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Oblique Convergence and Active Strike-Slip Faults of the Cascadia Subduction Zone: Oregon Margin

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A recent (May, 1993) sidescan sonar cruise focused on the investigation of suspected oblique strike-slip faults of the Cascadia continental margin off Oregon and Washington. Three such faults were investigated using SeaMarc 1A sidescan sonar in 1986 and 1989, which led to the present effort to investigate the extent of these faults and to search for similar structures along the margin. Using SeaMarc 1A sidescan sonar, and SeaBeam and Hydrosweep swath bathymetry in conjunction with existing seismic reflection profiles, we surveyed 10 suspected zones of oblique strike-slip faulting on the continental slope and abyssal plain from 43° N to 48° 10' N. Six new strike-slip faults were discovered, three in Washington and three in southern Oregon, totaling nine left-lateral faults. The six faults mapped in Oregon and three in Washington strike 298° to 283°, with obliquity to the margin increasing to the south. The three new faults are expressed prominently in swath bathymetry as irregular ridges composed of en echelon folds, and sigmoidal bends of throughgoing accretionary wedge folds. SeaMarc sidescan records of these structures reveal steep scarps cutting accretionary wedge folds and commonly show straight traces, reversals of vertical separation, and left-lateral horizontal offsets of submarine channels and other crossing structures. These newly mapped faults appear to be similar in most respects to the earlier mapped faults which cut both upper and lower plates, extending from the abyssal plain to the upper slope/outer shelf region.