## 1999 Fall Meeting
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HR: 1330h
AN: **S42B-02**
TI: Turbidite Event Stratigraphy and Implications for Cascadia Basin Paleoseismicity
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AB: Numerous Holocene turbidite events have been found in Cascadia Basin canyon mouth and downstream channels from Vancouver Island to Cape Mendocino. The consistent pattern of turbidite deposition from multiple canyon sources along 1000 km of the continental margin has several implications for the Basin paleoseismic record. Correlation of events is based on the first occurrence of Mazama Ash in turbidites and on the approximate onset of Holocene sediment deposition as determined by a dominance of radiolarian fauna in hemipelagic sediment. The Holocene onset is estimated to be about 11,300 calendar yr BP (cal yr) near the base of the continental slope. The first post-Mazama turbidite event occurred about 7500 cal yr ago or 100 yr after the Mt. Mazama eruption forming Crater Lake, Oregon. Twelve post-Mazama (MA) events are found in the Juan de Fuca Channel in north Cascadia Basin; 12 or 13 MA events occur at multiple locations in Cascadia Channel and Rogue Channel which is at the south end of Cascadia Basin. Astoria Canyon mouth and upper Astoria Channel contain 11 or 12 MA events; however, erosional cutouts and bed amalgamation make exact event determination difficult. In previously existing cores, only 3 MA events were found in middle and lower Astoria Channel which appeared to contradict Adams (1990) hypothesis for 13 MA events. In new cores, we find a progressive loss of turbidites from 7 to 6 to 5 MA events at each successive downstream channel splay in upper Astoria Channel. This down-channel loss of MA events resulting in only 3 MA events in the mid-lower Astoria Channel explains the previous apparent contradiction. In sum, for 700 km along the Juan de Fuca subduction zone, the most conservative interpretation is that a minimum of 12 MA events occurred. Assuming event 12 took place 7500 cal yr and event 1 took place 1700 AD (Satake et al., 1996), 11 turbidite events have occurred during 7200 years or on average every 655 years. Existing AMS ages show 700 yr between the first and second MA events; the same periodicity between most events in all cores also is suggested by the consistent thickness of hemipelagic sediment representing about 600-700 yr between turbidite beds. Where Mazama Ash stratigraphy is not present south of the Rogue Canyon, the number of evenly-spaced Holocene turbidite events in channel

systems progressively increases toward the Mendocino Triple Junction at the southern end of Cascadia Basin. In Trinidad 25 turbidite events or l per 452 yr occur, in Eel 50 or 1 per 226 yr and in Mendocino 1 per 65 yr based on AMS ages found in a 1986 box core. The synchroneity of turbidite events in the northern two thirds of Cascadia Basin (1 per 655 yr) and the progressively increasing frequency of events toward the triple junction are best explained by seismic triggering. Because up to 7.2 magnitude earthquakes have occurred in the Mendocino vicinity since 1986 and because there is no surface sand in a 1999 box core taken at the 1986 Mendocino Channel site or other southern Cascadia channel locations, it appears that southern Cascadia Basin turbidite events represent greater than 7.2 magnitude earthquakes. Most important, the Cascadia Basin evidence verifys this new paleoseismic technique utilizing turbidite event stratigraphy, and this technique can be applied in other specific settings worldwide where an extensive fault traverses a continental margin

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