

## Regional variations in soil geochemistry across southern New Zealand

Dr Troy Baisden<sup>5</sup>, **Dr Rose Turnbull**<sup>1</sup>, Dr Adam Martin<sup>1</sup>, Dr Mark Rattenbury<sup>2</sup>, Professor David Cohen<sup>3</sup>, Professor Jurian Hoogewerff<sup>4</sup>, Dr Karyne Rogers<sup>5</sup>, Dr Tony Christie<sup>2</sup>

<sup>1</sup>GNS Science, Dunedin Research Centre, <sup>2</sup>GNS Science, Avalon, <sup>3</sup>School of Biological, Earth and Environmental Sciences, University of New South Wales, <sup>4</sup>National Centre for Forensic Studies, University of Canberra, <sup>5</sup>GNS Science, National Isotope Centre

Regional geochemical baselines provide valuable information on natural and human-influenced concentrations and spatial variation of chemical elements, isotopes and compounds in the environment. A systematic multi-element geochemical baseline of southern New Zealand soils has recently been completed, where sample collection, preparation and analytical methodologies were tested to develop an appropriate survey design for a national-scale baseline survey. The survey collected from 348 sites, spaced approximately 8 km apart. Two depths were collected; the “A-depth” sample from 0-30 cm always collected soil from the A-horizon, and the “B-depth” sample from 50-70 cm mostly coincided with the soil B-horizon, however, in places where there was minimal soil development, the C-horizon was collected. Splits of samples were analysed using XRF for 12 major and trace elements (Si, Al, Fe, Ca, Mg, Na, K, Mn, Ti, P, Cr and Ba). Total C and S were also measured, and a suite of 65 trace elements including rare earth elements were analysed using ICP-MS on aqua regia digested dilutions. A further subset of samples were analysed for Sr, C, N and S isotopes.

Preliminary analysis of the results has been completed and regional variations in chemical concentration across southern New Zealand appear to be strongly influenced by underlying rock type, particularly for the B-depth. Variation in the concentration of some elements (e.g. S, P, Pb, Hg, Cd), particularly in the A-depth, is attributed to anthropogenic input, for instance from fertilisers, paints, vehicle emissions and industrial emissions.

The data (freely available to download from <http://pet.gns.cri.nz>) are applicable to the environmental, agricultural, mineral exploration and urban health sectors and would establish a baseline from which anthropogenic influences can be assessed over typical natural variations. A c. 5kg archive of each soil depth sampled has been retained as a resource that can be utilised for further analysis.