Aftershocks of the NEXT Cascadia Intraslab Earthquake

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In 1949, 1965, and 2001 damaging (M6.5-M6.8) deep (~60 km) earthquakes ruptured faults within the Juan de Fuca slab beneath the Puget Sound region of the Cascadia subduction zone in the Pacific Northwest of the U.S.. Each had only a few and very small (approximately M<4) aftershocks. Immediately after the *next* such damaging intraslab earthquake shall we tell the public and first responders that there will likely be no damaging aftershocks? While this low likelihood of aftershocks seems probable based on the historical record, there is no compelling well-agreed-upon physical reason to expect this behavior. For example, recent deep intraslab earthquakes in Japan, Alaska, and Mexico have been followed by strong aftershock sequences. Is the lack of aftershocks following Cascadian intraslab earthquakes unique or extreme? And is it expected and explainable? Possible explanations for regulating the production rate of aftershocks include physical environmental characteristics such as pressure and temperature, geological differences like rock types and faulting geometry, dynamic frictional factors like slip rates, afterslip, and stress drop, and possible roles of fluids. We survey aftershock occurrence following recent smaller Cascadian intraslab earthquakes and following recent large intraslab earthquakes in a number of subduction zones and attempt to classify and distinguish between hypotheses for the lack of Cascadian deep earthquake aftershocks. Is this another possibly unique feature of Cascadia, like the nearly complete lack of instrumentally observed interface earthquakes of any size?

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