Mercury speciation in a historic Hg-mining and smelting area, Apuseni Mts., Romania

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Few published data exist on mercury content in mine waste dumps from Romania, although mercury contamination in soil is a problem found at many production (active and inactive) sites. The Izvorul Ampoiului abandoned mercury mine is connected with the Neogene vulcanite from the Apuseni Mts. Mercury generally appears in the form of cinnabar (HgS), though native Hg is also occasionally found. Hg mining has been active from the 16th century till 1968. During this period, Izvorul Ampoiului deposit constituting the first productive mine in Romania. An Hg ore smelter located close to the mine had been in operation from 1925 since 1968. The waste material from the mine and the roasting site was dumped in close vicinity of the mine. There is no exact information available on the total production, but in 1967 the plant were processed 18000 tons of ore with a content of 0.468% Hg and were extracted 8434 kg of Hg. A total of 32 minesoils was sampled from the top 15 cm. Concentration of total Hg was determined using an AMA-254 (LECO). In addition from the total Hg determinations, waste samples were also submitted to a sequential extraction procedure (i.e. Kingston method) to remove mobile Hg (leaching with 2%HCl+10%ethanol solution), semimobile Hg (leaching with 33% HNO_3 solution) and nonmobile Hg (leaching with 1:6:7 HCl:HNO_3:H_2O solution). The XRD analysis revealed that the sampled waste material consisted mainly of kaolinite, muscovite, calcite, quartz, halloysite and goethite. Presence of clay minerals and Fe-oxyhidroxides suggested relatively favourable conditions for Hg adsorption to the mineral surfaces. Hg associated with mineral surfaces may undergo methylation processes, and thus, may represent a potential long-term environmental risk. Mercury concentrations in the mine waste samples were highly variable. Total Hg concentrations vary from 3.7 to 27.85 ppm with a mean of 14.03 ppm. These concentrations exceeded the guideline value of 1.0 ppm established by the Romanian Legislation. The sequential extraction shows that the semimobile fraction yielded the highest concentration of Hg, being about 50–57% of total mercury. Contents in the non-mobile fraction were about 30%. Although mobile Hg fraction represents only ~10% of total Hg, this fraction contains the most available Hg, including methylmercury content, not to be overlooked. Subspeciation by solid phase extraction showed that the mobile organic Hg concentration is less significant (approximately 4%). Mobile organic mercury subfraction corresponds, according to the reference method, to the most toxic and bioavailable fraction. These data could not be confirmed with others since there are no existing data about organic mercury content in this area. Further investigations will be carried out in order to elucidate the factors affecting mercury mobility in surrounding soils.

Intrusion mechanisms of mafic plutons in the middle crust: Insights from the Permian Sondalo gabbroic complex (Central Alps)

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Across Europe, Late-Carboniferous – Permian bimodal magmatism is one of the last manifestation of the Variscan orogenic cycle. Whereas acid magmatic bodies are mostly restricted to upper and middle crustal levels, mafic intrusions are emplaced through the entire continental crust. The reason for such shallow intrusion levels for basic magmas still remains enigmatic, as buoyancy shall not be the main driving force. In order to understand the emplacement of mafic magmas in rather uncommon levels (< 20km), we characterized the structure of the intrusion of the Sondalo gabbroic complex, exposed in the Austroalpine Campo unit (N-Italy).

Macroscopic foliations, anisotropy of magnetic susceptibility (AMS) data and lithological mapping allow to subdivide the pluton into three concentric areas. From the core composed of Ol-Gabbro to the dioritic rim, the mean magnetic susceptibility (Km) decreases from $1.43*10^{-3}$ S.I. to $8.42*10^{-4}$ S.I., and the mean anisotropy (P) from 1.073 to 1.044. These data reveal the existence of a vertical magnetic and magmatic foliation associated with a vertical magnetic lineation in the centre of the pluton composed of gabbro and Ol-bearing gabbro. The foliation is parallel to both the large granulite-facies metapelitic septa and the surrounding host-rock foliation. In contrary, the more dioritic external facies develops a moderately dipping magnetic fabric roughly parallel to the margins of the pluton.

Our data and field observations suggest that magma ascent was probably facilitated by the mechanical anisotropy provided by the steep fabric in the metapelitic host-rock. The assimilation of H2O-rich melts derived from the surrounding metapelites also made the magma buoyant enough to reach shallower crustal levels.

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