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The geochemical baseline survey of southern New Zealand

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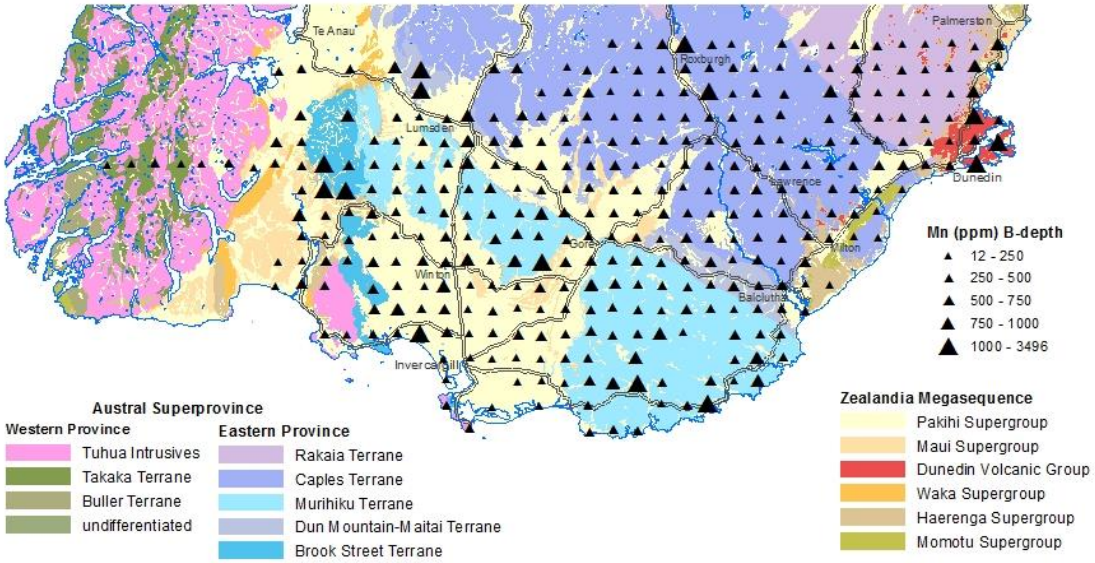
A grid-based, multi-analyte geochemical baseline survey of soils from southern New Zealand has been completed. Soil samples were collected from 347 sites, approximately 8 km-spaced, covering 40,000 km^2 of the Southland and southern Otago regions. Samples were collected from two depths; 0-30 cm (A-depth) and 50-70 cm (B-depth). The sub-180 µm fraction of all samples were analysed by inductively coupled plasma mass spectrometry (on an aqua regia partial digest) for 65 elements and for total C and S using a LECO analyser. A subset was further analysed by X-ray fluorescence for 12 elements. Other subsets have been analysed for their S, N, C and Sr isotopes.



Significant chemical concentration variations in the soil samples correlate with natural influences;

notably source geology, soil type, climate and topography. Of these the influence of the widely varying geological substrate appears to dominate the signal. For example soils above the volcanic arc-derived sedimentary rocks (Murihiku and Brook Street terranes) show higher Al, Mg, Mn, Ti, Cr, and Cu compared to those with proportionately more continental-derived component (Rakaia and Caples terranes) which show higher K, K_2O and Na_2O. Relatively high concentrations of certain elements (e.g. S, P, Pb, Hg, Cd), particularly in the A-depth, are attributed to an anthropogenic source, for example from fertilizer, paint, vehicle emissions or industrial emissions. Other elevated element concentrations, especially from B-depth samples, are probably natural, for example, As, Bi, Sb and W may suggest proximity to Au mineralisation, and elevated Pt and Re may be vectors to platinum group element mineralisation. Erosion and re-deposition of minerals with enriched heavy metal concentrations can be seen in the element chemistry, e.g. Cr_2O_3 or Ni, and may act as further vectors to in-situ mineralisation. This study provides an important baseline that is expected to benefit government, environmental, agricultural, forestry and mining sectors through improved regulatory guidelines and understanding of the regional geochemical landscape. This survey is the first step towards a national geochemical baseline survey for New Zealand.