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## Towards aquifer deformation models integrating SAR remote sensing: preliminary land subsidence results using GEP tools

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Groundwater is a critical resource that provides fresh drinking water to at least 50% of the global population and accounts for 43% of all of the water used for irrigation (Siebert et al., 2010; UNESCO, 2012). A main consequence of groundwater depletion in overexploited aquifers is land subsidence, which ensues other impacts, such as increasing flooding risk (specially in coastal areas), damages to infrastructures and reduction of storage capacity in aquifer systems. Aquifer deformation and groundwater flow models are essential to design sustainable management strategies. In this context, A-DInSAR techniques provide valuable surface displacement data to understand the deformational behaviour of the aquifer and to characterise its properties.

RESERVOIR project, which is part of the PRIMA programme supported by the European Union, aims to provide new products and services for a sustainable groundwater management model to be developed and tested in four water-stressed Mediterranean pilot sites. Each of them is representative of a different aquifer system flow scheme. They are located in Italy (coastal aquifer of Comacchio), Spain (Alto Guadalentín Basin), Turkey (Gediz River Basin) and Jordan (Azraq Wetland Reserve). The water usages of these aquifers are irrigation, drinking water and/or power generation. Each site is prone to different issues such as land subsidence, salt water intrusion, water pollution, over-exploitation and insufficient recharge.

One of the primary objectives of the project is the use of advanced satellite-based Earth Observation (EO) techniques for the hydrogeological characterization and their integration into numerical groundwater flow and geomechanical models. This will lead to improve the knowledge about the current capacity to store water and the future response of aquifer systems to natural and human-induced stresses. Free Sentinel-1 SAR acquisitions available at the Copernicus Open Access Hub will be used to perform A-DInSAR processing in representative areas of each pilot site. Additionally, the InSAR processing tools of the Geohazards Exploitation Platform (GEP) funded by the European Space Agency, will be used for a first assessment of ground deformation. In this work we present the preliminary results obtained with Sentinel-1 images using the P-SBAS web tool on GEP (De Luca et al., 2015) at the four pilot sites.

*De Luca, C., Cuccu, R., Elefante, S., Zinno, I., Manunta, M., Casola, V., Rivolta, G., Lanari, R., and Casu, F., 2015, An on-demand web tool for the unsupervised retrieval of earth's surface deformation from SAR data: The P-SBAS service within the ESA G-POD environment: Remote Sensing, v. 7, no. 11, p. 15630-15650.*

*Siebert, S., Burke, J., Faures, J.-M., Frenken, K., Hoogeveen, J., Döll, P., and Portmann, F. T., 2010, Groundwater use for irrigation—a global inventory: Hydrology and earth system sciences, v. 14, no. 10, p. 1863-1880.*

*UNESCO, 2012, World's Groundwater Resources Are Suffering from Poor Governance, UNESCO Publishing: Paris, France, UNESCO Publishing.*