Seismogenic-influenced fluid transport on low angle faults to the mofettes of Caprese Michelangelo (Northern Apennines)

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A group of mofettes located in the Upper Tiber Valley (Northern Apennines) has been investigated to study their gas flux variations in relation to local events occurred during winter 2001.

The reservoirs feeding those mofettes are trapped over-pressurized fluids, discovered by a deep borehole in the near vicinity. Chemical and isotope data of both the venting gases and gases from the drilled well provide indications about their origin. We discuss a fault-valve behavior during the rupture process as responsible mechanism for a co-seismic fluid migration along reactivated fractures zones. A migration of hypocenters towards the surface along the fault gives further indications for a pore pressure diffusion process. At the surface, the mofettes changed their morphological features macroscopically due to this enhanced gas dynamic. The phenomenological observation of post-seismic fluid expulsion 18 months after the seismic crisis suggests the interpretation of a long-term fluid transport process forced by pressure pulse propagation. This result was achieved by a new approach using photographical times series. The proposed model could help to explain a complex scenario of a long-term fluid transport from the trapped fluid reservoir through the seismogenic zone up to the gas emission sites at Caprese Michelangelo.