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Pb isotopic constrains and environmental risk assessment of the Domizio Flegreo and Agro Aversano area (Campania region, Italy).

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A comprehensive geochemical environmental study focused on topsoil, groundwater, vegetable (corn) and human hair samples has been carried out in the Domizio-Flegreo Littoral and Agro Aversano areas in Southern Italy, covering 1287 km2 and including 90 municipalities. Within the framework of thethis study a focus was also carried on some specific sites (Teverola, Trentola-Ducenta, Giugliano, Castelvolturno and Acerra), that may have been affected by different sources of pollution (industrial and agricultural) and by the large presence of illegal buried waste disposals. Among the industrial sites that are expected to contribute to the contamination of the region a car and a chemical factory producing polyester fibres could be taken into account together with an urban waste incineration plant that is in operation since 2009 within the Acerra municipality administrative area.
The research is based on 1064 topsoil samples, 27 groundwater samples, 24 samples of human hair and 13 corn samples taken in across the whole study area. Although samples were analysed for 53 elements at ACME Analytical Laboratories (Vancouver, Canada) by means of ICP-MS and ICP-ES after an aqua regia digestion, we focused on 15 key elements (As, Be, Cd, Co, Cr, Cu, Hg, Ni, Pb, Sb, Se, Sn, Tl, V and Zn), for which the Italian Environmental Law 152/06 establishes trigger and action limits for both residential/recreational and industrial/commercial land use, based on the risks to human health.
All the chemical data were statistically treated and dot and interpolated maps were produced by means of the GeoDAS software. Maps showing the distribution of contamination factors (1) (Hakanson,1980) for each key element were also created.
In general, As, Pb, Cr, Cd and Hg resulted to be the most critical pollutants for the area.
Furthermore, Pb isotopic analyses on soil, water, corn and hair were conducted in order to distinguish between possible sources of contamination and geogenic and/or anthropogenic contribution. These studies were done at the Radiogenic Isotope Laboratory of the U.S. Geological Survey (Reston, VA, USA) following standard isotopic separations in Class 100 laboratories. The samples were analyzed using an HR-ICP-MS and a FinniganMat (Spectromat) spectrometers. Notably, the Pb isotopic compositions of human hair generally matched the Pb isotopic values that were previously shown by others to represent the composition of aerosol (2) (Tommasini et al., 2000), implying that Pb originates from the anthropogenic activities in the area.
Further studies will include the determination of risks to human health caused by the elevated concentrations of the key elements in the environment and food items.To start with, apreliminary conceptual model will be created that serves as a basis for a detailed regional risk assessments.The results will enable us to define specific risk management actions needed for the protection of human health in the study area.

(1)Hakanson et al., 1980.An ecological risk index for aquatic pollution control. A sedimentological approach. Water Research. 14, 975 -100.
(2)Tommasini et al., 2000.Lead isotopic composition of three ring as biogeochemical tracers of heavy metal pollution: a reconnaisance study from Firenze. Italy. Appl. Geochm. 15, 891-900.