

MGS 710, Spring 2024
Subduction Zone Geodynamics
 N373, North Grosvenor, RSMAES

Timetable:

Week 1	16 th & 18 th Jan	<p>Subduction overview:</p> <ol style="list-style-type: none"> 1) Class Introduction 2) Lecture (geophysical observations) <p><i>Review papers: King (2001); Stern (2002); Billen (2008); Becker and Faccenna (2009); Gerya (2011; 2022).</i></p>
Week 2	23 rd & 25 th Jan	<p>Subduction kinematics and slab dip:</p> <ol style="list-style-type: none"> 1) Lecture 2) Tao leads discussion on Hu and Gurnis (2020) <p><i>Additional Reading: Jarrard (1986); Hager and O'Connell (1978); Heuret and Lallemand (2005); Heuret et al. (2007); Lallemand et al. (2005); Faccenna et al. (2007); Heuret et al. (2011); Goes et al. (2017); Holt and Royden (2020).</i></p>
Week 3	30 th Jan & 1 st Feb	<p>Asthenosphere and slab rheology:</p> <ol style="list-style-type: none"> 1) Lecture 2) Valeria leads discussion on Bessat et al. (2020) <p><i>Additional Reading: Billen and Hirth (2005, 2007); Hager (1984); Čížková et al. (2002); Hirth & Kohlstedt (2003); Jadamec and Billen (2010; 2012); Tetzlaff & Schmelting (2009); Androvičová et al. (2013); Garel et al. (2014); Agrusta et al. (2014; 2017); Bello et al. (2015); Holt and Becker (2017); Goes et al. (2017); Carluccio et al., (2019).</i></p>
Week 4	6 th & 8 th Feb	<p>Slab bending:</p> <ol style="list-style-type: none"> 1) Lecture 2) Zonglin leads discussion on Schellart (2009) <i>and</i> ensuing back-and-forth comments. <p><i>Additional Reading: Becker et al. (1999); Conrad and Hager (1999); Bellahsen et al. (2005); Buffett (2006); Buffett and Rowley (2006); Wu et al. (2008); Capitanio et al. (2009); Ribe (2010); Rose and Korenaga (2011); Buffett and Becker (2012); Fourel et al. (2014); Farrington et al. (2014); Petersen et al., (2017); Gerardi et al. (2019); Sandiford et al. (2020).</i></p>
Week 5	13 th & 15 th Feb	<p>Subduction-induced mantle flow</p> <ol style="list-style-type: none"> 1) Lecture 2) Reid leads discussion on Tovish et al. (1978) <i>and</i> Piromallo et al. (2006) <p><i>Additional Reading: McKenzie (1969); Stevenson and Turner (1977); Garfunkel et al. (1986); Dvorkin et al. (1993); Funicello et al. (2003b; 2004; 2006); Kincaid and Griffiths (2003); Faccenna et al. (2013; 2017); Kiraly et al. (2017); Holt et al. (2017).</i></p>
Week 6	20 th & 22 nd Feb	<p>Force balance approach for subduction dynamics</p> <ol style="list-style-type: none"> 1) Adam leads discussion on Royden and Husson (2006). 2) Class project discussion and planning

		<i>Additional Reading: Billen (2008); Royden and Husson (2009); Crowley and O'Connell (2011); Royden and Holt (2020)</i>
Week 7	27 th & 29 th Feb	<p>Trench motions and 3-D subduction modeling</p> <ol style="list-style-type: none"> 1) Class project session 2) <i>Someone</i> leads discussion on Stegman et al. (2006) <i>and</i> Schellart et al. (2007). <p><i>Additional Reading: Kincaid and Olson (1987); Christensen (1996); Funicello et al. (2003a; 2003b); Enns et al. (2005); Bellahsen et al. (2005); Faccenna et al. (2007; 2009; 2018); Nagel et al. (2008); Di Giuseppe et al., (2008); Schellart (2008); Stegman et al. (2010); Ribe (2010); Cizkova and Bina (2013; 2015); Holt et al. (2015a); Yang et al. (2017).</i></p>
Week 8	5 th & 7 th March	<p>Planetary subduction (Venus):</p> <ol style="list-style-type: none"> 1) Class project session 2) Reid leads discussion on Davaille et al. (2017). <p><i>Additional Reading: Sandwell & Schubert (1992); Fowler & O'Brien (1996); Solomatov & Moresi (1996); Moresi & Solomatov (1998); Reese et al. (1999); Ueda et al. (2008); Gulcher et al. (2020; 2023); Adams et al. (2022); Chen et al. (2022).</i></p>
Week 9	11 th – 15 th March	SPRING RECESS
Week 10	19 th & 21 st March	<p>Subduction interface and slab-overriding plate interactions</p> <ol style="list-style-type: none"> 1) Lecture 2) <i>Someone</i> leads discussion on Beall et al. (2021). <p><i>Additional Reading: Capitanio et al. (2010; 2011); Holt et al. (2015b); Sharples et al. (2014); Yamato et al. (2009); Butterworth et al. (2012); Clark et al. (2008); Wallace et al. (2009); Schellart & Moresi (2013); van Dinther et al. (2013a, 2013b); Behr and Becker (2018); Cerpa et al. (2018); Guillaume et al. (2018); Brizzi et al. (2020; 2021); Sandiford et al. (2021); Behr et al. (2022).</i></p>
Week 11	26 th & 28 th March	<p>Rock exhumation at subduction zones:</p> <ol style="list-style-type: none"> 1) Lecture 2) Valeria leads discussion on Vaughan-Hammon et al. (2022) <p><i>Additional Reading: Chemanda et al. (1995; 1996; 2001); Burov et al. (2001); Gerya et al. (2002); Boutelier et al. (2004); Stockhert & Gerya (2005); Brun and Faccenna (2008); Warren et al. (2008a; 2008b); Yamato et al. (2008); Husson et al. (2009); Beaumont et al. (2009); Bialas et al. (2011); Ruh et al. (2015); McCarthy et al. (2020); Kerswell et al. (2023).</i></p> <p><i>Some Geology Reviews: Guillot et al. (2009); Warren (2013); Platt (1993); Brown and Johnson (2019); Agard et al. (2018; 2023);</i></p>
Week 12	2 nd & 4 th April	<p>Subduction-induced topography</p> <ol style="list-style-type: none"> 1) Lecture (Goldberg) 2) Tao leads discussion on Cramer et al. (2017). <p><i>Additional Reading: Melosh and Raefsky (1980); Mitrovica et al. (1989; 1996); Zhong and Gurnis (1992; 1994); Gurnis</i></p>

		<p>(1993); <i>Buiter et al. (2001)</i>; <i>Gurnis et al. (1996)</i>; <i>Husson (2006)</i>; <i>Husson et al. (2012)</i>; <i>Heine et al. (2008)</i>; <i>DiCaprio et al. (2009)</i>; <i>Eakin et al. (2014)</i>; <i>Gerault et al. (2015)</i>; <i>Flament et al. (2015)</i>; <i>Rubey et al. (2017)</i>; <i>Sarr et al. (2019)</i>; <i>Briaud et al. (2020)</i>; <i>Faccenna and Becker (2020)</i>, <i>Balazs et al. (2022)</i>; <i>Holt (2022)</i>; <i>Xue et al. (2022)</i>; <i>Deng et al. (2024)</i>.</p> <p>Reviews: <i>Braun (2010)</i>; <i>Flament et al. (2013)</i>; <i>Hoggard et al. (2021)</i>; <i>Davies et al. (2022)</i></p>
Week 13	9 th & 11 th April	<p>Global subduction dynamics</p> <ol style="list-style-type: none"> 1) Lecture 2) Class project session <p><i>Additional Reading: Alisic et al. (2010; 2012)</i>; <i>Stadler et al. (2010)</i>; <i>Morra et al. (2009; 2010; 2012)</i>; <i>Husson (2012)</i>; <i>Quevedo et al. (2013)</i>; <i>Ficini et al. (2017)</i>; <i>Chertova et al. (2018)</i>; <i>Holt and Royden (2020)</i>, <i>Chamolly and Ribe (2021)</i>; <i>Hu et al. (2022)</i>; <i>Holt (2022)</i>; <i>Chen et al. (2022a, 2022b)</i>; <i>Goldberg and Holt (2024)</i>.</p>
Week 14	16 th & 18 th April	<p>Subduction initiation</p> <ol style="list-style-type: none"> 1) Lecture (Shuck) 2) Zonglin leads discussion on Lallemand & Arcay (2021). <p><i>Additional Reading: Toth & Gurnis (1998)</i>; <i>Faccenna et al. (1999)</i>; <i>Hall et al. (2003)</i>; <i>Stern (2004)</i>; <i>Stern & Gerya (2017)</i>; <i>Gurnis et al. (2004; 2019)</i>; <i>Leng & Gurnis (2011; 2015)</i>; <i>Baes et al. (2016)</i>; <i>Crameri & Tackley (2016)</i>; <i>Crameri et al. (2020)</i>; <i>Maunder et al. (2020)</i>; <i>Lallemand & Arcay (2021)</i>; <i>Zhou & Wada (2021; 2022)</i>; <i>Shuck et al. (2022)</i>; <i>Li & Gurnis (2023)</i>.</p>
Week 15	23 rd & 25 th April	Wrap-up & Class presentations

Additional topics: We cannot of course cover the entirety of subduction zone geodynamics within one semester and so I have tried to strike a balance between: i) fundamental subduction geodynamics topics; and ii) topics relevant to work within the research group. Notable absences include subduction zone thermal structure, volcanism, slab-deep mantle interactions, flexural/isostatic topography, seismicity (e.g., shallow vs. intermediate depth vs. deep slab earthquakes), megathrust earthquakes and slip, and many other types of observations (e.g., the modeling of shear wave anisotropy/splitting).

[Full bibliography coming soon]