

Multiple controls on the geochemistry of early Cenozoic volcanism in Victoria, Australia

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Early Cenozoic volcanism in Victoria (resulting in the so-called 'Older Volcanics' province) has received little attention compared to younger volcanic provinces in Australia. Magmatism occurred intermittently between ~20 to 40Ma and new trace element and isotope data for a number of subprovinces reveal wide geochemical variations both locally and regionally.

These rocks are dominated by alkali basalts and basanites, and all samples are reasonably fresh with typical mineral assemblages including olivine, clinopyroxene, and plagioclase, with or without nepheline. Mantle xenoliths have been observed in 4 samples. The MgO and SiO₂ contents range between 3.2-11.1wt% and 41.1-52.1 wt% respectively and the wide range in magnesium numbers (39-69) indicate that the magmas vary from primitive (perhaps even primary) to evolved in composition. Although trace element compositions broadly resemble those of modern OIB; in detail, mantle-normalised patterns show distinct differences between subprovinces. The transitions between subprovinces coincide with large-scale faults, that separate different structural zones in Victoria, indicating possible structural control over the magma chemistry. Ce/Pb and Nb/U ratios range between 11.4-33.3 and 23.8-60.9 respectively, with lower values reflecting the effects of crustal assimilation. Initial ⁸⁷Sr/⁸⁶Sr (0.70285-0.70507) and ¹⁴³Nd/¹⁴⁴Nd (0.512659-0.513021) ratios are corrected using new ⁴⁰Ar/³⁹Ar or ⁴⁰K/³⁹Ar ages. Isotopic compositions of the younger basalts (20-30Ma) form a distinct trend along the mantle array whereas the older basalts (~40Ma) scatter around Bulk Silicate Earth. Together, these new observations reveal that the earliest period of volcanism in the Older Volcanics province tapped a relatively homogeneous mantle source, and that magmas migrated to the surface without significant assimilation of continental crust. In contrast, the younger magmas interacted with and assimilated crustal material, modifying their compositions prior to eruption. The extent to which the mantle source rocks for this younger group may also have varied is under investigation. In addition, the role of the large-scale structures in channelling magmas to the surface, and/or influencing their ability to interact with crust, is an important component of this study.

Characteristic Elements of Products of Designations of Origin selected from Yangchun in Guangdong Province, China

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Kaempferia Galanga L. which is the product of designations of origin was selected from Shuangjiao town, Yangchun, Guangdong Province, China. The plants and soil profile samples were collected and the element content, element speciation, and lead isotope ratio were determined. Through the multivariate statistical analysis to ascertain the characteristic elements and multi-element group, and provide evidence for establishing the elements- isotope fingerprints of product identification system, the following conclusions:

A group of chemical elements in the plant could indicate the special effect from the special environment where the plants grown, with a closely relationship to the plants growth, those elements are called characteristic elements. According to the results of the analysis of weight, the characteristic elements of Kaempferia Galanga L. were Mn, Zn, Mg, Sr, Cu, Ni and Fe.

The factor analysis and cluster analysis were used for the purpose of the group of elements. The result of factor analysis showed that Cu, Co, Ni, Pb, Sr were the common element group in Kaempferia Galanga L. and soil. The cluster analysis showed that Co, Cr, Cu, Mg, Sr, Zn were the common element group in Kaempferia Galanga L. and soil. The results of the two methods can corroborated each other.

According to the results of the cluster analysis, Co/Ni, V/Co, Mg/Mn, Mn/Sr, Ni/Fe, Zn/Mn, Zn/Sr, V/Cr and V/Cu nine elements ratios was selected, and the change trend of consistent of elements ratios in the Kaempferia Galanga L. with corresponding soil profiles. The elements ratios could be identified as an important tracer tool.

The correlation analysis between elements speciation of soil and Kaempferia Galanga L. showed that effective state of element in soil had a significant relationship with the element content in Kaempferia Galanga L. The level of effective state of element of Fe, Mg, Mn, Pb and Zn in the research area was higher, but the level of Sr, Ti, V was lower.

Lead isotope ratios showed that the sources of lead in the soil profile and Kaempferia Galanga L. were very stable, lead isotope ratios of Kaempferia Galanga L. were very close to the distribution characteristics of soil region. ²⁰⁶Pb/²⁰⁸Pb-²⁰⁶Pb/²⁰⁷Pb showed significant correlation further proves the product with soil were homology. Lead isotope could be used as the criterion of fingerprint identification of products of designations of origin.

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