Groundwater pressures in Cr(VI) impacted aquifers of Central Greece

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Groundwater quantity and quality can be directly affected through changes in precipitation, evapotranspiration, recharge rates, and indirectly through changes in land use, irrigation and other human activities. Here we focus on the water quality of four groundwater bodies in central Greece. A common feature of the studied aquifers is the presence of geogenic Cr(VI), linked to ophiolithic rock occurrences. Our data are interpreted within the frame of the ERANETMED CrITERIA project. In CrITERIA, groundwater quality is assessed following a gradient from relatively wet to dry conditions along the Tethyan Suture Zone that structurally defines locations of ophiolite occurrences, extending from the eastern Mediterranean to Oman.

Total precipitation in the Greek study areas ranges from 272 to 445 mm in the wet season and from 56 to 111 mm in dry season. The majority of over 100 groundwater samples collected and analysed are of Mg-HCO_3, Mg-Ca-HCO_3 and Ca-Mg-HCO_3 types. The influence of anthropogenic activities such as intensive agriculture is indicated by high nitrate concentrations (>50 mg/L) occurring mainly in the groundwater of agricultural areas while the dispersion of samples towards high chloride and sodium concentrations indicate the impact of sea water intrusion on the quality of groundwater in coastal areas. Cr(VI) concentrations range between <2 μg/L and 430 μg/L. No seasonal variation has been observed in Cr(VI) concentrations. However, the increased predicted climate variability and the trend in precipitation decrease [1], with probable evapotranspiration increase has profound impacts on water balance. This is supported by a gradual decrease in dissolved oxygen concentrations from Mediterranean countries to Oman, indicating changes in biogeochemical conditions taking place within the aquifers. Changes in groundwater recharge and quantity in the study areas will also lead to increased anthropogenic pressures on water. We suggest that the estimation of potential groundwater quality feedbacks, including geogenic Cr release and oxidation, lies with being able to better constrain and manage the effects of anthropogenic pressures within water recharge zones.

[1] Hatzaki *et al.* (2017) AGU Fall Meeting Abstracts. 2017.