**CONTROL ID:** 1788566

**TITLE:** Effect of Latent Heat of Freezing on Crustal Generation at Ultraslow Spreading Rates

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**ABSTRACT BODY:** The transition between slow and ultraslow ridge axes occurs at the spreading rate below which steady state molten rock cannot exist above the normal Moho depth of ca. 6 km. The latent heat of basaltic magma freezing within the mantle and the kinematics of the seafloor spreading play significant roles in this transition. Using thermal models, we show that freezing of melt at mantle depths buffers temperature due to latent heat of freezing. This allows steady state crustal magma at lower spreading rates than when all the melt freezes at shallow crustal depths. Two quasi-stable seafloor-spreading patterns are possible: (1) basaltic magma along a narrow axial zone, maintaining a hot, weak axial lid that favors this extension pattern; (2) extension in simple shear over a broad zone with isotherms that are horizontal within the cool lid, favoring extension in simple shear. The statistics of basalt, gabbro, melt-impregnated peridotite, and peridotite dredged from transitional ridge axes indicates that the mode of crustal generation is extremely variable at ultraslow spreading rates. Portions of the easternmost Southwest Indian Ridge (SWIR) are spreading at 14 mm per year and consist of 90 percent peridotite, whereas the SWIR Oblique Segment has the same spreading rate but only 37 percent peridotite. Overall, the dredge statistics indicate that some, but not all, the latent heat of ascending magmas is released at mantle depth, that both quasi-stable seafloor-spreading geometries occur, and that magma ascent focuses locally along the strike of transitional ridge axes.

**KEYWORDS:** 8416 VOLCANOLOGY Mid-oceanic ridge processes, 8150 TECTONOPHYSICS Plate boundary: general, 8162 TECTONOPHYSICS Rheology: mantle.

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## Additional Details

**Previously Presented Material:** 20% in AGU talk several years ago. Paper has just been submitted to G^3 and will not likely be published by meeting.

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