



PACIFIC OCEAN MINERALS PROJECT: PROGRESS REPORT
OCTOBER 1980.

By R. L. Chase, E. V. Grill, and J. W. Murray

INTRODUCTION

The Pacific Ocean Minerals Project has as its objective location and evaluation of mineralization by hydrothermal processes on the actively spreading Juan de Fuca and Explorer Ridges in the Northeastern Pacific Ocean west of British Columbia. Since mid-1977, three cruises aboard a Canadian oceanographic vessel have resulted in study of four areas at ridge crests. Of the following resultant M.Sc. thesis projects, four are nearing completion, and the fifth is in its initial stages:

- (1) G. Beland (1977) – Rocks and Sediments of the Western Rift of the Northern Explorer Ridge.
- (2) R. Cook (1977) – Sediments of Northern Juan de Fuca Ridge.
- (3) M. Price (1978-1980) – Sediments of Juan de Fuca Ridge at 47°N Latitude.
- (4) K. Hansen (1979) – Sediments of the Eastern Rift of Explorer Ridge.

A manuscript has been accepted for publication concerning a hydrothermal deposit from the eastern rift of Explorer Ridge (Grill, *et al.*, in press).

METHODS

Work at sea included echo-sounding and continuous seismic-reflection profiling, magnetometry, sediment coring, rock dredging, and water sampling. Resultant profiles and contour maps of bathymetry and sediment thickness showed details of the rift system formed by recent spreading.

Laboratory work by graduate students, designed to elucidate relative importance of various inputs to the sediment near the ridge crests, included chemical analysis, mineralogy, grain-size analysis, and study of x-radiographs. E. V. Grill analysed pore fluids and sediment of selected cores.

RESULTS

The region has received terrestrial sediment at a rate far higher than the average rate for spreading oceanic ridges, because of its proximity to a heavily glaciated continent of high relief. As a result, inputs on heavy metals to the sediment due to hydrothermal effusion at the ridge crest, if they exist, are masked in most areas by glaciogenic sediment. This is particularly true on Juan de Fuca Ridge, where open-ended valleys and proximity to the sediment-flooded Cascadia Abyssal Plain allowed relatively free access of turbidity currents to the ridge crest. Explorer Ridge, with rift valleys more sheltered from turbidite deposition, is the site of at least one hydrothermal deposit (Grill, *et al.*, *op. cit.*). Minerals developed here are oxides of manganese and iron-rich montmorillonites, indicative of the low-temperature effusion like that described on

Galapagos Ridge rather than the high-temperature effusion encountered west of Mexico which produced the copper-zinc-rich 'black smokers'. Further indications of hydrothermal input on Explorer Ridge come from anomalously high manganese content of pore waters in a core from the east rift.

The following work is planned for 1980-1981:

- (1) Further analysis of core samples.
- (2) A Q-mode factor analysis of chemical and grain-size data.
- (3) Petrography and analysis of major and trace elements of basalt from Explorer Ridge.

REFERENCE:

Grill, E. V., Chase, R. L., MacDonald, R. D., and Murray, J. W. (in press): A Hydrothermal Deposit From Explorer Ridge in the Northeastern Pacific Ocean, *Earth Planet. Sci. Lett.*, in press.