New evidences for H_2-rich gas seepages in New-Caledonia

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The results of a recent study complete previous works made on natural hydrogen in the ophiolitic nappes of New-Caledonia. Gas seepages are present in various places and they are associated to the deposition of carbonate deposits. The gases are H_2-N_2-CH_4 mixtures seeping into ultrabasic spring water (pH ~ 10-11; temperatures between 30 and 40°C). This type of gases shows H_2 contents between 12 and 34%, N_2 between 50 and 80%, and CH_4 between 9 and 18%. Close to the sole thrust of the ophiolites, the H_2 contents decease and the N_2 contents increase. The isotopic values of H_2 and CH_4 correspond to classical values in high pH springs in ophiolitic massifs. The origin proposed to explain these emanations of H_2 is a process of oxidation of Fe(II) present in the ophiolitic rocks and reduction of the water present in the fractures system of the ophiolites. The methane, due to high C1/C2 ratios (between 5000 and 13000), is interpreted as the result of methanogenesis by reaction between H_2 and inorganic carbon present in subsurface. $\delta^{13}C$ of CH_4 is a little higher compared to classical microbial gas and it is in accordance with those obtained in natural H_2-rich gas seepages in the Oman ophiolite. H_2 measurements using detectors made in lateritic soils (perforations ~ 1m) showed low levels of H_2 concentration. An autoclave experiment was made, in which 5 g of laterites were mixed with 150 ml of neutral water, with argon and hydrogen at constant pressure and temperature (temperature of 80°C). In this experiment, the laterite powder was kept in contact with water and argon by a stirrer. The results of this experiment suggest a mineral consumption of H_2 which, in addition to a probable microbial consumption of H_2, could also explain the absence of H_2 in the lateritic shallow layers, even though H_2 is probably regionally generated at depth.