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## Earthquake Hazards in BC

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British Columbia has the highest earthquake risk in Canada due to the tectonic configuration of the west coast of North America. The Juan de Fuca, and two smaller plates, are subducting under the western portion of the North American plate. This results in three locations of possible damaging earthquakes: along the plate boundary; in the overriding North American plate; and in the subducting Juan de Fuca plate. A megathrust earthquake (aka “the big one”) along the subducting plate boundary would result in a ~ M9 earthquake causing intense ground shaking over a large area and trigger a large tsunami. The last Cascadia subduction zone earthquake was January 26, 1700. The deeper portion of the locked subduction zone undergoes episodic tremor and slip. Movement in the range of a few cm migrates along the plate boundary, relieving stress in this area, but increasing stress on the shallower, completely locked zone. This occurs every ~15 months, and is a time of increased risk of a subduction zone earthquake.

Earthquakes in the North American plate are caused by stresses built up by the locked subduction zone. These earthquakes are shallower than a subduction zone earthquake and cause intense shaking but in a smaller area. The 1946 Vancouver Island M7.6 caused significant damage to the central Island area, and extensive liquefaction and landslides. Although active postglacial faults have been identified in Washington State for decades, only with the advent of lidar have active postglacial faults been identified in BC, with three on southern Vancouver Island. This significantly increases the risk of a damaging crustal earthquake in greater Victoria.

Earthquakes in the subducting plate are caused by flexure of this plate. The 2021 M6.8 Nisqually earthquake was at 50 km depth and caused ~\$2 billion in damage. The swarm of small earthquakes just south of Victoria in September originated in the subducting plate.