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Pore water and hydrocarbon gas chemistry of mud mounds from the Pen Duick area, El Arraiche mud volcano field, Gulf of Cadiz, NE Atlantic

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The El Arraiche mud volcano field is composed by mud volcanoes (MVs) grouped in the vicinity of the sub-parallel Vernadsky and Renard seafloor ridges (Van Rensbergen et al., 2005). These ridges are confined by abrupt fault escarpments, where the Pen Duick escarpment is the one forming the SW flank of the Renard ridge (Van Rensbergen et al., 2005). The Pen Duick escarpment is topped by numerous topographic elevations or mounds at maximum 50 m in height. Some of them are sited on the flanks of MVs, assuming that the origin of these elevations is somehow linked to migrated hydrocarbon fluids from the seafloor subsurface. Previous campaigns within the Pen Duick area revealed that a number of the mounds are covered by seep carbonates similar to those found on the top of diapir ridges within the gulf (Somoza et al., 2002). This supports the notion that methane potentially could contribute to the mound formation scenario. On the other hand, the presence of mainly dead and lifeless cols water corals, colonization of ahermatypic cold water corals and diverse biogenic debris suggests that local currents, tides, internal waves, resuspension and thus transport of nutrients are likely key factors inducing the mound formation and development of coral colonies or *vise versa* (Freiwald et al., 2002). This paper discusses current fluid dynamics in the subsurface of two alongside sited mounds found at the NW slope of the Gimini MV. Vertical distribution profiles of sulfate, sulfide, chlorinity, DIC in

combination with hydrocarbon gas data indicate that the chemistry of subsurface fluids within these flanking mounds is different than that in mud breccias of the active Ginsburg MV from the adjoining MV area. The results of pore water and hydrocarbon gas measurements point toward local and sharp changes in the sediment biogeochemistry within both mounds that most likely dictated by the heterogeneous distribution of migrating fluids in the subsurface. This results in the development of exclusive small-scale metabolic ecological niches of diverse microbes within the studied sediments. Methane-related microbial activity was detected only below the 1.5 m depth interval, indicating relatively low methane fluxes and methane consumption before it can reach the seafloor surface, which is consistent with previous reported data from other MVs in the gulf (Stadnitskaia et al., 2006, 2008 in press).

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