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► **To cite this version:**

Pierre Malie, Julien Bailleul, Frank Chanier, Sébastien Potel, Geoffroy Mahieux, et al.. Intervenant-Fossil plumbing system of oil and gas hydrocarbon seepage -impact on the shallow fluid migration system of the Hikurangi prim (North Island, New Zealand). 26e Réunion des Sciences de la Terre, SGF, Oct 2018, Lille (France), France. hal-04297213

HAL Id: hal-04297213

<https://hal.science/hal-04297213v1>

Submitted on 21 Nov 2023

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*Intervenant Fossil plumbing system of oil and gas hydrocarbon seepage – impact on the shallow fluid migration system of the Hikurangi prism (North Island, New Zealand)

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Cold seeps display a unique pathway of material transfer by migration of liquids, gases and sediments through the surface. To describe such fluid circulation systems three major elements, have to be considered: (1) the hydrocarbon formation in depth, (2) the plumbing system and (3) the seepage system. Fossil hydrocarbon seeps can be recognized by the identification of seep carbonates, or of their cemented plumbing systems known as fossil conduits of paleo-fluids. Previous work on numerous tubular carbonate concretions, outcropping in the uplifted onshore Hikurangi prism (eastern North Island of New Zealand), has demonstrated that they correspond to the shallow subsurface plumbing systems of paleoseeps. Early to Middle Miocene syn-subduction mudrocks in the Wairarapa Area, display some of these tubular carbonate concretions formed in a Miocene trench slope basin of the Hikurangi active margin. Our mapping and structural analysis indicate that a strong relationship exists between the principal tectonic fabrics and the occurrence of those tubular concretions. New structural and petrographic observations of the Middle Miocene paleoplumbing system demonstrate for the first time the presence of migrated solid bitumen within the tubular carbonate concretions and also in some of the major fault planes at the basin edge (e.g. Breakdown Fault zone). A multi-proxy approach was performed from some source rocks samples, from fault planes, and from tubular carbonate concretions and their host rocks to determine the organic matter maturity (organic petrography, Rock-Eval pyrolysis, vitrinite reflectance (VR) Rr% and solid bitumen reflectance (BR) Rr% (Rr: random reflectance). The main potential source rock of the basin, the Waipawa Formation (Late Paleocene black shales), appears to be thermally mature (VR = 0.8 to 0.9 Rr%) in the south of the study area and generated hydrocarbons. The occurrence of the Breakdown Fault zone filled by solid bitumen directly beneath the tubular carbonate concretions (BR = 0.68 Rr%) suggests that the hydrocarbons were sourced from deep within the subduction wedge, migrating upward along and/or beneath the fault toward a hydrate system associated with the development of the concretions.

Mots-Clés: Cold seep plumbing system, tubular carbonate concretions, New Zealand

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