



University
of Victoria

PHYSICS AND ASTRONOMY COLLOQUIUM (In Person Only)

Dr. Suzanne Carbotte
Columbia University

“Illuminating the great earthquake fault of the Cascadia subduction zone with modern geophysical techniques: Implications for earthquake rupture propagation and plate fragmentation”

Abstract

Subduction zone megathrust faults rupture in patches or segments and some patches rupture repeatedly in multiple earthquakes with similar slip distributions whereas others do not.

There is strong evidence that structural heterogeneities in the upper or lower plate can contribute to rupture segmentation and in some locations, the along-margin arrest of earthquake propagation, but the details of the physical mechanisms involved are debated. In this presentation I will describe results from recent active source seismic imaging of the Cascadia subduction zone which reveals previously unrecognized structural segments of the megathrust bounded by margin-crossing faults in the lower plate, inferred to be tears in the weak thin down-going Juan de Fuca plate. The newly identified structural segments of the megathrust align with along-margin segments evident in indicators of past ruptures and current frictional behavior at Cascadia and we infer the segment-bounding plate tears may be narrow sites of reduced locking and frequent barriers to megathrust rupture propagation. A

key insight is that local topographic relief on the subducting plate can form within the subduction zone, in addition to relief inherited from crustal formation, and these structural heterogeneities can impact rupture propagation along the megathrust. I will also discuss what contributes to the regional changes in lower plate geometry, why the lower plate may be tearing, and implications for processes deeper in the subduction zone at Cascadia.

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