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Gas-bearing sediments response to earthquakes: insights from continuous pore pressure readings on a mud volcano near the Main Marmara Fault, Western Turkey

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Increasing evidence suggest that earthquakes may trigger seafloor seepage and that strike-slip faulting may influence mud volcanism in marine environments. However, the role that different parameters play in controlling triggering are still not understood. Here, we present new data from the Main Marmara Fault (MMF), in Western Turkey, which represents the submerged section of the northern branch of the North Anatolian Fault System. The western segments of the MMF cut across multiple hydrocarbon gas sources from the Thrace Basin making this zone a unique natural laboratory to study the relations between seismicity, gas emissions and mud volcanism.

Within the EU funded Marsite project, two lance-like shafts equipped with differential pore pressure and temperature sensors located at depths of 83, 283, 293, 548, 648 and 702 cm below the seabed and a sampling rate of 10s were placed in the sediment for a period of roughly 13 months (i.e. 06/10/2013 to 14/11/2014). The location the two shafts were placed at less than 1km apart at 40.81305°N, 27.77177°S and 40.81552 °N, 27.77760°S with a distance of $\sim$50 and $\sim$550 meters from the MMF respectively. The shaft located furthest from the MMF was $\sim$50 m away from the summit of a mud volcano.

Large differences in pressures observed between the two sites and sensors at different depths implies that unconnected systems can coexist across small spatial scales (i.e. < 1m) and highlights the highly heterogeneous nature of the environment. An additional complexity is the evolution of pressure with time. On both sites nearby earthquakes can be observed to alter the pressure recorded at the deeper sensors. At the site closest to the mud volcano, a series of large pressure increases (i.e. +20 kPa) occurred over a 5 month period. Analysis of this episode and the effect that earthquakes play in temporal pressure variations will be presented.