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Mineral, gases and organic signature of hydrothermal fluids issued from ultramafics on the Mid-Atlantic Ridge

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Fluids issued from serpentinized peridotites outcropping on the slow-speading mid-Atlantic ridge (MAR)are proved to be controlled by phase-separation and seawater-rock interaction. They are very enriched in Fe, H2, CH4 and heavier hydrocarbons compared to fluids issued from basalt-hosted sites. Abiogenic methane found in hydrothermal fluids support the occurrence of an abiogenic source of hydrocarbons. They are formed by the reduction of CO2 occurring during magma cooling and more commonly during seawater-mantle exchanges involving Fischer-Tropsch Type reactions and the serpentinization of ultramafic rocks. In these fluids, the progressive isotopic trends for the series C1–C4 alkanes are very useful to discriminate thermogenic hydrocarbons and hydrocarbon formation occurring by way of polymerization of methane precursors. During recent cruises on the MAR, SPME (Solid Phase Micro-Extraction) and SBSE (Stir-Bar Sorptive Extraction) extraction techniques were used on board for organic recovery. The analysis was performed on shore by direct GC/MS or by Thermo-Desorption/GC/MS. The hydration of olivine and pyroxen minerals with conversion of Fe(II) to Fe(III) in magnetite during serpentinization leads to production of H_2 and conversion of dissolved CO_2 to reduced-C species including methane, ethane, propane. In addition heavier straight chain hydrocarbons, aromatics, and cyclic compounds are identified. These compounds may be generated in ultramafic rocks through catalytic reactions (Fischer-Tropsch type reactions), but a biogenic input cannot be excluded,, as deduced from the preliminary isotopic mea-

surements by Gas-Chromatography Isotope-Ratio Mass-Spectrometry (GC-IR-MS). Abiogenic organic compounds may be produced from crystalline basement, from volcanic structures, from riftogenic zones and probably from sedimented margins.