CARBONATITE AND KIMBERLITE MAGMATISM ASSOCIATED WITH THE IMPACT OF THE PROTO-TRISTAN PLUME:

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The genesis of the Early Cretaceous Paraná-Etendeka large igneous province is believed to have been generated by the sub-lithospheric impact of the proto-Tristan mantle plume. Anhydrous decompression melting of the plume head caused the genesis of picritic and basaltic magmas beneath lithosphere of about 120 km. In regions of thicker lithosphere (e.g. the Luis Alves-Rio de la Plata and Congo cratons), the plume was volumetrically less significant as a melt source, but was responsible for transferring heat by conduction and/or advection in very small-fraction melts. These initiated melting of readily-fusible volatile-rich parts of the overlying lithospheric mantle and produced carbonatite complexes (132 Ma Jacupiranga, Brazil) and mafic potassic rocks (e.g. 127 Ma Sapucai minettes, Paraguay) in former mobile belts, and kimberlites in cratonic regions (e.g 134 Ma Lunda province, Angola). The Lunda kimberlites are highly diamondiferous and contain a variety of mantle xenoliths (garnet lherzolites and eclogites). The host rocks have higher abundances of LREE, lower HREE contents and slightly lower Sr- and higher Nd-isotopic ratios than the mafic potassic igneous rocks (lamprophyres) and carbonatites from the Damara Belt of NW Namibia and the Ribeira Belt of southern Brazil. Paraguayan carbonatites and mafic potassic magmas are characterised by relatively low abundances of elements such as Nb, Ta and Ti and very low epsilon Nd values (-13 to –17). These geochemical variations in the Early Cretaceous mafic potassic and carbonatite magmas reflect variations in depths of melt generation and the evolutionary histories of the sub-continental lithospheric mantle.