Thesis Summary

Determination of mantle characteristics below south west Japan: inferred from trace element and Sr-Nd-Pb isotope compositions of basalts from Kyushu island, southwest Japan arc
(西南日本弧九州地域の玄武岩の微量元素および Sr-Nd-Pb 同位体組成をもちいた西南日本直下のマントルの地球化学的研究)

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Basaltic magma erupted in an arc or back-arc setting is a gateway to understand the characteristics of the underlying mantle below the subduction zone. South-west Japan and adjoining areas in mainland Asia has a unique tectonic setting with a subducted pacific plate stagnant at the bottom of the upper mantle. The current arc magmatism at SW Japan arc is related to the young and hot subducting Philippine sea plate. Chemical characteristics of the magma produced in this setting is different from north-east Japan or other subduction zones in general. This area shows ocean island basalts (OIB) type enriched trace element patterns which indicate either an enriched mantle source or a unique magma generation process which contributes to this signature.

The aim of this study is to determine the source of this enrichment by looking at the trace elements and isotopic characteristics of alkali basalts erupted in this setting. Geochemical data from SW Japan arc and adjoining areas has been compiled from published papers reports and geochemical databases to observe the characteristics and trends within the data. Fieldwork was carried out in north-west Kyushu to study the petrological characteristics and obtain more geochemical data in our lab. Optical study, X-Ray fluorescence (XRF) and Inductively coupled plasma mass spectrometry (ICPMS) was used with established methods to obtain mineralogical, major element and trace element data. A new and improved method was developed for isotopic analysis which was used to measure basaltic samples from Kyushu in Thermal ionization mass spectrometry (TIMS).

The compiled and analysed data shows that the source of enrichment for Kyushu alkali basalts are likely to be different from that of the adjoining mainland Asia and Jeju island. The “OIB” like component do not have an isotopically enriched OIB endmember as a source and is more likely to be derived from the asthenospheric mantle itself, which was enriched by the subduction and stagnation of the Pacific slab. Geochemical trends show a similarity between alkali basalts from SW Japan and high Nb basalts from Philippine which may have been enriched by a similar process.