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Interactions between living benthic foraminifera and methane seeps in the Adriatic Sea

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Benthic foraminifera represent one of the most useful tools for paleoenvironmental and paleoceanographic study, and for this reason investigators have also begun to explore the ecological role of these protists in hydrocarbon-based environments. Although some findings have been obtained worldwide, they are partially, conflicting. Live (Rose Bengal stained, protoplasm-full) and dead (empty tests) benthic foraminifera of surface sediments from a site characterized by methane release and a methane free-site in the northern Adriatic sea were analysed to decipher a potential influence of methane on the foraminiferal distribution and stable carbon isotopic composition of foraminiferal tests ($>63\mu$m). Because large shifts in stable isotopic composition of benthic foraminiferal carbonate tests as indicators of methane release are still controversial, in this study sediment, water, carbonate rock, and gas samples were collected in a gas emission point by divers (26 m water depth). Results obtained from the study suggest that there is an effect of methane on the foraminiferal distribution. In sample associated with active seepage *Brizalina catanensis* and *B. dilatata* are the most abundant stained species. Despite the low oxygen and high sulphide content, density of living foraminifera is higher in samples related to seepage activity than in control site. The mean carbon isotopic values of living benthic foraminifera in seep samples from any group of those analysed are not significantly lighter than those expected in the methane-free site. Carbon isotopic values (relative to PDB) measured in *Bolivina* spp. show the same trend both in seep (-1.49 per mil protoplasm-full test) and seep-free sample (-1.47 per mil protoplasm-full test). These differences can be explained in terms of carbon isotopic composition of the pore water. On the contrary, the difference in carbon isotopic values of empty tests in seep (-1.33 per mil and seep-free sample (1.87 per mil can be interpreted as indicative of a potential evidence for

an authigenic influence on the recorded δ^{13}C composition. The overprinting of the original isotopic composition of foraminifera, produced by overgrowth and/or recrystallization during dyagenesis, can influence the extreme ^{13}C depletion observed in fossil foraminifera recovered from sites of active methane discharge.