

RELATIVE SEA LEVEL RISE AT VENICE, ITALY

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Land movement relative to mean sea level, or relative sea level rise (RSLR), includes in the Venice coastland land subsidence of both natural and anthropogenic origin, and sea level rise due to global climate change. From the early 1900s, about 23 cm of RSLR has occurred at Venice creating a great concern for the survival of the city and conservation of the lagoon environment. Natural subsidence is mainly due to consolidation of recent deposits. Anthropogenic subsidence was caused by groundwater overdraft from the aquifers located in the upper 350 m of the 1000-m-thick Quaternary formation underlying the coastland. Freshwater pumping, mostly performed for industrial purposes, started around the 1930s and reached the peak between 1950-1970 yielding a subsidence of about 5 mm/yr in Venice. Countermeasures adopted in the early 1970s produced a quick general improvement. Recent regional investigations using leveling, GPS, DInSAR, and PSI have definitely verified the stability of Venice over the 1992-2007 period, with a subsidence rate generally less than 1 mm/yr. Conversely, the measurements have revealed that the lagoon edges are sinking at 2-3 mm/yr due several causes, i.e. natural consolidation still ongoing, groundwater withdrawal for agricultural/tourist use, and oxidation of recently reclaimed histosols. Concerning with the sea level rise, an accurate statistical analysis has been performed on the data collected at the Venice gauge. Once removed the subsidence contribution using a nearby stable station, the mean secular eustatic rise has resulted about 1.2 mm/yr. Oscillations characterize the yearly-averaged level behavior which is linked the particular Adriatic Sea tide regimes and depends upon the short-term climatic fluctuations. Significant are the steadily decrease (-0.8 mm/yr) recorded from 1971 to 1993, the serious rise (5.5 mm/yr) from 1994 to 2000, and the new lowering phase (-2.64 mm/yr) between 2001 and 2007.