level related to arid conditions. Differences of lacustrine/palustrine ratio are consistent with global climatic conditions prevailing during the Chattian and Aquitanian periods. However, thickness of the cycles changes throughout the Chattian to Aquitanian; the Chattian cycles being thinner than the Aquitanian ones. In addition, the physiography of the lake controls the carbonate/siliciclastic ratio of each humid part of cycles by successive weathering of carbonate and marly palustrine deposits in different gradient margin. The difference of thickness between the Chattian and Aquitanian cycles is attributed to differences of accommodation, low for the Chattian and high for Aquitanian cycles. These changes in accommodation may result from a local subsidence consistent with a northward tilting of the Limagne Basin at the Oligo-Miocene transition. This tectonic control is revealed by a non-random distribution of microbial and metazoan buildups throughout the Limagne Basin. They are mainly aligned along the main faults and on the paleo-high. In addition, incipient volcanic activity may impact on the chemistry of the lake promoting or inhibiting the development of microbial activity and their potential preservation.