

HEAT FLUX FROM BLACK SMOKERS ON THE ENDEAVOR  
AND CLEFT SEGMENTS, JUAN DE FUCA RIDGE

A thesis submitted to the graduate division of the University of Hawaii  
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

IN

OCEANOGRAPHY

DECEMBER 1992

by

Ursula Ginster

Thesis Committee:

Michael J. Mottl, Chairperson  
James P. Cowen  
Christopher I. Measures  
Telu Y.-H. Li  
David Bercovici

## ABSTRACT

I have estimated the heat flux from black smokers on the Juan de Fuca Ridge to establish their importance for heat transfer from young ocean crust. The velocity and temperature of smoker effluent were measured using a turbine flowmeter with a temperature probe attached. The estimated heat flux from smokers alone is  $49 \pm 14$  MW for the Plume Site, Vent 1 and Vent 3 on the Cleft Segment;  $364 \pm 168$  MW for the main vent field on the Endeavor Segment and  $122 \pm 65$  MW for the Tubeworm field 2 km north. These values constitute only 6% to 10% of the total advective heat flux estimated for these vent sites from measurements of diffuse flow and of total flow made by other methods. On the Endeavor Segment the heat flux is focused by faults. The heat flow data in conjunction with seismic data suggest a non-steady-state magma chamber beneath the Juan de Fuca Ridge.