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Comparison of Offshore Turbidite records and Lake Disturbance Events at the Latitude of Seattle, Washington

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Abstract:

We are investigating the paleoseismic history of northern Washington using offshore turbidite cores and lake sediments collected from forearc lakes along a transect from offshore to Seattle, Washington. Additional offshore cores, ash determinations and heavy mineral analysis flesh out the turbidite stratigraphy off northern Washington, and support 3-5 proximal turbidites in northern Washington canyons (see Adams, 1990) in addition to the 19 regionally correlated beds. Onshore, we have cored multiple lakes including (west to east) Beaver, Leland, Tarboo, Hall, Sawyer, and Wapato, east of the Cascades, and collected multibeam bathymetry, backscatter and chirp subbottom data. These lakes are small (2-113 ha), 6-18 m deep, and are all kettle lakes except Beaver Lake (landslide-dammed) and Wapato Lake, a glacial scour. These lakes were selected for their limited outside sediment sources and low sensitivity to ground shaking. The sedimentology is mostly organic-rich gyttja. All lakes contain the Mazama ash based on its similar depth occurrence in previously published cores and new EMP analysis. Computed Tomography (CT) density, gamma density, and magnetic susceptibility (ms) data show there is more stratigraphic variability than is visually apparent. Low-energy disturbance events are apparent in the stratigraphy of all lakes (except Hall) as increases in clastics, density, and ms. The number of post Mazama disturbance events is similar to the number of expected great earthquakes found offshore and onshore, though definition of the boundaries of the lake events is much less clear. Initial radiocarbon results and preliminary correlations along this 185 km transect show strong similarities in stratigraphic records between these cores over the past ~7600 years, anchored by the Mazama tephra. Preliminary comparisons with offshore cores show a striking similarity in downcore variability in physical properties. Given the evidence for earthquake origin for the offshore cores, and the strong common signal across the lake transect, we suggest that the lake disturbance events are likely of earthquake origin, representing turbidites generated internally within each lake. Analysis continues with the goal of estimating slope stability and minimum levels of ground shaking required to destabilize lake margins.