Geophysical Research Abstracts
Vol. 17, EGU2015-874, 2015
EGU General Assembly 2015


# Effects of anthropogenic land-subsidence on river flood hazard: a case study in Ravenna, Italy

Francesca Carisi, Alessio Domeneghetti, and Attilio Castellarin

School of Civil, Chemical, Environmental and Materials Engineering, DICAM, University of Bologna, Bologna, Italy (francesca.carisi@unibo.it)

Can differential land-subsidence significantly alter the river flooding dynamics, and thus flood risk in flood prone areas? Many studies show how the lowering of the coastal areas is closely related to an increase in the flood-hazard due to more important tidal flooding and see level rise. On the contrary, the literature on the relationship between differential land-subsidence and possible alterations to riverine flood-hazard of inland areas is still sparse, while several areas characterized by significant land-subsidence rates during the second half of the 20th century experienced an intensification in both inundation magnitude and frequency. This study investigates the possible impact of a significant differential ground lowering on flood hazard in proximity of Ravenna, which is one of the oldest Italian cities, former capital of the Western Roman Empire, located a few kilometers from the Adriatic coast and about 60 km south of the Po River delta. The rate of land-subsidence in the area, naturally in the order of a few mm/year, dramatically increased up to 110 mm/year after World War II, primarily due to groundwater pumping and a number of deep onshore and offshore gas production platforms. The subsidence caused in the last century a cumulative drop larger than 1.5 m in the historical center of the city. Starting from these evidences and taking advantage of a recent digital elevation model of 10m resolution, we reconstructed the ground elevation in 1897 for an area of about 65 km2 around the city of Ravenna. We referred to these two digital elevation models (i.e. current topography and topographic reconstruction) and a 2D finite-element numerical model for the simulation of the inundation dynamics associated with several levee failure scenarios along embankment system of the river Montone. For each scenario and digital elevation model, the flood hazard is quantified in terms of water depth, speed and dynamics of the flooding front. The comparison enabled us to quantify alterations to the flooding hazard due to large and rapid differential land-subsidence, shedding some light on whether to consider anthropogenic land-subsidence among the relevant human-induced drivers of flood-risk change.