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Variability of Sea-Surface Magnetic Anomalies at Ultraslow Spreading Centers: Consequence of Detachment Faulting and Contrasted Magmatism?

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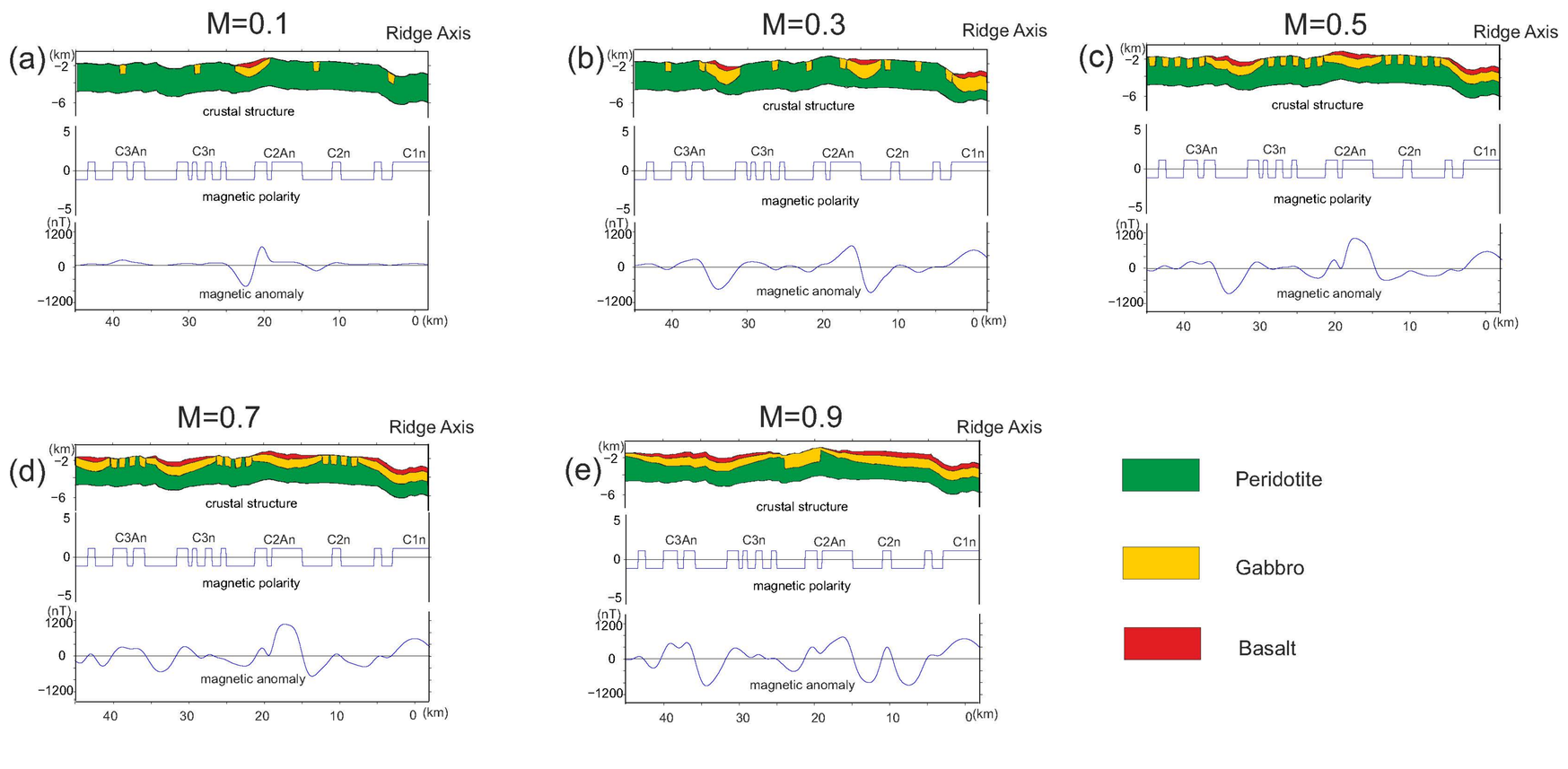
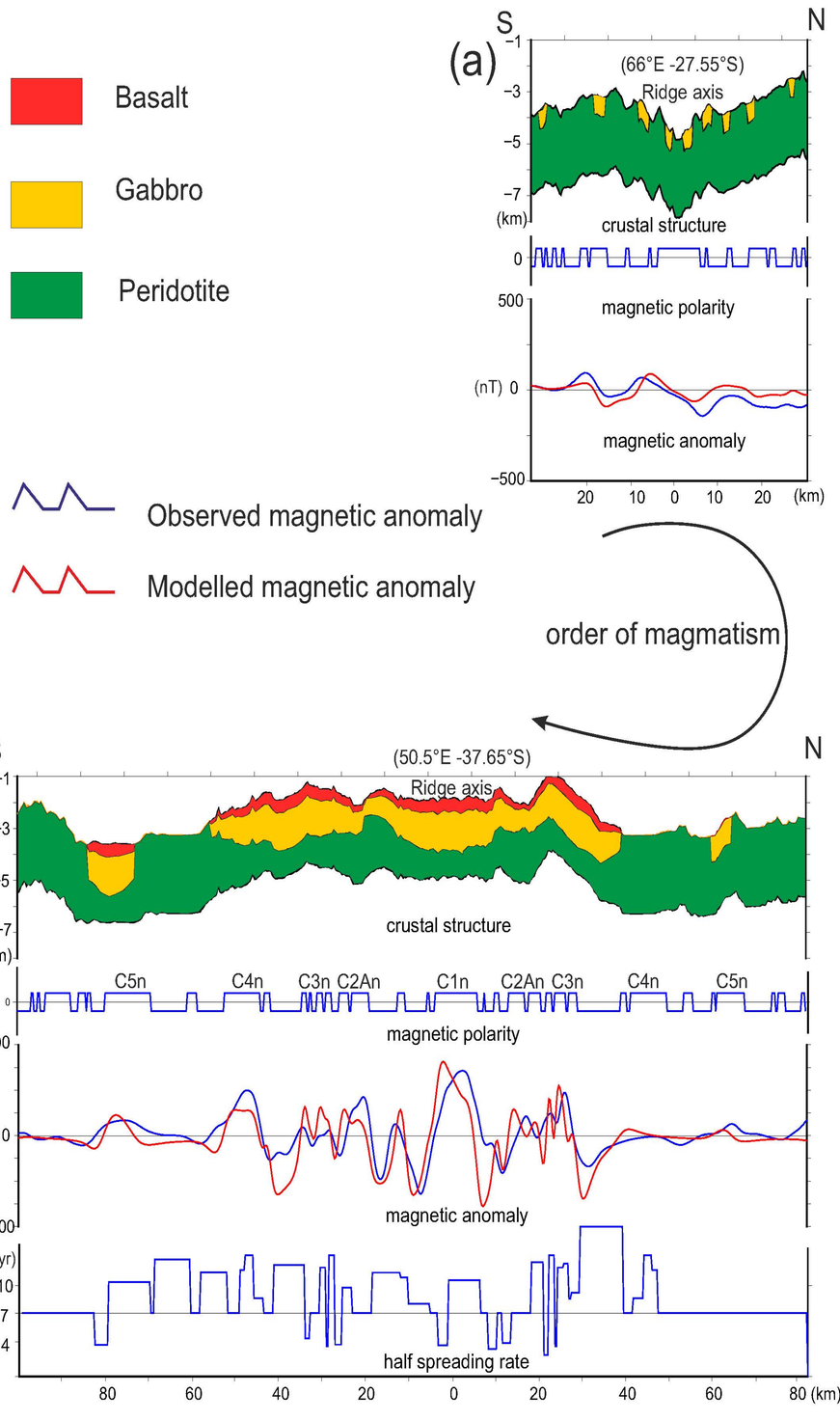
The capacity of oceanic crust to record geomagnetic polarity reversals makes sea-surface magnetic anomalies an essential tool to study plate tectonics. The anomalies are usually well-defined at magmatic spreading centers, but are distorted and eventually disappear on magma-poor mid-ocean ridges such as the ultraslow Southwest Indian Ridge (SWIR), making their interpretation difficult.

We attribute the skewness of marine magnetic anomalies to the detachment faulting at magma-starved environment.

To test this hypothesis, we set up a three-layer model in which assign the distribution of magmatic seafloor and detachment seafloor with gabbro bodies intrusion in different degrees of magmatism and polarity reversals.





Conversely, we selected four across-axis observed magnetic profiles along the ultraslow spreading Southwest Indian Ridge to test the reliability of the method and prove the reasonability of our hypothesis.

We set up models according to the forward results (The influences of different modes of seafloor to the anomalies) and compare the synthetic anomalies with observed anomalies.

We conclude that our method is reliable to approach the crustal structure at ultraslow spreading centers and detachment fault indeed distort the marine magnetic anomalies.