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Mapping the chemical elements on the Earth: sustaining natural resources and environments

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Ninety chemical elements have been found in the nature. Everything in and on the earth is made from these elements. Mineral resources are composed of elements, while environmental problems in turn are caused by these elements and their components. A global geochemical database with all naturally occurring elements are critically needed for sustaining natural resources and environments. Little is known, however, of spatial distribution of these elements on the Earth. Geochemical mapping is an unique technique to illustrate spatial distribution of elements on the earth. Global-scale geochemical mapping has been carried out with the proposal of the 'International Geochemical Mapping' (1988-1992) and 'Global Geochemical Baselines' (1993-1997) [1]. Since then, slow but significant progress has been or is being made with approximately 22% of the world's land surface covered by the global/continental-scale geochemical projects (Fig. 1) [2,3].

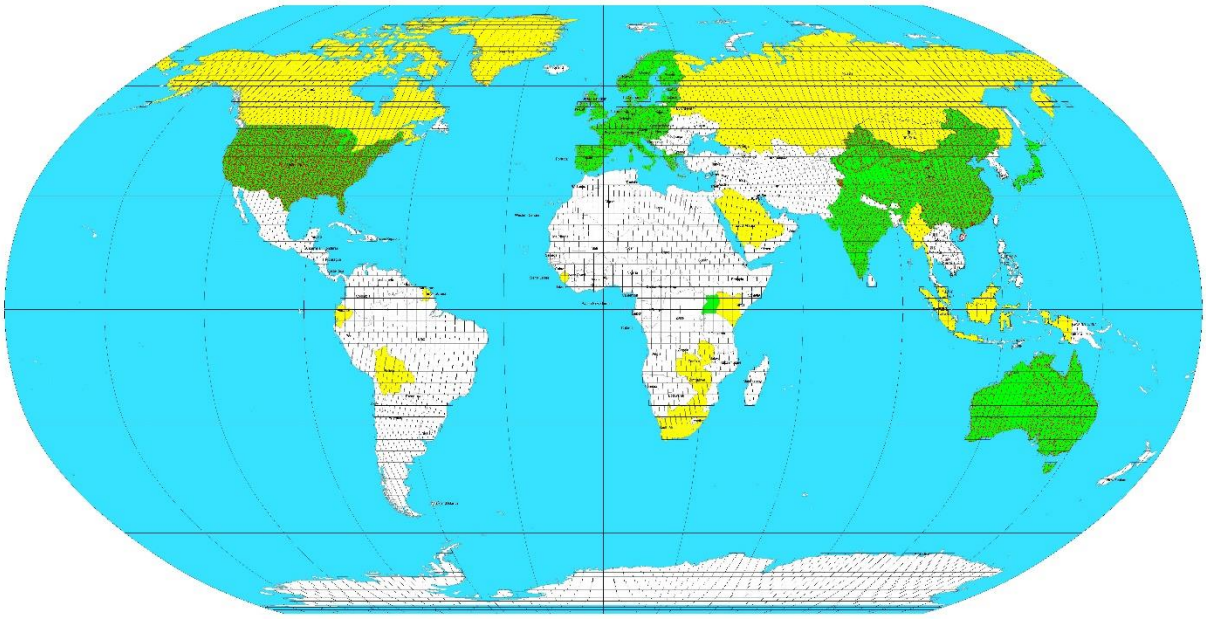

Fig. 1: Global Geochemical sampling locations in Australia, China, India, USA and Europe (green colour).

These new geochemical data and atlas leads a preliminary geochemical overview of global geology, mineral resources and environments. Initial results show excellent correlations of element distribution with lithology, mineral resources, mining activities, industry and urban activities, agriculture, and climate. Some major elements, such Ca, show the influence of lithology, climate and acid rain. Elements

of Ti, V, Co, Ni, Cr, Fe, Mn and PGEs are correlated with lithology and mineral resources, particularly related to mafic or ultramafic rocks. Elements of W, Sn, Au, Ag, Cu, and REE are correlated with metallogenic provinces. The concentration of many potentially toxic elements, such as Cd, Hg, As, Pb, P and the halogens, in surface soil are influenced by human activities.

References:

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