Crustal-Scale Architecture and Segmentation of the Argentine Margin and Its Conjugate Off South Africa

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Integration of regional seismic reflection/refraction and potential field data across the Argentine margin and its conjugate off South Africa, complemented by crustal-scale gravity modelling, is used to reveal and illustrate the whole-crust architecture, onshore-offshore crustal structure correlations, the character of the continent-ocean boundary/transition, and the relationship of crustal structure to regional variation of potential field anomalies. Several crustal transects are constructed at the investigated margins. The study reveals within these two provinces distinct along-margin structural and magmatic changes that are spatially related to a number of conjugate transfer systems, governing the margin segmentation and evolution and clearly implying structural inheritance. In particular, the Colorado transfer system on the Argentina margin, marks a distinct along-margin boundary in the distribution and volume of breakup-related magmatism. Similarly, the Hope transfer system on the conjugate South Africa margin also marks a distinct along-margin transition from a zone of relative magnetic quiescence to a zone of prominent magnetic anomalies. Furthermore, the study indicates that the “G-magnetic anomaly” along the South Africa margin probably defines the eastern limit of the continent-ocean transition rather than the continent-ocean boundary. Potential field plate reconstructions of the South Atlantic suggest conjugate margin asymmetry, characterized by a rather broad Argentine margin conjugate to a narrow South Africa margin. In detail, the Argentine margin is characterized by a sharp and relatively constant continent-ocean transition, whereas the continent-ocean transition along the conjugate South Africa margin is considerably wider. An along-strike tectono-magmatic asymmetry variation is also observed and is expressed by the northward increase of the continent-ocean transition width on the South Africa margin. The study clearly shows that integration of regional seismic reflection and refraction profiles, potential field data and gravity modelling provides a powerful resource for testing and validating alternative seismic profile structural interpretations and plate tectonic reconstructions, as well as geodynamic models for lithospheric breakup and early drift