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Geochemical background/baseline values in top soils of Campania region: assessment of the toxic elements threat to ecosystem and human health

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In the late years an intense geochemical prospecting activity on the whole territory of Campania region (Southern Italy) has been carried aiming at the definition of the geochemical backgrounds/baselines at both regional and local scale.
At the end of 2003 the first edition of an atlas containing 200 maps showing the distribution patterns of 40 chemical elements on the whole regional territory was published (De Vivo et al., 2003, 2006a; Albanese et al., 2007a). The atlas provided a base knowledge of environmental status of the region and allowed to individuate some critical areas to be further investigated by topsoils sampling follow up activity; the topsoils are considered as the best media in order to examine closely the sources and the distribution patterns of harmful elements at a local scale.
The topsoils sampling was mainly focused on anthropized areas (at urban and metropolitan scale), industrial settlments, brownfields and intensely cultivated zones, aimed at:
• showing the distribution of concentration values and to determine baseline values (or backgrounds, depending on local conditions) of each analyzed element (38) in the top soils;
• assessing harmful elements pollution levels and their geographic distribution;
• providing reliable analytical data for assessment of toxic element pollution threat to ecosystem and human health;
• creating a sound basis for policy makers and legislators who need to address the public concerns regarding environmental pollution.
Five atlases (De Vivo et al., 2006b; Albanese et al., 2007b; Lima et al., 2007; Fedele et al., 2007 Cicchella et al., 2009) were produced reporting soil geochemical maps compiled using 1620 samples collected both in the metropolitan and provincial area of Napoli and in the cities of Avellino, Benevento, Caserta and Salerno. Further studies were also carried out taking into account Pb isotopes (Cicchella et al., 2008a), PGE's (Cicchella et al., 2003; 2008b) and bioavailability of harmful elements (Albanese, 2008) distributions to better discriminate the influence of human activities on urban environment.
A detailed analysis of harmful elements distribution and some organic compounds (PCB and PAH's) was also completed for the Bagnoli brownfield area, in the western sector of the city of Napoli (Tarzia et al., 2002; De Vivo and Lima, 2008; Albanese et al, in press). Since Bagnoli is located inside an active volcanic field (Campi Flegrei) characterized by a strong geothermal activity that generates hydrothermal fluids, the definition of the anthropic impact on environment for this area was complicated by the presence of two main contamination sources, one natural (originating from the hydrothermal activity) and one anthropogenic (from the industrial activity).
At present, a geochemical prospecting based on soil and water sampling is also being completed on two contiguous areas mainly devoted to agriculture in correspondence of the north-western coastal sector of Campania Region territory (Domitio-Flegreo Littoral e Agro Aversano). The latter studies aim at defining the impact of agricultural activities (including the use of fertilizers) on soil and deep waters.
All the geochemical data obtained for the whole territory of Campania have been also spatially compared with cancer mortality data distribution (Montella et al., 1996) to individuate, at least, some spatial correspondences between high concentration levels of harmful elements and mortality incidence (Albanese et al., 2008). An interesting overlapping has been found for the Napoli metropolitan area for some elements and cancer types:

Zn–Cd-rich areas overlap with areas of high prostate-cancer mortality; bladder and pancreatic cancer are correlated with Pb–Sb-rich areas, whereas, bronchial–tracheal–lung cancer is correlated with As-, Cd- and Pb-rich areas.

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