

Depth to the Juan De Fuca Slab Beneath the Cascadia Subduction Margin -- A 3-D Model for Sorting Earthquakes

By

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OVERVIEW OF THE SLAB-GRID PROJECT

We present an updated model of the Juan de Fuca slab beneath southern British Columbia, Washington, Oregon, and northern California, and use this model to separate earthquakes occurring above and below the slab surface. The model is based on depth contours previously published by Flück and others (1997). Our model attempts to rectify a number of shortcomings in the original model and to update it with new work. The most significant improvements include (1) a gridded slab surface in geo-referenced (ArcGIS) format, (2) continuation of the slab surface to its full northern and southern edges, (3) extension of the slab surface from 50-km depth down to 110-km beneath the Cascade arc volcanoes, and (4) revision of the slab shape based on new seismic-reflection and seismic-refraction studies. We have used this surface to sort earthquakes and present some general observations and interpretations of seismicity patterns revealed by our analysis. In addition, we provide files of earthquakes above and below the slab surface and a 3-D animation or fly-through showing a shaded-relief map with plate boundaries, the slab surface, and hypocenters for use as a visualization tool.

FILES

1_README.txt	Overview of the slab-grid project - this file
2_TEXT.pdf	Project description and references in Adobe Reader format

3_FIGURES A folder containing the figures for this report in Adobe Reader PDF format as well as a set of smaller JPG files of the same illustrations

4_DATA A folder containing GIS data, metadata, and animations:

ASCII_GIS_DATA A folder containing the following 5 GIS files in (either comma-separated or tab-separated) ASCII format:

hypos_above_slab_GCS_WGS84.txt
Sorted earthquakes above slab surface
List of North American seismic events selected from ANSS catalog earthquakes

See text for explanation of parameters used to select earthquakes

hypos_below_slab_WGCS_GS84.txt
Sorted earthquakes below slab surface
List of Juan de Fuca seismic events selected from ANSS catalog earthquakes

See text for explanation of parameters used to select earthquakes.

slab_contours_GCS_WGS84.txt
Geo-referenced contours of depth to Juan de Fuca slab surface in XYZ format using decimal degrees and kilometers

See text for explanation of method used to create contours

slabgcs_wgs84.txt
Geo-referenced grid of depth to Juan de Fuca slab surface in ASCII format using decimal degrees and kilometers. Grid
in
Geographic Coordinate System WGS84.
The cell size is equivalent to 5 km.

slabgcs_wgs84.csv

Geo-referenced grid of depth to Juan de Fuca slab surface in XYZ format using decimal degrees and kilometers. Same data as slabgcs_wgs84.txt but in comma-separated XYZ format.

See text for explanation of method used to create grid

METADATA

A folder containing 4 metadata files for the ASCII GIS data and binary GIS data

BINARY_GIS_DATA

A folder containing a single zipped file with ArcScene projects in both ArcGIS 8x and 9x format that utilize included GIS shapefiles and ESRI grid files in a 3-D scene (.sxd) format

MOVIES

A folder containing the following animation files:

PNW_animation.avi

3-D animation in Microsoft Media Player format

PNW_animation.mov

3-D animation in Apple QuickTime format

5_SOFTWARE

A folder containing:

Acrobat Installer

The installer for Adobe Reader in both Macintosh and Windows formats

autorun.inf

Windows auto-launch file

usgsid.ico

Windows icon file, USGS

version_history.txt

Citation and release information

SYSTEM REQUIREMENTS

This CD-ROM (DS_91) was produced in accordance with the ISO 9660 Level 2 standard and Apple Computer's(R) hierarchical file system (HFS) standard. The data and text on this CD-ROM require either a UNIX(R) system-based or Linux(R) workstation, Macintosh(R) or compatible computer, or an IBM(R) or compatible personal computer, all equipped with a CD-ROM drive and a color monitor that can display 256 colors (16.7 million recommended).

To use this CD-ROM, a Windows-based PC should have:

- Intel(R) Pentium(R) or equivalent processor-based personal computer
- Microsoft(R) Windows(R) 95 OSR 2.0, Windows 98 SE, Windows Millennium, Windows NT(R) 4.0 with Service Pack 5, Windows 2000, or Windows XP, and
- 64 MB of RAM

To use this CD-ROM, a Macintosh computer should have:

- PowerPC(R) processor
- Mac OS software version 8.6, 9.0.4, 9.1, 9.2, or OS X and
- 64 MB of RAM

To use this CD-ROM, a UNIX-based computer:

- Almost any UNIX system-based or Linux workstation can read these files.

All platforms:

- Adobe(R) Acrobat Reader 5.0 or higher (Acrobat Reader 5.0.5, 5.1, and 6.0 for Windows and Macintosh are provided on this CD-ROM in the "Acrobat" folder in the "software" folder). The PDF files on this CD-ROM can be read with Acrobat 4 but without the re-wrap feature or tags that provide accessibility to sight-disabled people through the use of assistive technology such as screen readers.

PORTABLE DOCUMENT FORMAT (PDF) FILES

Using Adobe Acrobat Reader, you can view and print copies

of the PDF documents in this report. Acrobat Reader installer software is provided on this CD-ROM. You can use the installers provided on this CD-ROM. You can download the latest version of Adobe Acrobat Reader free via the World-Wide Web from the Adobe home page at

<http://www.adobe.com/products/acrobat/readstep2.html>

GEO-REFERENCED FORMAT (GIS) FILES

To view all of the 2-D and 3-D GIS files in this report, you must have a UNIX or PC computer running ESRI ArcView or ArcInfo software. The digital geospatial database is distributed in both ASCII and binary formats. Each ASCII GIS file has a metadata file (.htm format) and each binary GIS data file has a metadata file (.xml format) that provides information about the map projection and the origin of the data.

In addition to their commercial software, ESRI offers ArcExplorer software free for importing and viewing 2-D coverages and shape files. You can download the software from their web site at

<http://www.esri.com/software/arcexplorer/>

This report includes an animation in both Apple QuickTime and Microsoft Media Player formats which depicts a 3-D scene "fly through" created from the binary GIS data. The movie was created using the ESRI ArcInfo 3D analyst extension called ArcScene. If you have this extension, you can reconstruct and manipulate the model shown in the animation by executing the .sxd file included with the binary GIS data.

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