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New constrains on ridge-hotspot interactions from the PLURIEL cruise, Saint Paul-Amsterdam Plateau, Indian Ocean

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The PLURIEL cruise (Marion Dufresne II, 19 September - 31 October 2006) had as main objective the study of the temporal evolution of the interaction between the St Paul-Amsterdam hotspot (SPA) and the Southeast Indian Ridge (SEIR) over the last 15 m.y.. The SPA-SEIR system is an ideal target to study the transition of hotspot activity from an intraplate to an axial context. North-east of the SPA plateau, which corresponds to the axial activity of the hotspot, a chain of volcanoes possibly marks its intraplate activity. The most recent volcanic activity is located east of the Amsterdam island, very close to the ridge axis. The first results of the cruise show that the time evolution of this ridge-hotspot interaction is very complex.

Between the Amsterdam and the St Paul fracture zones, magnetic anomalies 6 to 5 (20 to 10 Ma) are well identified on each side of the plateau. The spreading rate is 2.5 cm/yr, as in the nearby ridge segments. Since 10 Ma, the spreading rate changed to 3.2 cm/yr. The volcanic chain is formed by several volcanoes emplaced on a broad regional depth anomaly. At about 450 km of the ridge axis, the chain disappears and a volcanic plateau begins to form. The plateau was built in different steps, with several ridge jumps and probably periods of increased magmatic activity.

The Bouguer anomaly shows that the crustal thickness varied with time as a function of the ridge-hotspot interaction. The volcanic chain is dominated by the gravity signature of the crustal thickening associated with each individual volcano. The volcanoes tend to form clusters and the Bouguer anomaly also shows a regional signature in good agreement with the depth anomaly. The transition between the chain and the plateau corresponds to a reduction in the size and volume of the volcanoes. When the plateau begins to form, the volcanoes disappear. On the plateau, the shallowest depths corre-

spond to a relatively negative Bouguer anomaly, revealing crustal thickening. The area where two ridge jumps were identified is marked by less negative Bouguer anomalies, corresponding to thinner crust and to a less magmatic accretion regime. The present day plateau is marked by a strong negative anomaly, the highest amplitudes corresponding to the St Paul-Amsterdam volcanic ridge.

The preliminary analysis of the magnetic data reveals at least three ridge jumps: between 10 and 8 Ma, the ridge jumped to the northeast; two ridge jumps took place to the southwest at 3.7 Ma ($\sim$50 km) and at 3.0 Ma (probably to the present day location). For the two recent jumps, the paleo-axes are marked by a deep axial valley. For the first ridge jump, the paleo-axis is probably located south of the plateau, where no multibeam data is available. These first results suggest that the plateau formed in at least two main phases, one between 10 and 3 Ma and another one between 3 Ma and the present.

Basalt samples obtained for several volcanoes and for features on the plateau were not yet analysed but the observation of the thin sections made on board reveal that the seamount lavas are richer in gas, which could mean either melting at greater depths or more water in the mantle.