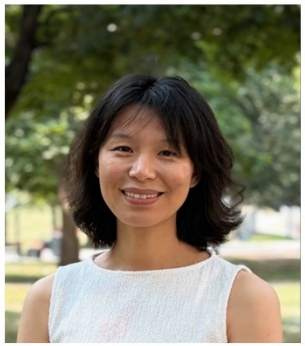
UNIVERSITY OF ALBERTA

Physics Colloquium



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October 23, 2026 @ 3 pm, CCIS L1-160

Refreshments available

Earthquake cycles, rupture barriers and fault-zone variability along oceanic transform faults

Oceanic transform faults that offset mid-ocean ridges display a unique combination of seismic slip and aseismic creep. With the fast-spreading rate (~140mm/yr) and short recurrence intervals (5-6 years) of magnitude 6 (M6) earthquakes, the Gofar transform fault of East Pacific Rise provides a natural laboratory to investigate the complex interplay between fault slip, stress and fluids. Along Gofar, M6 earthquakes repeatedly rupture segments straddled by barrier zones that also experience abundant foreshocks and seismic swarms but the physical processes governing this systematic behavior remain unclear. I will discuss recent studies based on two ocean bottom seismometer experiments (2008, 2019-2022), collectively covering over 60% of the seismic cycle along the Gofar fault. Our analysis shows that rupture barriers hosted intense microseismicity, including frequent, episodic seismic swarms and migrating earthquake bursts. The observed scaling between their migration speed suggests that these seismic swarms are governed by a combination of fluid-diffusion and aseismic fault creep. In contrast to the relatively simple geometry of the overall oceanic transform fault system, the rupture barrier zones exhibit structural architectures comprised of multi-strand faults and trans-tensional stepovers. Together with the observed seismic swarm migration patterns, these structural complexities suggest that damage-enhanced porosity and dilatancy-strengthening play key roles in governing rupture segmentation. We also observe abrupt relative seismic velocity (dv/v) reductions during M5-6 earthquakes, followed by rapid postseismic recovery with relaxation times of ~ 1-3 months, and distinct dv/v lows during seismic swarms, further revealing a consistent co-evolution of fault slip and fault zone damage that provides favorable conditions for strong dilatancy effect.

HOST: Mirko van der Baan, Professor of Applied Seismology