TURBIDITE PATHWAYS IN CASCADIA BASIN AND TUFTS ABBYSSAL PLAIN, PART A, ASTORIA CHANNEL, BLANCO VALLEY, AND GORDA BASIN

OVERVIEW

This report was prepared in support of the USGS Earthquake Hazards of Cascadia Project. The primary objective of this phase of the project is to determine recurrence intervals of turbidites in Cascadia Basin floor channel systems and evaluate implications of this event record for the paleoearthquake history of the Cascadia subduction zone. The purpose of this study is to determine whether the canyon/channel systems themselves are blocked or deformed to such an extent that the downstream turbidite stratigraphy might not be representative of the ancient Cascadia paleoearthquakes. The analysis of turbidite channel sediments from 7508 km of preexisting 3.5-KHz seismic data were evaluated to determine the direction and extent of the Astoria Channel pathway system (44°42'N) which continues southward from the morphologically well-developed proximal channel of northern Astoria Fan (44°44'N) (see seismic section A). Additionally, distribution and thickness of turbidite sediment sequences were determined along each identified pathway. Bathymetry and distance were used to calculate bedforms and to compare turbidite channel segments to each of the secondary pathways that feed into it. Channel pathways were identified on the basis of channel physiography, where visible at the seafloor, subbottom channel configuration, and acoustic patches of sediments that might represent turbidite deposits. A principal result of this study is that the Astoria Channel pathway extends continuously from the northern Astoria Fan southwest along the base of the continental slope through the Blanco Valley. From the Blanco Valley, the channel descends on the mantle and enters the Gorda Escarpment region of the Escanaba Trough. Additionally, it was determined that the Astoria Channel is filled and locally buried for its full length south of 44 degrees latitude. The Heeds Megafan and the Ano North Slump, as defined by Goldfinger (1989), (see sheet 3, Map A and B), may have been instrumental in blocking the pathway and thus contributed to the filling of the original channel/pathway.

Sheets 1 and 2 show the Astoria and secondary turbidite pathways in blue. Ship survey locations are shown for the area studied: they are time and date coded, and color keyed with the ID of the data source at the bottom of each sheet. The first letter in the circled ID is an abbreviation letter for the ship name, the following numbers represent the consecutive cruise number of that year, followed by the year number. The letters at the end of the ID represent the survey area, i.e., N: northern California, NW: north Pacific, W: Washington/Oregon. Locations of selected sample seismic sections are shown in sheets 3, 5, A, and B. Stacks for each of the sheets are the same as for sheets 3, 5, which have been color coded for the survey area. Seismic sections are drawn along major pathways in white circular highlights. The data and interpretation are based on a background of USGS GLORIA side scan sonar imagery (1984) to illustrate the relationship of pathway positions to subsea features.

Channel distance points are plotted along channel centerlines at 25-km intervals. These points begin at the start of each interpreted channel pathway. A bathymetric distance was assigned to each distance point. These data points were used to create the channel pathways shown on sheets 3 (MAP A), 4 (MAP B), and 5 (MAP C). These pathways have been drawn along major pathways in white circular highlights. The data and interpretation are based on a background of USGS GLORIA side scan sonar imagery (1984) to illustrate the relationship of pathway positions to subsea features.

S. P. Lee  L-4-77-NC ship tracks
Sea Sounder  S-12-78-NC ship tracks
S. P. Lee  L-5-81-NC ship tracks
S. P. Lee  L-12-81-NC ship tracks
S. P. Lee  L-5-81-NC ship tracks
Farnella  F-4-84-WO ship tracks
S. P. Lee  L-3-86-NC ship tracks
S. P. Lee  L-4-86-NC ship tracks
Farnella  F-3-84-NC ship tracks
Ewing  E-14-94-WO ship tracks

Sheets 3 (MAP A), 4 (MAP B), and 5 (MAP C) show channel location pathways, bathymetric depth based on the USGS COrb data base (GLOB), bathymetry, thickness and turbidite sediment fill of various locations. The interpreted turbidite sediments are also highlighted on the selected seismic sections to differentiate them from the typical deep sea sediments below and/or to the side of the channel. Turbulidite location is shown along major pathways in white circular highlights. The data and interpretation are based on a background of USGS GLORIA side scan sonar imagery (1984) to illustrate the relationship of pathway positions to subsea features.