

## SYLLABUS

Week	Date	Topic	Reading
<b>INTRODUCTION</b>			
<b>1</b>	08/26/2003	Plate tectonics	Complete WWW course information form
	08/28/2003	General overview and geology of subduction zones	Stern, R.J., Subduction zones, <i>Rev. Geophys.</i> , 40, art. no. 1012, 2002.
<b>2</b>	09/02/2003	Subduction inputs (oceanic lithosphere)	
	09/04/2003	Subduction outputs (arc magmatism)	
<b>3</b>	09/09/2003	Geophysical overview of subduction zones	Zhao, D., A. Hasegawa, and H. Kanamori, Deep structure of Japan subduction zone as derived from local, regional, and teleseismic events, <i>J. Geophys. Res.</i> , 99, 22,313-22,329, 1994.
	09/11/2003	<b>Quiz #1</b> Thermal structure of subduction zones	
<b>4</b>	09/16/2003	Seismic structure of subduction zones	Spence, W., Slab pull and the seismotectonics of subducting lithosphere, <i>Rev. Geophys.</i> , 25, 55-69, 1987.
	09/18/2003		
<b>5</b>	09/23/2003	Subduction zone dynamics	
	09/25/2003	<b>Quiz #2</b> Subduction zone earthquakes	Burbach, G.V., and C. Frohlich, Intermediate and deep seismicity and lateral structure of subducted lithosphere in the Circum-Pacific region, <i>Rev. Geophys.</i> , 24, 833-874, 1986.
<b>DISCUSSIONS</b>			
<b>6</b>	09/30/2003	Silent slip and deep tremors	Dragert, H., K. Wang, and T.S. James, A silent slip event on the deeper Cascadia subduction interface. <i>Science</i> , 292, 1525-1528, 2001. Obara, K., Nonvolcanic deep tremor associated with subduction in Southwest Japan. <i>Science</i> , 296, 1679-1681, 2002. Rogers, G., and H. Dragert, Episodic tremor and slip on the Cascadia subduction zone: The chatter of silent slip, <i>Science</i> , 300, 1941-1943, 2003.

	10/02/2003	Intermediate- and deep-focus earthquakes	<p>Wallace, T.C., Introduction to the special issue on the great Bolivian earthquake of 1994, <i>Geophys. Res. Lett.</i>, 22, 2231, 1995.</p> <p>Kirby, S.H., E.A. Okal, and E.R. Engdahl, The 9 June 94 Bolivian deep earthquake - an exceptional event in an extraordinary subduction zone, <i>Geophys. Res. Lett.</i>, 22, 2233-2236, 1995.</p> <p>Silver, P.G., S.L. Beck, T.C. Wallace, C. Meade, S.C. Myers, D.E. James, and R. Kuehnel, Rupture characteristics of the deep Bolivian earthquake of 9 June 1994 and the mechanism of deep-focus earthquakes, <i>Science</i>, 268, 69-73, 1995.</p> <p>Tibi, R., D.A. Wiens, and H. Inoue, Remote triggering of deep earthquakes in the 2002 Tonga sequences, <i>Nature</i>, 424, 921-925, 2003.</p>
7	10/07/2003	Seismic structure of subduction zones <ul style="list-style-type: none"> <li>• Slab morphology</li> <li>• Phase transitions</li> </ul>	<p>Widiyantoro, S., B.L.N. Kennett, and R.D. van der Hilst, Seismic tomography with P and S data reveals lateral variations in the rigidity of deep slabs, <i>Earth Planet. Sci. Lett.</i>, 173, 91-100, 1999.</p> <p>Zhao, D.P., Y.B. Xu, D.A. Wiens, L. Dorman, J. Hildebrand, and S. Webb, Depth extent of the Lau back-arc spreading center and its relation to subduction processes, <i>Science</i>, 278, 254-257, 1997.</p>
	10/09/2003		<p>Roth, E.G., D.A. Wiens, and D.P. Zhao, An empirical relationship between seismic attenuation and velocity anomalies in the upper mantle, <i>Geophys. Res. Lett.</i>, 27, 601-604, 2000.</p> <p>Vidale, J.E., and H.M. Benz, Upper-mantle seismic discontinuities and the thermal structure of subduction zones, <i>Nature</i>, 356, 678-683, 1992.</p> <p>Bina, C.R., Patterns of deep seismicity reflect buoyancy stresses due to phase transitions, <i>Geophys. Res. Lett.</i>, 24, 3301-3304, 1997.</p>
8	10/14/2003	Water in subduction zones <ul style="list-style-type: none"> <li>• Slab petrology</li> <li>• Mantle wedge hydration</li> </ul>	<p>Schmidt, M.W., and S. Poli, Experimentally based water budgets for dehydrating slabs and consequences for arc magma generation, <i>Earth Planet. Sci. Lett.</i>, 163, 361-379, 1998.</p>
	10/16/2003		<p>Bostock, M.G., Hyndman, R.D. &amp; Peacock, S.M., An inverted continental Moho and serpentinization of the forearc mantle. <i>Nature</i>, 417, 536-538, 2002.</p> <p>Abers, G.A., Plank, T. &amp; Hacker, B.R., The wet Nicaraguan slab. <i>Geophys. Res. Lett.</i>, 30, art. no.-1098, 2003.</p> <p>Ranero, C.R., J.P. Morgan, K. McIntosh, and C. Reichert, Bending-related faulting and mantle serpentinization at the Middle America trench, <i>Nature</i>, 425, 367-373, 2003.</p>
9	10/21/2003	Mantle flow in subduction zones <ul style="list-style-type: none"> <li>• Seismic anisotropy</li> </ul>	<p>Wiens, D.A., and G.P. Smith, Seismological constraints on structure and flow patterns within the mantle wedge, The Subduction Factory, AGU Monograph, in press, 2003.</p>

	10/23/2003	<ul style="list-style-type: none"> <li>Flow models</li> </ul>	<p>Russo, R.M., and P.G. Silver, Trench-parallel flow beneath the Nazca plate from seismic anisotropy, <i>Science</i>, 263, 1105-1111, 1994.</p> <p>Fischer, K.M., Fouch, M.J., Wiens, D.A. &amp; Boettcher, M.S., Anisotropy and flow in Pacific subduction zone back-arcs. <i>Pure and Applied Geophysics</i>, 151, 463-475, 1998.</p> <p>Smith, G.P., D.A. Wiens, K.M. Fischer, L.M. Dorman, S.C. Webb, and J.A. Hildebrand, A complex pattern of mantle flow in the Lau backarc, <i>Science</i>, 292, 713-716, 2001.</p>
10	10/28/2003	<p>Melting in subduction zones</p> <ul style="list-style-type: none"> <li>Time scales of melting</li> <li>Melt transport – porous, fracture, diapirs</li> </ul>	<p>Turner, S., and C. Hawkesworth, Constraints on flux rates and mantle dynamics beneath island arcs from Tonga-Kermadec lava geochemistry, <i>Nature</i>, 389, pp 568-573, 1997.</p>
	10/23/2003		<p>Turner, S., P. Evans, and C. Hawkesworth, Ultrafast source-to-surface movement of melt at island arcs from 226Ra-230Th systematics, <i>Science</i>, 292, pp 1363-1366, 2001.</p> <p>Hall, P.S., and C. Kincaid, Diapiric flow at subduction zones: A recipe for rapid transport, <i>Science</i>, v. 292, 2472-2475, 2001.</p>
11	11/04/2003	Dynamical modeling	<p>King, S.D., Subduction zones: observations and geodynamic models, <i>Phys. Earth Planet. Int.</i>, 127, 9-24, 2001.</p>
	11/06/2003		<p>Kincaid, C., and I.S. Sacks, Thermal and dynamical evolution of the upper mantle in subduction zones, <i>J. Geophys. Res.</i>, 102, 12295-12315, 1997.</p> <p>Conder, J.A., D.A. Wiens, and J. Morris, On the decompression melting structure at volcanic arcs and back-arc spreading centers, <i>Geophys. Res. Lett.</i>, 29, art. no.-1727, 2002.</p> <p>Billen, M.I., and M. Gurnis, Comparison of dynamic flow models for the Central Aleutian and Tonga-Kermadec subduction zones, <i>Geochem. Geophys. Geosyst.</i>, 4, art. no.-1035, 2003.</p>
12	11/11/2003	<b>NO CLASS – Veteran’s Day</b>	
	11/13/2003	Subduction initiation	<p>Hall, C.E., M. Gurnis, M. Sdrolias, L.L. Lavier, and R.D. Muller, Catastrophic initiation of subduction following forced convergence across fracture zones, <i>Earth Planet. Sci. Lett.</i>, 212, 15-30, 2003.</p> <p>Mueller, S., and R.J. Phillips, On the initiation of subduction, <i>J. Geophys. Res.</i>, 96, 651-665, 1991.</p>

## CLASS PRESENTATIONS

<b>13</b>	11/18/2003	Class presentations I	Teresa Lassak, Maurits Thayer, Mandi Thomson
	11/20/2003	Class presentations II	Kristi Diller, Nick Schmerr, Sean Ford
<b>14</b>	11/25/2003	Class presentations III	Karen Anglin, Susan Schultz, Nathan Toké
	11/27/2003	<b>NO CLASS – Thanksgiving</b>	TV Guide, comics, etc.
<b>15</b>	12/02/2003	Class presentations IV	Michele Buttram, Chris Crosby
	12/04/2003	Class presentations V	Jesse Yoburn, Spencer Riley
<b>16</b>	12/09/2003	<b>NO CLASS - Final project wrap-up</b>	(Last day of class)
	12/11/2003	<b>Final term projects due (5pm)</b>	