Induced and triggered seismicity - data and research applications within the EPOS Thematic Core Service on Anthropogenic Hazards (TCS-AH)

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Integration of dispersed infrastructure and knowledge is challenging regardless to the discipline. Within the community working upon the anthropogenic seismicity and broader anthropogenic hazards, the data, software and knowledge were very dispersed. Research was mainly concentrated upon the technology inducing hazard. The EPOS TCS-AH brings together a community interested in Anthropogenic Hazards research related to triggered and induced seismicity concentrating the data and software resources on the common physics driving the seismogenic process in any type of technological activity. The concept of EPOS and particularly TCS AH is e-research infrastructure that provides access to a large set of relevant data and allows conducting research analyses in a virtual workspace, promoting interdisciplinary collaborations between stakeholders (the scientific community, industrial partners and society). TCS AH datasets are prepared as Episodes, which comprehensively describe anthropogenic hazard cases for infra-structures, people and/or environment. They are grouped in several categories of subsurface exploitations: CO_2 sequestration, conventional hydrocarbon extraction, geothermal energy production, reservoir impoundment, unconventional hydrocarbon extraction, underground gas storage, underground mining, and wastewater injection. Episode covers all relevant for the considered hazards data types (e.g. seismic, air/water quality), industrial data (e.g. well path, in-jection rates, mining front advance, gas production, water level), and other geodata (e.g. geo-logical section, velocity model, faults, shear wave velocity, bathymetric map). All data is stored in two local data centers (eNodes: IG-PAS/Poland and CDGP-EOST/France), but TCS AH is designed to include more data centers into the framework. Metadata and data are prepared and served to the TCS-AH platform in commonly used standards and formats (e.g. miniSEED, Geo-TIFF, and .mat). A registration/authorization is mandatory to access some data covered by restriction imposed by data industry providers or shared data embargoed by running projects. The platform grants access to an application portfolio, designed for the AH area, and addressing: (1) basic services for data integration and handling such as data search, map view or basic visualisation; (2) services for physical models of stress/strain changes over time and space as driven by geo-resource production; (3) services for analyses of geophysical signals; (4) services to extract the relation between technological operations and observed induced seismic/deformation; (5) services to quantitative probabilistic assessments of anthropogenic seismic hazard - statistical properties of anthropogenic seismic series and their dependence on time-varying anthropogenesis; ground motion prediction equations; stationary and time-dependent probabilistic seismic hazard estimates, related to time-changeable technological fac-tors inducing the seismic process; (6) simulator for multi-hazard/multi-risk assessment in exploration/exploitation of georesources (MERGER) - numerical estimate of the occurrence probability of chains of events or processes impacting the environment.

TCS-AH is one of the 10 TCS forming the EPOS infrastructure. It is part of the IS-EPOS and EPOS-IP project. It is a place for sharing and studying AH datasets, respecting the owners intellectual property rights, for a common benefit for Science, Industry and Society. The TCS-AH web-platform is available at https://tcs.ah-epos.eu/