

MORGAN, HUGH M., Western Mining Corporation, Ltd., Melbourne,
Australia

Geology, Structure, and Volcanic Processes of Southern Juan de Fuca Ridge

The southern Juan de Fuca Ridge is a medium-rate spreading center (total opening rate = 6 cm/year) in the northeast Pacific Ocean, 500 km west of central Oregon. A 25-km segment of the ridge has been the focus of a 6-year study by the U.S. Geological Survey. The ridge crest displays well-developed

cross-axis symmetry with 80 to 100-m high ridges formed by predominantly inward-facing fault scarps and a relatively smooth 1-km wide axial valley floor. Multichannel seismic reflection profiles across the axis indicate the presence of a crustal magma chamber roof, 1-2 km wide and 2.3 km beneath the valley floor. The seismic reflection data are insufficient to determine the along-axis continuity of the magma chamber. SeaMARC II side-scan imagery, extensive photographic surveys, and observations from the *Alvin* submersible reveal a continuous linear depression 30-50 m wide and 10-30 m deep that bisects the axial valley floor through the study area. The depression is offset in places and may locally have short overlapping strands.

The depression is characterized by sharp rims, steep walls, and a floor of mostly rough-surfaced lava and lineated sheet flows. It is flanked by a region of subsided, fresh lava flows. These flows, in turn, are surrounded by sheet flows containing numerous small collapse pits. Unpitted sheet flows occupy the marginal part of the axial valley floor. The depression appears to be the site of voluminous fissure eruptions that fed the lavas on the surrounding valley floor. Active hydrothermal vents are present within the axial depression, but have not been observed elsewhere on the axial valley floor. This axial depression appears to be a unique feature among medium-rate spreading centers that have been studied to date.