

Deformation Modes of Magmatic and Amagmatic Ocean Lithosphere at Ultraslow Spreading Ridges

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Carriage House, Quissett Campus, WHOI

Talk Summary

At spreading rates below about 20 mm/y very little melt is formed at diverging plate boundaries and a particular class of mid-ocean ridge forms, the so-called ultraslow spreading ridges. They are characterized by extended regions that lack magmatic accretion and directly expose mantle rocks at the seafloor. Between these amagmatic segments, massive volcanic complexes receive more melt than the regional average.

To study the generation of new lithosphere in these contrasting regions we conducted passive seismic surveys with ocean bottom seismometers at two characteristic locations on the Southwest Indian Ridge. We discovered earthquake foci down to more than 20 km depth below seafloor that testify to a very cold lithosphere. Its upper portion deforms aseismically potentially indicating deep reaching serpentinisation.

The thickness of the elastic lithosphere varies drastically along axis, thinning considerably underneath sites of magmatic activity. We witnessed a dike intrusion event and imaged a melt body beneath a large volcano at the eastern Southwest Indian Ridge.

My talk will give an overview over the seismicity studies we conducted at ultraslow spreading ridges, explain the seismicity pattern and deformation modes at magmatic and amagmatic rift sections and discuss the differences in seismicity pattern to faster spreading ridges.