



HAL
open science

Study of two carbonate seepages from lower to upper miocene Hikurangi active margin (New Zealand, North Island)

Renaud Toullec, Julien Bailleul, Vincent Caron, Geoffroy Mahieux, Franck Chanier, Sébastien Potel

► To cite this version:

Renaud Toullec, Julien Bailleul, Vincent Caron, Geoffroy Mahieux, Franck Chanier, et al.. Study of two carbonate seepages from lower to upper miocene Hikurangi active margin (New Zealand, North Island). 36th IAS Meeting of Sedimentology, Croatian Geological Society (HGD) and International Association of Sedimentologists (IAS), Jun 2023, Dubrovnik, Croatia. hal-04292476

HAL Id: hal-04292476

<https://hal.science/hal-04292476v1>

Submitted on 21 Nov 2023

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.

STUDY OF TWO CARBONATE SEEPAGES FROM LOWER TO UPPER MIOCENE HIKURANGI ACTIVE MARGIN (NEW ZEALAND, NORTH ISLAND)

Renaud Toullec¹, Julien Bailleul¹, Vincent Caron², Geoffroy Mahieux², Franck Chanier³, Sébastien Potel¹, ¹B2R Geosciences Dpt - U2R 7511, UniLaSalle, 19 rue Pierre Waguet F-60000 Beauvais, France, ²B2R Geosciences Dpt - University of Picardie Jules Verne, 33 rue St Leu, 80039 Cedex Amiens, France, ³LOG, UMR 8187, University of Lille I, Bâtiment SN5, Cité Scientifique, Avenue Paul Langevin, 59655 Villeneuve D'Ascq cedex, France
renaud.toullec@unilasalle.fr

The study focuses on the analysis of tubular carbonate concretions outcropping in two areas in the New-Zealand Hikurangi active margin: the Akitio syncline and Cape Turnagain. This work intends to enlighten the role of pipes involved in fluids circulation and to compare them from two former basins having evolved from lower/middle Miocene (Akitio) and upper Miocene (Cape Turnagain). In both cases, the host rock is composed of very fine-grained muddy sediments (calcareous mudstones) containing a lot of framboidal pyrites, quartz, feldspar and very few and poorly diversified fauna indicating paleoenvironmental stressed depositional settings. Concerning the tubes themselves, they differ drastically on a morphological point of view: They are cylindrical and very large in Cape Turnagain, whereas they are rugose and far smaller in Akitio. In the Akitio syncline, the biggest tubes are characterized by a lot of late cross-cutting fracturation and brecciation stages, filled by softly deformed monomict fluidized muds. More-over, association of framboidal pyrite, authigenic quartz and bitumen lining was observed in pre-fracturation/pre-injection sequence. In the case of Cape Turnagain, diagenesis sequence is highlighted by complex dissolution/cementation stages (early calcite/dolomite cementation, framboidal pyrite, aragonitic crust). Neither late fluidized infills were observed nor late fracturing. 80 stable isotope ($\delta^{18}O/\delta^{13}C$) analysis were carried on micro-samples. All these data are completed by cathodoluminescence analysis associated to major and minor chemical analysis (SEM/EDS elemental measurements) In Akitio basin, two main origins of carbonate cements and mud infilling were revealed: anaerobic oxidation of microbial CH₄ and temperature increasing in the later stages. The building of tube framework took place in early reducing environment followed by later infilling of the tubes, using the pre-existing "plumbing system". In Cape-Turnagain, early dissociation of gas hydrates below the sea floor and reduction of CO₂ as a by-product of methanogenesis are involved (Nyman, 2009). Finally, tube formation differs strongly between these two areas: they were both differently early built and they moreover experienced hotter late fluid circulation in Akitio than those of Cape-Turnagain

Key words: carbonates pipe, stable isotopes, Akitio basin, Cape Turnagain, New Zealand