



Structure and Formation of the Agulhas Plateau Large Igneous Province

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The Agulhas Plateau in the SW Indian Ocean is a submarine plateau, whose crustal type was discussed controversial. Earlier studies describe it as consisting of continental fragments, while more recent studies found evidence for an oceanic affinity and conclude that it formed as a Large Igneous Provinces (LIP). LIPs are significant accumulations of intrusive and extrusive magmatic rocks on Earth. In order to address open questions on the structure and evolution of the Agulhas Plateau and its crustal role in the geodynamics of supercontinental break-up and seafloor generation, we collected seismic refraction, seismic reflection and potential field data on the Agulhas Plateau.

Our P-wave velocity-depth model of the Agulhas Plateau reveals 20 km thick oceanic crust on average. Seismic reflection profiles illustrate volcanic flows on the plateau, where seismic velocities in this layer range between 3.3 and 5.3 km/s. The upper and middle crust consists of mafic material with velocities between 5.3 and 6.7 km/s. In the lower 10 km of the plateau, velocities well above 7 km/s are observed. The velocity-depth structure leads to the conclusion that the Agulhas Plateau consists of overthickened oceanic crust. The typical three structural units of an oceanic LIP (extruded cover, intruded middle crust and a lower crustal body) are observed on the Agulhas Plateau. We determined the total volume of the Agulhas Plateau ($4 \times 10^6 \text{ km}^3$) and the extent of the extruded cover ($4 \times 10^5 \text{ km}^3$) with structural and velocity-depth information from seismic profiling. This data was used to investigate the amount of emitted gases from the extruded material into the ocean and atmosphere, which may have had an impact on the environment during Agulhas Plateau formation. We used a plate-kinematic reconstruction to obtain information on geometry and timing of the emplacement of the

LIP. These plate-tectonic reconstructions suggest a coeval formation of the Agulhas Plateau together with Maud Rise and Northeast Georgia Rise between 100 Ma and 94 Ma with a total size of 0.5 million km². Between these three parts of the LIP, a triple junction was situated which caused the fragmentation into Agulhas Plateau, Maud Rise and Northeast Georgia Rise leading to their present location on three different plates.