

Delayed coastal subsidence over abandoned gas fields in the Northern Adriatic, Italy

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As is well known gas production from subsurface reservoirs induces anthropogenic land subsidence with an adverse environmental impact over low-lying coastal areas. One such low area is the Northern Adriatic coastland, Italy, where several gas fields, located in Quaternary and Pliocene sedimentary formations between 1000 and 4000 m depth, are at present withdrawn or planned for future production. Generally the land subsidence bowl is expected to conform with the field outline and the settlement process to stop at the end of the field production life. However, this is not always the case if the reservoir is confined by an extensive aquifer (or waterdrive) which may propagate the pore pressure decline far from the field for quite a long time after the pumping cessation. The Northern Adriatic gas fields are usually surrounded by active waterdrives. To investigate the likely residual waterdrive compaction, and the resulting delayed land subsidence, a 3-D finite element (FE) model is developed, and used to predict the occurrence over the depleted gas fields of *Dosso degli Angeli* and *Chioggia mare*, two major reservoirs close to the Northern Adriatic coastland. The model addresses the aquifer groundwater flow, the medium structural deformation and the field gas dynamics by *ad hoc* nonlinear constitutive laws for both gas and porous medium. Use is made of an existing large database of the rock geomechanical properties along with accurate 3-D reconstructions of the basin geology. The results show that a residual land subsidence of several centimeters can be expected in the next decades after the field abandonment adjacent to the reservoir margin with a non-negligible impact on the Northern Adriatic local shoreline stability.