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Geo-environmental impact on the aquifer systems of the wider fire-affected area (August 2017) on Kythira Island, Greece

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Three main aquifer systems developed on Kythira Island include (Pagounis, 1981; Pagounis & Gertsos, 1984, Danamos, 1991; Koumantakis *et al.*, 2006):

- The porous aquifer system in Neogene and Quaternary formations.
- The karstic aquifer system in the carbonate formations of the Pindos and Tripolis units.
- The aquifer system (both shallow and deep) in the fractured hard rocks mainly of the Phyllites – Quartzites unit.

The main discharge of the aquifer systems takes place in coastal and submarine brackish springs around the island, except for its northern part where the Phyllites – Quartzites unit outcrops and its central part where springs of small capacity discharge the carbonate formations of the Pindos unit.

The municipal water supply of Kythira has been reinforced by a series of projects and interventions, focusing on the summer touristic period, when water demand surpasses by far water availability, mainly consisting of new deep boreholes. Precipitation is the direct recharge of the three aforementioned aquifer systems while indirectly lateral discharge occurs in places between adjacent and tangential aquifer systems and from the streams runoff as well.

On August 4, 2017 a shrub, rather a forest fire broke out close to the island hospital; it expanded rapidly due to strong winds blowing in the area and raged out of control for four days, inducing considerable damage. The size of the fire-affected area was about 20km^2, 16km^2 mainly of shrub and 4km^2 of agriculture land.

For the detailed evaluation of the geo-environmental impact of the aforementioned fire to the aquifer systems of the Kythira Island concerning the quantitative and qualitative degradation seventeen municipal water points were finally selected for further hydrogeological study.

The water points monitoring network were used in September 2017, June 2018 and October 2018 for measurements of the water tables heads and springs discharges while water samples were collected and chemical, trace elements and microbiological analysis were carried out.

The impact of the fire on the quantity of the aquifer systems of the wider fire-affected area could not be fully clarified and there was indirect evidence of their recharge (it remains unknown its rate compared to the recharge before the August 2017 fire) during the three field trips such as:

- Fluctuation of the measurements of the water table heads.
- Fluctuation of the measurements of springs discharges.
- Fluctuation of the measurements of boreholes hydrometers.
- Changes to the hydrochemical facies of the Piper's, Durov's and Stiff's diagrams of the collected water samples.

The results and the evaluation of the chemical and trace elements showed that there was no impact of the fire on the quality of the wider fire-affected area aquifer systems. However, microbiological analysis from the Mylopotamos spring showed qualitative degradation, due to human activities in the wider area preexisting the August 2017 fire (Pagounis, 1981).

For the sustainable water resources management of the wider fire-affected area new projects were proposed in order to prevent phenomena that favors the runoff instead of infiltration which lead to the restriction of the recharge of the three main aquifer systems, such as works of artificial recharge.

References

Danamos, G., 1991. Contribution to the geology and hydrogeology of the Kythira Island. PhD Thesis, National and Kapodistrian University of Athens.

Koumantakis, I., Vassiliou, E., Psychogios, K., Dimitrakopoulos, D., Markantonis, K., 2006. The important role of nappe tectonics in the coastal aquifers. The case study in the island of Kythira (Greece). Proceedings of the 8th conference on limestone hydrogeology, Switzerland.

Pagounis, M., 1981. Hydrogeological investigation of the island of Kythira. Hydrological and Hydrogeological Investigations, No. 36, IGME, Athens.

Pagounis, M., Gertsos, T., 1984. Hydrogeological investigation of the island of Kythira. Hydrological and Hydrogeological Investigations, No. 42, IGME, Athens.