
Oligocene volcanism contemporaneous with the lacustrine deposits of the Limagnes (France) based on U/Pb dating and sedimentological data

Lawnizack Guillaume^{*1}, Pierre Pellenard¹, Emmanuelle Vennin¹, Valérie Bosse², and Nicolas Olivier²

¹Biogéosciences, UMR 6282 CNRS, Université Bourgogne Europe – UMR 6282 Biogéosciences – France

²Laboratoire Magmas et Volcans – Institut de Recherche pour le Développement, Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique, Université Clermont Auvergne, Observatoire de Physique du Globe de Clermont-Ferrand – France

Résumé

Lacustrine deposits of the Limagne Basin (Massif Central, France) are composed of a succession of marls, evaporites, microbial carbonates, interbedded clay horizons, and carbonates horizons, thought to span from the late Eocene to the Miocene.

However, the chronostratigraphy of the basin remains poorly defined, and the influence of volcanic activity on sedimentation, diagenesis, and biogeochemistry has yet to be fully considered. Volcanic inputs may have significantly influenced microbial ecosystems, which were particularly active in this region during the Oligocene and Miocene periods. Volcanic episodes were linked to Miocene deposits but a comprehensive assessment of the spatial and temporal variability of volcanic activity across the basin is still lacking.

New field data from the Cournon section, located near Clermont-Ferrand, completed by petrography, mineralogy and U/Pb dating, provide valuable insights into relationship between volcanism, lacustrine sedimentary dynamic, and microbial activity. Here, we demonstrate that the volcanic activity was contemporaneous with Oligocene deposits, based on sedimentologic observations and U–Pb LA-ICP-MS dating. This temporal relationship is supported by a new age of 23.89 ± 0.31 Ma obtained from volcanoclastic deposits that unconformably and erosively overlie lacustrine carbonates. This implies that lacustrine sedimentation was impacted by subaerial phreatomagmatic volcanism and that volcanic deposits recognized at Cournon, and likely in some other place in the Limagne Basin, cannot be considered as later Miocene intrusive magmatism in the basin.

Singular clay horizons are also identified in the Cournon lacustrine carbonate deposits and are characterised by pure illite. Since the main clay components are smectites likely of detrital origin, we propose that the authigenic illite horizons may have formed during the early diagenesis through microbially induced processes and potassium enrichment. This also opens the possibility of dating the lacustrine sedimentation. Initial attempts to date these illitic horizons using the *in situ* LA-ICP-MS Rb-Sr method were unsuccessful while K/Ar and Ar/Ar dating efforts are currently ongoing.

U/Pb ages on zircons from volcanoclastic material provide thus new temporal calibration in

*Intervenant

the Limagne basin. Such data will offer new insights into the role of volcanism in lacustrine environments favourable to microbial processes and during significant episodes of climatic change.

Mots-Clés: Palaeoenvironment, lacustrine records, Limagne basins, volcano, sedimentary deposits, Massif Central volcanism