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Structure and evolution of the Mozambique Ridge and Mozambique Basin

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The opening between Africa and Antarctica during the break-up of Gondwana was of utmost importance for the development of an effective exchange of water masses between the Indian and South Atlantic Ocean affecting the climate of the southern hemisphere. For the reconstruction of paleo ocean currents detailed knowledge of paleobathymetry is of substantial importance. Therefore, plate tectonic reconstructions serve as a basis for any kind of paleo ocean current model and are the first step in any paleo climate reconstruction. Recent models for the Mesozoic break-up of Gondwana between Africa and Antarctica (160-100 Ma) are able to describe the relative movements on a global scale. However, much uncertainty still exists about the development of oceanic features like the Mozambique Ridge, the Agulhas Plateau and the Maud Rise. All of these structures are large bathymetric features which act as effective barriers for ocean currents. Knowledge of the timing and the processes involved in the development of these ridges and plateaus is of great importance for the understanding of ocean circulation in the past. Within the AISTEK-II project a high resolution magnetic, bathymetric, and gravimetric survey was carried out across the Mozambique Basin and the Mozambique Ridge with the German research vessel SONNE (SO183). The objectives of this survey were to better constrain the chronology and geometry of the opening between Africa and Antarctica and the formation of the Mozambique Ridge. In the Mozambique Basin a decrease in the amplitude of the magnetic anomalies can be observed from west to east. This is probably the result of the decreasing influence of the Mozambique Ridge on the spreading system in the Mozambique Basin and the increase of the sedimentary input from the Mozambique Channel and the Zambesi Canyon. The magnetic anomalies can be modelled with ages from M0 to M25n (125 - 154 Ma). Existing interpretations of magnetic anomalies could be significantly extended to the east showing a continuation of the spreading system up to about

41°E. In the western part of the basin for the first time a sequence of magnetic anomalies from M0 to M25n (125 - 154 Ma) could be dated west of the known fracture zone E (name of the fracture zone after Segoufin (1978) and Simpson et al. (1979)). This yields new constraints on the early development of this basin and the break-up between Africa and Antarctica. Along the Mozambique Ridge the sequence of magnetic anomalies being present south of the ridge seems to be continued across the ridge with amplitudes between 200-800 nT. However, the southern end of the ridge is marked by a strong positive magnetic anomaly. In accordance with the new magnetic dataset two models for the development of the Mozambique Ridge are discussed. The one is based on the assumption that the Mozambique Ridge is of purely oceanic origin and that the ridge was once an active part of an east-west oriented spreading system. The second model describes the ridge as a large igneous province that was subject to extensional tectonics during the break-up between Africa and South America and the opening of the southern Natal Valley.