

## **Reservoir-induced seismicity associated with the Pertusillo lake (Southern Italy): poroelastic and time-dependent earthquake nucleation modelling**

Flaminia Catalli (1), Sebastian Hainzl (1), Luca Urpi (2), Luigi Imbrota (3), and Torsten Dahm (1)

(1) GeoForschungsZentrum Potsdam, Physics of Earthquakes and Volcanoes, Potsdam, Germany, (2) Swiss Seismological Service, Swiss Federal Institute of Technology, ETHZ, Zürich, Switzerland, (3) 3 Istituto Nazionale di Geofisica e Vulcanologia, Seismology and Tectonophysics, Rome, Italy

The Pertusillo artificial lake in Southern Italy is one of the known water reservoirs showing protracted seismicity for several years after the initial filling in 1965. For a period of about twelve years in between 2001 and 2013 we have records of seismicity and water level changes. In this period more than 1800 events with local magnitude ranging between -0.2 and 3.2 are observed; in the same period the water column fluctuated in average of 15 m per year.

We model stress and time-dependent pore-pressure due to water level variations associated with the Pertusillo lake. The solutions are given for a homogeneous, porous-elastic half-space and considering the decoupled approximation when resolving the governing partial differential equations (i.e. elastic stresses influence the pore pressure but not vice versa). Stress and pore-pressure are used to compute seismicity rate changes through the rate-and-state nucleation model.

Our approach is a first-order approximation of the problem of reservoir-induced earthquakes because we are not considering information of the complex crustal structure in our methodology. However, it allows for understanding the relative importance of the driving forces and quantifying the primary consistency between modelled and observed seismicity. All the discrepancies between forecasted and observed seismicity might reveal the need of considering different settings of the surrounding area, as for example the existence of high-permeable fracture zones and layers with different elastic and hydraulic parameters.