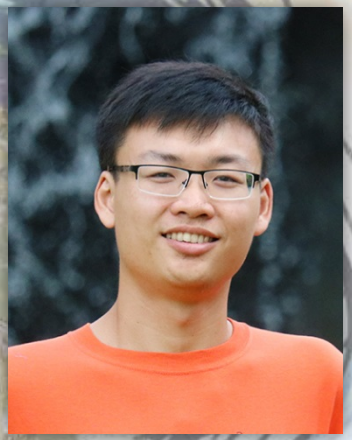
Dynamics of Submarine Volcanic Eruptions



Dr. Yen Joe TAN
（陳衍佐博士）

Ph.D. Marine Geophysics/Seismology
Columbia University

Over 75% of the Earth's volcanic activity happen on the seafloor, mostly at mid-ocean ridges. Mid-ocean ridge volcanism plays an important role in forming two-thirds of the Earth's surface and in chemical exchange between the subseafloor and the overlying ocean which supports chemosynthetic biological communities. Despite mid-ocean ridges' importance in our fundamental understanding of the Earth system, our knowledge of the dynamics of mid-ocean ridge eruptions is limited due to the difficulty of long-term monitoring on the seafloor. I will present results from in situ geophysical observation of two mid-ocean ridge eruptions. At the East Pacific Rise, a typical fast-spreading ridge, we find that the eruption was primarily controlled by the buildup of tectonic stress to a critical level. At Axial Seamount, a ridge-based hotspot volcano, we observe increased rate of magma influx into a segmented shallow magma reservoir weeks before the eruption. This suggests the eruption might have been triggered by magma overpressure in the shallow reservoir. Our observations present two end-member models of how mid-ocean ridge systems might evolve towards an eruption.

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EARTH SYSTEM SCIENCE PROGRAMME

Enquires: 3943 9624 essc@cuhk.edu.hk