Geophysical Research Abstracts
Vol. 16, EGU2014-14507, 2014
EGU General Assembly 2014

Advancements in near real time mapping of earthquake and rainfall induced landslides in the Avcilar Peninsula, Marmara Region

Stella Coccia
INERIS, France (stella.coccia@ineris.fr)

Stella COCCIA (1), Fiona THEOLEYRE (1), Pascal BIGARRE(1) , Semih ERGINTAV(2), Oguz OZEL(3) and Serdar ÖZALAYBEY(4)

(1) National Institute of Industrial Environment and Risks (INERIS) Nancy, France, (2) Kandilli Observatory and Earthquake Research Institute (KOERI), Istanbul, Turkey, (3) Istanbul University (IU), Istanbul, Turkey, (4) TUBITAK MAM, Istanbul, Turkey

The European Project MARsite (http://marsite.eu/), started in 2012 and leaded by the KOERI, aims to improve seismic risk evaluation and preparedness to face the next dreadful large event expected for the next three decades. MARsite is thus expected to move a “step forward” the most advanced monitoring technologies, and offering promising open databases to the worldwide scientific community in the frame of other European environmental large-scale infrastructures, such as EPOS (http://www.epos-eu.org/).
Among the 11 work packages (WP), the main aim of the WP6 is to study seismically-induced landslide hazard, by using and improving observing and monitoring systems in geological, hydrogeotechnical and seismic onshore and offshore areas. One of the WP6 specific study area is the Avcilar Peninsula, situated between Kucukcekmece and Buyukcekmece Lakes in the north-west of the region of Marmara. There, more than 400 landslides are located. According to geological and geotechnical investigations and studies, soil movements of this area are related to underground water and pore pressure changes, seismic forces arising after earthquakes and decreasing sliding strength in fissured and heavily consolidated clays.
The WP6 includes various tasks and one of these works on a methodology to develop a dynamic system to create combined earthquake and rainfall induced landslides hazard maps at near real time and automatically. This innovative system could be used to improve the prevention strategy as well as in disaster management and relief operations.
Base on literature review a dynamic GIS platform is used to combine theoretical models, variable on-site data (rainfall, earthquake, etc), products and results obtained by other WP6 partners’ contributions.
This platform is in progress, a 1D deterministic method for calculating co-seismic displacements was for the moment implemented in the GIS based on Newmark’s method for mapping shallow slides. Rigid sliding block analysis is commonly adopted to predict the potential for earthquake-induced landslides. These predictions give the expected level of displacement as a function of the characteristics of the natural slopes and the characteristics of earthquake shaking. In our case the first characteristics are the results of a precise DEM data and an existent landslide inventory. The geotechnical parameters used come from the literature and will be improved thanks to a borehole geological and geotechnical campaign in progress. The static hydrogeological model in our GIS will be replaced by transient models for hill slope hydrology and time series of intense and/or prolonged precipitation (provided by Tubitak) which will be shortly accessible. Our next aim is to introduce, when ready, site effects information issued from the next IU geophysical campaign, results from numerical simulations and automatic near real time shake maps (developed by KOERI).
Moreover, in the spring 2014, an observation & Early Warning System (EWS) prototype system will be set up on an active but slow landslide (pilot site) and composed of GPS devices, seismic probes, piezometers, meteorological station and inclinometers. This will improve our scientific understanding of Avcilar landslides and enable to also improve and better calibrate our GIS platform.