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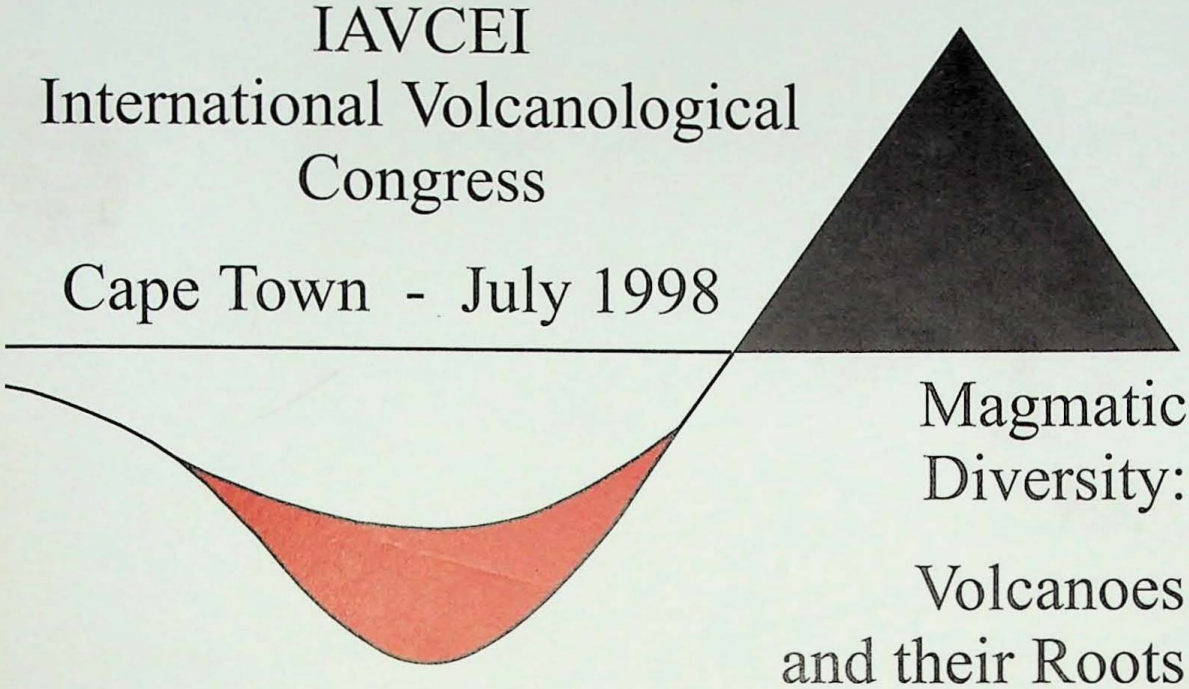

Magmatic
Diversity:

Volcanoes
and their Roots

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# Abstracts

## GEOCHEMICAL CHARACTERISTICS OF ANGOLAN CARBONATITES

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Geochemical characteristics were determined for some Angolan carbonatitic complexes of Early Cretaceous age. The data show that in general the occurrences have a depleted isotopic signature and a negligible or absent crustal imprinting, similar to the Namibian alkaline complexes. An occurrence located at the Namibian border (Lupungola) has low $^{143}Nd/^{144}Nd$ and $^{87}Sr/^{86}Sr$ ratios, and a carbonatite (Longonjo, central Angola) gives evidence of crustal contamination.

On the whole, the Angolan carbonatitic complexes fit the analogues from the Paraná Basin in terms of O-C isotopes, and represent the extension of the "Paraguay Array" into the depleted quadrant in terms of $^{143}Nd/^{144}Nd$ and $^{87}Sr/^{86}Sr$ ratios.

Model ages, with respect to the depleted mantle, cover the whole range of age spanning from Early-Middle- to Late Proterozoic times, corresponding to two main enrichment events in the subcontinental upper mantle, estimated at 2.0-1.4 and 1.0-0.5 Ga, respectively, as envisaged for the alkaline-carbonatitic complexes and flood tholeiites of the Paraná Basin.

## MIXING OF IGNIMBRITE AND UNCONSOLIDATED MUD DURING EMPLACEMENT OF THE KOS PLATEAU TUFF

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The eruption of the Kos Plateau Tuff (KPT) deposited several unwelded rhyolitic ignimbrites. On the northern side of Kos, the coarsest ignimbrite, E, was deposited on a surface comprising unconsolidated water-saturated Plio-Pleistocene sediments a few metres thick. The basal parts of ignimbrite E show spectacular interesting mixing features with this unconsolidated mud.

The mixed zone is up to 6 m thick. In places the lower boundary of the ignimbrite is entirely gradational into the underlying mud. Elsewhere the ignimbrite interfingers with the mud, forming ragged and fluidally shaped domains within deformed mud. In addition irregular lobes of ignimbrite E with lithic clasts concentrated at the base have deformed the underlying unconsolidated mud. The ignimbrite lobes may be discrete and uncontaminated or else be pervasively mixed with the surrounding mud. The lobes grade upwards into typical pumiceous ignimbrite E.

The irregular basal contacts of the ignimbrite are attributed to liquefaction of the underlying wet mud in response to rapid and uneven loading by the overlying hot ignimbrite and/or to fluidisation of the wet mud by steam generated from heated pore water. The gradational boundaries suggest that some mixing was syn-depositional with the emplacement of the overlying ignimbrite. However the lobes of ignimbrite probably formed as a result of post-depositional loading into the unconsolidated mud.

## ERUPTION OF THE RHYOLITIC KOS PLATEAU TUFF

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The explosive eruption of the Kos Plateau Tuff (KPT), Greece ejected 60 $km^3$ of rhyolitic magma depositing fallout, internally stratified pyroclastic density current deposits and ignimbrites.

The KPT magma had a granitic protolith represented by partially melted, variably vesiculated granitoid clasts identical in composition to the dominant juvenile pumice. A small volume of andesite (5%) is also present. The KPT magma chamber varied in the distribution of solid components and in the extent of mixing with andesitic magma. During the earliest phases of the eruption, the upper, less crystal-rich part of the magma chamber was tapped generating fine grained, finely vesicular, relatively dense pumice clasts. The deepest parts of the magma chamber were sampled during the climactic phase when a large amount of partially melted co-magmatic granitoid clasts, and coarse pumice blocks with a high crystal abundance, large vesicles and high vesicularities, together with the andesitic component, were ejected.

The internal stratigraphy of the KPT shows that the eruption increased systematically in intensity to a catastrophic climax followed by a waning phase. The climactic phase generated the most voluminous, widespread, coarsest and most lithic-rich ignimbrite, covering more than 8000 $km^2$. The coarsest and largest volume of accessory lithic clasts of the KPT occur within the co-ignimbrite lithic breccia at the base of this ignimbrite. The lithic breccia includes the greatest range of vent-derived lithic clasts of the KPT, encompassing the entire subvolcanic stratigraphic sequence.

Intensity controlled the style of the eruption (phreatomagmatic versus "dry" explosive) and nature of the deposit (fallout versus pyroclastic density current deposit versus ignimbrite). The intensity was also influenced by magmatic controls (depth of magma withdrawal and depth of fragmentation), the extent of vent and conduit erosion and eruption column dynamics.

## RAPID CHANGES OF MAGMA COMPOSITION IN RECENT ERUPTIONS FROM MERAPI VOLCANO, CENTRAL JAVA: A WINDOW INTO SUB-VOLCANIC MAGMA CHAMBER PROCESSES

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During the late Holocene, Merapi Volcano has been continuously active. Eruptive activity has ranged from relatively gentle lava dome effusion to violently explosive eruptions up to magnitude 5. Small to moderate eruptions appear to be the background to less frequent large magnitude eruptions. Study of the chemical composition of the deposits of these eruptions has provided an extremely detailed picture of the magmatic system which feeds the volcano.

Magma composition at Merapi ranges from basalt to basaltic andesite (52-56 wt.% $SiO_2$) and is characterised by high $Al_2O_3$ and medium to high $K_2O$. Systematic geochemical trends suggest the operation of three distinct processes in at least two distinct sub-volcanic reservoirs. A relatively long time scale ($10^3$yr.) deep-seated process, is seen as a discontinuous evolution from medium-K magmas to high-K magmas. A shorter time scale ($10^2$-$10^1$yr.) of continuous and cyclical variation is expressed in terms of parameters such as $SiO_2$, LILE and HFSE abundance and is interpreted as the results of shallow fractionation processes coupled with recharge from a mid-crustal storage reservoir. Variations within single eruption sequences reflect compositional zoning in small shallow magma pockets.

Geochemical trends point to a complex feeder system in which small magma batches evolve by crystallisation differentiation and interact by mixing and mingling. Periodic deeper seated recharge events 'reset' trends to less evolved compositions. Changes in eruptive behaviour reflect these processes.