Full-Rip 9.0: The Next Big Earthquake in the Pacific Northwest

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Book Review

Waiting For the Next Big One(s)

Full-Rip 9.0: The Next Big Earthquake in the Pacific Northwest by Sandi Doughton, Sasquatch Books, Seattle, WA. ISBN 978-1-570-61855-0. 288 Pp. $9.99 paperback

Anyone who has lived in the Pacific Northwest for long enough has witnessed a profound revolution in our understanding of the natural hazards that can afflict this region. Prior to the mid-1980s, the rogue's gallery of potential risks to life and property included volcanic eruptions, landslides, floods, and the occasional odd earthquake. Regional "great earthquakes" driven by plate tectonics were not on the radar, even though the Cascadia Subduction Zone (CSZ) was known to be lurking offshore and the Northwest's tectonic setting was extremely similar to areas of Japan and Chile, where megathrust earthquakes with magnitudes greater than 8.0 were recognized if not common. Geologists had a spate of theories to explain the unusual quiescence of the CSZ: a tectonically dead plate too small to worry about, perhaps with well-greased skids that didn't lock up. Thus, it remained primarily a curiosity until the mid-1980s when Brian Atwater paddled his canoe up and down the estuaries along the western coast of Washington, and made a startling discovery in the muddy river cut-banks. Many of them displayed a distinctive peat layer, sometimes with remnant dead forests rooted in place, then overlain by beach sands. That combination could only have come from the one-two punch of a sudden dropping of the land, followed immediately by an on-rushing tsunami. This signature deposit showed up repeatedly in different estuaries down the Washington and Oregon coasts and, when the radiocarbon dates from all locations converged on similar dates, it could mean only one thing: the quiescent CSZ was prone to massive, megathrust earthquakes.

In *Full-Rip 9.0*, Sandi Doughton, science reporter for the *Seattle Times*, has given us a first-rate, detail-rich, and technically sound chronicle of these changing geological perspectives. The narrative follows more than subduction zone earthquakes, encompassing as it does the entire earthquake-prone setting and history of the Pacific Northwest. Although I initially found the title off-putting—sounding a bit of a mash-up between the famous "Rip City!" Blazer war-cry of Bill Schonely and an instruction manual for a late-edition woodworking app—the book itself is anything but. Part scientific detective story, part seismic tutorial, part sobering oracle of disasters to come, Doughton takes us on a lively and literate tour of the landscapes, both seen and unseen, where earthquakes and the cast of interesting geological characters who study and think about them, are born.

The book begins with a thoughtful word-painting of how the last CSZ earthquake that struck at 9 pm on January 26, 1700, might have been experienced by the Northwest natives in their coastal villages. The precision of this date and time is explained later in the recounting of an "orphan" Japanese tsunami that was not preceded by a local Japanese earthquake. We are then introduced to Atwater, Tom Heaton, and other now-famous geologists who, early in their careers, became convinced that the CSZ wasn't dead but in fact very much alive and posed a major regional threat. Doughton plays this story off against the travails of the Northwest nuclear power industry, trying to get their plants approved and built. Other types of earthquakes, including both deep and shallow events, are introduced, and their frequencies, magnitudes and potentials for wreaking havoc assessed.

Along the way she explains the sometimes arcane science of seismology with lucidity and verve, relying on clear metaphors and visual images to help the reader along. How many different ways can the subterranean earth rupture and jerk? How do we know how frequently earthquakes occur and how big they get? What areas are most at risk, and how do we know? The book would work well as a text for an undergraduate, non-major class

in natural hazards, conveying as it does both the rich and evolving understanding of the regional's tectonic history and the excitement and uncertainty of the scientific chase. We see the human face of geology as well as its insights.

I have a few nits to pick. While the graphics are informative, there are too few of them to help geological rookies pick their way through the large, 3-dimensional canvas on which the region's earthquakes play out. Doughton might have used an early graphic to foreshadow the diversity of earthquake types that the book addresses rather than having them accrue later, potentially confusing the reader. I thought her discussion of tsunami generation and resultant hazards a bit thin, particularly given the fact that much of the carnage from the next CSZ earthquake will likely come from massive coastal flooding rather than shaking, as it did in Japan in the Tohoku quake of 2011.

But these are relatively minor issues that pale in comparison to the compelling overarching narrative and scope of the book. We learn about the "sausage-making" that goes into seismic hazard maps, the potential for urban centers and skylines to survive future seismic events (spoiler alert: the Space Needle will probably do just fine), the chimera of earthquake prediction, and the struggles of scientists and educators to bring a reluctant public on board with the certainty of great earthquakes to come. The book concludes with a checklist of what everyone should do to prepare, and a call to individual and collective action.

If Kathryn Schulz's Pulitzer-Prize winning account in the *New Yorker* of the CSZ earthquake to come awakened the public to the inevitable hazards of living in the Pacific Northwest, *Full-Rip 9.0* takes us further and deeper, reminding us that the solid Earth on which we live keeps its own seasons and rages. The imperative to listen, plan, and prepare for what lies ahead is both earthshaking and essential.

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Gordon Grant's research focuses on river and watershed responses to changing streamflow and sediment transport regimes due to climatic change, geomorphic processes, volcanism, land use, and landscape evolution. He is also Courtesy Professor in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University, and a Fellow of both the Geological Society of America and American Geophysical Union. The views expressed in this review belong to the author and do not represent a position of the U.S. government.