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Fluid pathways to venting sites in the Sea of Marmara

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The main Marmara Fault exhibits numerous sites of fluid venting, observed during previous cruises with towed camera (Patzold et al. 2001) and in particular with ROV during MARMARASCARPS (2002, Armijo et al. 2005), where methane seepages, chimneys expelling water, and carbonate crusts were observed along the seafloor fault trace. Acoustic evidence of gas plumes in the sediments near the fault zone was displayed on 3,5kHz profiles. Several long CALYPSO cores were recovered near active vents and at reference sites during the MARMARA VT cruise (2004). Most cores displayed gas related expansion, most intense for cores taken within the gas plumes. Pore fluids were extracted on board. Electrical conductivity, gamma-ray porosimetry and magnetic susceptibility measurements were also obtained.

We compiled video observations from MARMARASCARPS cruise and show that all known seeps occur in relationship with strike-slip fault, providing pathways for fluid migration. Many fault segments have no or very limited cold seep activity, suggesting very focused flow. Among the main active sites, a distinction is made between gas seeps and water seeps. At gas seeps, bubble emissions at the seafloor, triggered while coring with the ROV, demonstrate the presence of free methane gas at a shallow depth within the sediment. No evidence of spontaneous bubbling within the water column was recorded yet. On the other hand, authigenic carbonate chimneys characterize the water seeps and visible water outflow was observed at two sites (in the Tekirdag and Central basins). This may relate with the paleoceanography of the Sea of Marmara (Cagatay et al. 2000). The transition from lacustrine (or brakish) to marine conditions near the end of the last glaciation causes a salinity gradient in the sediment (between 5 and 40 m deep), which may trigger buoyancy driven convection if high permeabil-

ity conduits are present. The chimneys in the Tekirdag basin are associated with the interplay of a N80˚-striking fault scarp and N65˚-striking riedel shears, where voids may form. Moreover, this site is located at the outlet of a canyon feeding a buried fan with coarse sandy turbidites in the lacustrine sequence. Pore fluid composition profiles indicate that the sand layers channel brackish pore fluid laterally. This suggests water seeps correspond to local flow cells from the basin into the fault zone. A contribution from a deeper source cannot be excluded and still need to be examined for gas seeps and gas charging of the sand layers.

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