Geophysical Research Abstracts, Vol. 8, 04768, 2006
SRef-ID: 1607-7962/gra/EGU06-A-04768

Ground deformation and mass transfer along the Sabina fault, Central Italy, retrieved by means of time-series InSAR

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The area of the Acque Albule Basin (AAB), is located 20 km East of Rome, and has been known for over two thousand years for its sulphur waters and travertine quarries. The AAB is in fact identified with a large travertine formation, deposited in a depressed area since the Upper Pleistocene, whose maximum thickness of ˜100 m is occurring along a N-S alignment going through the center of the basin. The formation of the basin has been attributed to a pull apart structure driven by N-S right lateral displacement along the strike-slip Sabina Fault. Although the Sabina Fault is not considered active in the Holocene, infrequent low-magnitude (< 2.5 M) and very shallow (400-800 m) seismic sequences periodically affect this area. To investigate the relationships among the Sabina Fault, the AAB, and the local seismicity, we evaluated the ground deformation by mean of Permanent Scatterers interferometry (PS-InSAR) and SBAS (Small Baseline Subset) technique. We used ERS ascending and descending archive data spanning the period 1993-2000 and retrieved ground velocities with uncertainties better than ś1.5 mm/a, and a location accuracy less than 10 m. The results for the ascending and descending data show similar displacement fields, elongated N-S, and reaching LoS velocities up to -15 mm/a in the central part of the AAB, in correspondence with the maximum thickness of the travertines. We model this deformation field by mean of several sources (a point pressure source, a finite prolate ellipsoid and an opening crack) and compare the results. Using geochemical modelling, we attribute the subsidence to mass transfer of carbonate material along the Sabina fault zone.