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Evaluation of possible asbestos fibres movement in porous aquifers through laboratory column tests

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Weathering and erosion of rocks and sediments containing Naturally Occurring Asbestos (NOA), together with run off from mine tailings deposits containing non-exploitable fibrous minerals, may result in asbestos (and other asbestiform minerals non-asbestos classified) fibres dispersion in surface waters and groundwater.

Asbestos is considered highly carcinogenic to humans when is respired (Group 1 by IARC). Therefore, in the past, asbestos occurrence has been mainly monitored in air and not considered in other matrices, such as water. Nowadays, waterborne asbestos is gaining new attention since it can constitute a non-conventional exposure way. Indeed, as groundwater and surface waters resources are exploited for both agricultural and industrial activities and as a source for tap water, water contamination by asbestos could pose a risk related to possible water-to-air migration of fibres, thus being a secondary source of airborne asbestos, and to possible ingestion (particularly when present in the tap water). Therefore, asbestos could be considered as an Emerging Pollutant in water because, historically, it has not been systematically monitored in this matrix and it could actually represent a problem for human health and environment.

NOA-containing rocks are widespread in Italy, such as in northwest (NW) and Central Alps and also in the Apennines. In NW area, possible diffusion of asbestos in water has been recently considered as a consequence of interactions between water and ophiolitic rocks or related sediments. Migration through water (particularly groundwater) far away from the pollution source, which has been considered negligible until recently, has gained new attention since column-based laboratory study has highlighted asbestos mobility through porous media under particular conditions, suggesting that the same could happen in the environment.

Knowing this background, it is particularly important to investigate possible fibres diffusion in porous aquifers and their transport linked to aquifer characteristics, dimension and morphology

of fibres, their chemical composition and surface charge.

To better understand groundwater flow and fibres transport, a laboratory test has been set in collaboration with Politecnico di Torino using a packed column in which polluted water movement was forced. Several tests have been done using different material to pack the column with various granulometry and changing water characteristics, such as asbestos fibres concentration and ionic strength.

Details regarding the experimental setup and first data on the tests will be presented to better define possible groundwater contamination by asbestos fibres and their movement through porous aquifers. These data will help to understand how reservoir peculiarities (geology, hydrogeology) and anthropogenic activities could influence mineral fibres presence and movement in the water system and, more generally, would help to monitor asbestos (and asbestiform) fibres transport due to water flowing in NOA rich settings or in areas where uncontrolled mine tailings deposits are present.