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

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Three of the nine strike-slip faults discovered in the Cascadia subduction zone were imaged on the abyssal plain and continental slope off southern Washington with a deep-towed SeaMARC-IA sidescan sonar system. Two of these faults were previously discovered on the Juan de Fuca plate (Nitinat Fan) at the base of the continental slope in a water gun seismic reflection survey, but their continuity, orientation, and slip direction were unknown. All faults apparently cut the Holocene turbidite sediments of the fan which are ovelain by 1-2 m of mud. The faults are oriented about 284¡. The Holocene age of the faulted sediments is based on radiocarbon ages and the foraminiferan-radiolarian ratio, a biostratigraphic indicator, dated at 13,000 years B.P in piston cores. The late Pleistocene submarine channels on the fan are offset up to 450 m in a left-lateral sense. A prominent mound with 75 m of relief and about 2 km in diameter occurs about 3 km seaward of the base of the continental slope and lies along one of these strike-slip faults. Water gun records made over the circular mound show a loss of acoustic signal directly beneath the feature, suggesting this feature is a diapiric intrusion. Bottom photographs and a sediment core from the mound show that highly dewatered and fractured mudstones crop out in irregular patterns on the seafloor. The strike-slip fault has probably breached the overpressured abyssal plain deposits beneath the fan, allowing the intrusion of muds. The faults continue up the continental slope where folds on the accretionary prism are displaced left-laterally, producing a sigmoidal map pattern.