The Structural Evolution of the Gorda "Plate": Destruction of a Plate Fragment Prior to Subduction in the Cascadia Subduction Zone

Details

Meeting	2002 Fall Meeting
Section	Tectonophysics
Session	The Structure and Evolution of the Incoming Plate at Subduction Zones II Posters
Identifier	T52B-1203
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Index Terms	Oceanic structures [0930] Plate tectonics [3040] Seafloor morphology, geology, and geophysics [3045] Seismicity and tectonics [7230] Fractures and faults [8010]

Abstract

The Gorda "plate" the southern-most fragment of the Juan de Fuca plate subducting beneath North America within the Cascadia Subduction Zone, represents an excellent example of the destruction of an oceanic lithospheric plate. Continuing structural mapping of the entire plate based on new and previously acquired multibeam bathymetric, backscatter, and seismic reflection data reveals a complex interplay of multiple generations, styles, and orientations of faulting. Primary spreading-center created faults dominate the plate, many of which are found to have undergone reactivation either as normal faults or as dip-slip faults that contain a significant component of strike-slip motion. Although fewer in number, the faults of most significance are northeast-southwest trending left-lateral strike-slip faults cutting through the central and northern parts of the plate, offsetting basement ridges, knolls and at least one inter-ridge channel. The most prominent of these is an approximately 100 km long fault originating at the spreading ridge, smoothly

curving through the center of the plate laterally offsetting several large basement ridges, one knoll, and an inter-ridge channel, and joining a normal-reactivated basement ridge fault in the northern part of the plate. These second-generation strike-slip faults appear to be a major controlling factor in the absorption of deformation currently being imposed on the plate by continued subduction in the Cascadia Subduction Zone. In addition, recently acquired 3.5 KHz reflection data over several faults in the southern and central parts of the plate, including structures previously identified as inactive pseudofaults, shows clear evidence of recent activity. Relocated earthquake epicenters from several large Gorda intraplate events, achieved using the North Pacific SOSUS network, show excellent correlation with both the left-lateral strike slip and other mapped faults within the plate, attesting to the continued internal deformation of the plate.

Cite as: *Eos Trans. AGU*, 83(47), Fall Meet. Suppl., Abstract T52B-1203, 2002

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