References

Agrusta, R., Goes, S., & van Hunen, J. (2017). Subducting-slab transition-zone interaction: Stagnation, penetration and mode switches. *Earth Planet. Sci. Lett.*. doi: 10.1016/j.epsl.2017.02.005

Agrusta, R., Van Hunen, J., & Goes, S. (2014). The effect of metastable pyroxene on the slab dynamics. *Geophys. Res. Lett.*, *41*(24), 8800–8808. doi: 10.1002/2014GL062159

Alisic, L., Gurnis, M., Stadler, G., Burstedde, C., & Ghattas, O. (2012). Multi-scale dynamics and rheology of mantle flow with plates. *J. Geophys. Res. Solid Earth*. doi: 10.1029/2012JB009234

Alisic, L., Gurnis, M., Stadler, G., Burstedde, C., Wilcox, L. C., & Ghattas, O. (2010). Slab stress and strain rate as constraints on global mantle flow. *Geophys. Res. Lett.*. doi: 10.1029/2010GL045312

Androvičová, A., Čížková, H., & van den Berg, A. (2013). The effects of rheological decoupling on slab deformation in the Earth's upper mantle. *Stud. Geophys. Geod.*, *57*(3), 460–481. doi: 10.1007/s11200-012-0259-7

Balázs, A., Faccenna, C., Gerya, T., Ueda, K., & Funiciello, F. (2022). The Dynamics of Forearc BackArc Basin Subsidence: Numerical Models and Observations From Mediterranean Subduction Zones. *Tectonics*, *41*(5). doi: 10.1029/2021tc007078

Baumann, C., Gerya, T. V., & Connolly, J. A. (2010). Numerical modelling of spontaneous slab breakoff dynamics during continental collision. *Geol. Soc. Spec. Publ.*, *332*(1), 99–114. doi: 10.1144/SP332.7

Beall, A., Fagereng, Å., Davies, J. H., Garel, F., & Davies, D. R. (2021). Influence of Subduction Zone Dynamics on Interface Shear Stress and Potential Relationship With Seismogenic Behavior. *Geochemistry, Geophys. Geosystems*, *22*(2), 1–20. doi: 10.1029/2020GC009267

Beaumont, C., Jamieson, R. A., Butler, J. P., & Warren, C. J. (2009). Crustal structure: A key constraint on the mechanism of ultra-high-pressure rock exhumation. *Earth Planet. Sci. Lett.*, *287*(1-2), 116–129. doi: 10.1016/j.epsl.2009.08.001

Becker, T. W., & Faccenna, C. (2009). A Review of the Role of Subduction Dynamics for Regional and Global Plate Motions. In S. Lallemand & F. Funiciello (Eds.), (Frontiers ed., pp. 3–34). Berlin, Heidelberg: Springer. doi: 10.1007/978-3-540-87974-9_1

Becker, T. W., Faccenna, C., O'Connell, R. J., & Giardini, D. (1999). The development of slabs in the upper mantle: Insights from numerical and laboratory experiments. *J. Geophys. Res. Solid Earth*, *104*(B7), 15207–15226. doi: 10.1029/1999jb900140

Behr, W. M., & Becker, T. W. (2018). Sediment control on subduction plate speeds. *Earth Planet. Sci. Lett.*, *502*, 166–173. doi: 10.1016/j.epsl.2018.08.057

Behr, W. M., Holt, A. F., Becker, T. W., & Faccenna, C. (2022). The effects of plate interface rheology on subduction kinematics and dynamics. *Geophys. J. Int.*, *230*(2), 796–812. doi: 10.1093/gji/ggac075

Bellahsen, N., Faccenna, C., & Funiciello, F. (2005). Dynamics of subduction and plate motion in laboratory experiments: Insights into the "plate tectonics" behavior of the Earth. *J. Geophys. Res. Solid Earth*, *110*(1), 1–15. doi: 10.1029/2004JB002999

Bello, L., Coltice, N., Tackley, P. J., Dietmar Müller, R., & Cannon, J. (2015). Assessing the role of slab rheology in coupled plate-mantle convection models. *Earth Planet. Sci. Lett.*, *430*, 191–201. doi: 10.1016/j.epsl.2015.08.010

Bessat, A., Duretz, T., Hetényi, G., Pilet, S., & Schmalholz, S. M. (2020). Stress and deformation mechanisms at a subduction zone: Insights from 2-D thermomechanical numerical modelling. *Geophys. J. Int.*, *221*(3), 1605–1625. doi: 10.1093/gji/ggaa092

Bialas, R. W., Funiciello, F., & Faccenna, C. (2011). Subduction and exhumation of continental crust: Insights from laboratory models. *Geophys. J. Int.*, *184*(1), 43–64. doi: 10.1111/j.1365-246X.2010.04824.x

Billen, M. I. (2008). Modeling the dynamics of subducting slabs. *Annu. Rev. Earth Planet. Sci.*, *36*, 325–356. doi: 10.1146/annurev.earth.36.031207.124129

Billen, M. I., & Hirth, G. (2005). Newtonian versus non-Newtonian upper mantle viscosity: Implications for subduction initiation. *Geophys. Res. Lett.*, *32*(19), 1–4. doi: 10.1029/2005GL023457

Boutelier, D., Chemenda, A., & Jorand, C. (2004). Continental subduction and exhumation of high-pressure rocks: Insights from thermo-mechanical laboratory modelling. *Earth Planet. Sci. Lett.*, *222*(1), 209–216. doi: 10.1016/j.epsl.2004.02.013

Braun, J. (2010). The many surface expressions of mantle dynamics. *Nat. Geosci.*, *3*(12), 825–833. doi: 10.1038/ngeo1020

Briaud, A., Agrusta, R., Faccenna, C., Funiciello, F., & van Hunen, J. (2020). Topographic Fingerprint of Deep Mantle Subduction. *J. Geophys. Res. Solid Earth*. doi: 10.1029/2019JB017962

Brizzi, S., Becker, T. W., Faccenna, C., Behr, W., van Zelst, I., Dal Zilio, L., & van Dinther, Y. (2021). The Role of Sediment Accretion and Buoyancy on Subduction Dynamics and Geometry. *Geophys. Res. Lett.*, *48*(20), 1–12. doi: 10.1029/2021GL096266

Brizzi, S., van Zelst, I., Funiciello, F., Corbi, F., & van Dinther, Y. (2020). How Sediment Thickness Influences Subduction Dynamics and Seismicity. *J. Geophys. Res. Solid Earth*, *125*(8), 1–19. doi: 10.1029/2019JB018964

Brun, J. P., & Faccenna, C. (2008). Exhumation of high-pressure rocks driven by slab rollback. *Earth Planet. Sci. Lett.*, *272*(1-2), 1–7. doi: 10.1016/j.epsl.2008.02.038

Buffett, B. A. (2006). Plate force due to bending at subduction zones. *J. Geophys. Res. Solid Earth*, *111*(9), 1–9. doi: 10.1029/2006JB004295

Buffett, B. A. (2010). Comment on: "Evolution of the slab bending radius and bending dissipation in three-dimensional subduction models with variable slab to upper mantle viscosity ratio" by W.P. Schellart, Earth and Planetary Science Letters 288 (2009) 309-319. *Earth Planet. Sci. Lett.*, *296*(1-2), 153–154. doi: 10.1016/j.epsl.2010.04.038

Buffett, B. A., & Becker, T. W. (2012). Bending stress and dissipation in subducted lithosphere. *J. Geophys. Res. Solid Earth*, *117*(5), 1–10. doi: 10.1029/2012JB009205

Buffett, B. A., & Rowley, D. B. (2006). Plate bending at subduction zones: Consequences for the direction of plate motions. *Earth Planet. Sci. Lett.*, *245*(1-2), 359–364. doi: 10.1016/j.epsl.2006.03.011

Buiter, S. J., Govers, R., & Wortel, M. J. (2001). A modelling study of vertical surface displacements at convergent plate margins. *Geophys. J. Int.*, *147*(2), 415–427. doi: 10.1046/j.1365-246X.2001.00545.x

Burov, E., Jolivet, L., Le Pourhiet, L., & Poliakov, A. (2001). A thermomechanical model of exhumation of high pressure (HP) and ultra-high pressure (UHP) metamorphic rocks in Alpine-type collision belts. *Tectonophysics*. doi: 10.1016/S0040-1951(01)00158-5

Butterworth, N. P., Quevedo, L., Morra, G., & Müller, R. D. (2012). Influence of overriding plate geometry and rheology on subduction. *Geochemistry, Geophys. Geosystems*, *13*(6), 1–15. doi: 10.1029/2011GC003968

Capitanio, F. A. (2014). The dynamics of extrusion tectonics: Insights from numerical modeling. *Tectonics*, *33*(12), 2361–2381. doi: 10.1002/2014TC003688

Capitanio, F. A. (2020). Current Deformation in the Tibetan Plateau: A Stress Gauge in the India-Asia Collision Tectonics. *Geochemistry, Geophys. Geosystems*, *21*(2), 1–22. doi: 10.1029/2019GC008649

Capitanio, F. A., Faccenna, C., Zlotnik, S., & Stegman, D. R. (2011). Subduction dynamics and the origin of Andean orogeny and the Bolivian orocline. *Nature*, *480*(7375), 83–86. Retrieved from `http://dx.doi.org/10.1038/nature10596` doi: 10.1038/nature10596

Capitanio, F. A., & Morra, G. (2012). The bending mechanics in a dynamic subduction system: Constraints from numerical modelling and global compilation analysis. *Tectonophysics*, *522-523*, 224–234. doi: 10.1016/j.tecto.2011.12.003

Capitanio, F. A., Morra, G., & Goes, S. (2009). Dynamics of plate bending at the trench and slab-plate coupling. *Geochemistry, Geophys. Geosystems*, *10*(4). doi: 10.1029/2008GC002348

Capitanio, F. A., & Replumaz, A. (2013). Subduction and slab breakoff controls on Asian indentation tectonics and Himalayan western syntaxis formation. *Geochemistry, Geophys. Geosystems*, *14*(9), 3515–3531. doi: 10.1002/ggge.20171

Capitanio, F. A., Stegman, D. R., Moresi, L. N., & Sharples, W. (2010). Upper plate controls on deep subduction, trench migrations and deformations at convergent margins. *Tectonophysics*. doi: 10.1016/j.tecto.2009.08.020

Carluccio, R., Kaus, B., Capitanio, F. A., & Moresi, L. N. (2019). The Impact of a Very Weak and Thin Upper Asthenosphere on Subduction Motions. *Geophys. Res. Lett.*, *46*(21), 11893–11905. doi: 10.1029/2019GL085212

Cerpa, N. G., Guillaume, B., & Martinod, J. (2018). The interplay between overriding plate kinematics, slab dip and tectonics. *Geophys. J. Int.*. doi: 10.1093/gji/ggy365

Chamolly, A., & Ribe, N. M. (2021). Fluid mechanics of free subduction on a sphere. Part 1. The axisymmetric case. *J. Fluid Mech.*, *929*, 1–32. doi: 10.1017/jfm.2021.871

Chemenda, A. I., Hurpin, D., Tang, J. C., Stephan, J. F., & Buffet, G. (2001). Impact of arc-continent collision on the conditions of burial and exhumation of UHP/LT rocks: Experimental and numerical modelling. *Tectonophysics*, *342*(1-2), 137–161. doi: 10.1016/S0040-1951(01)00160-3

Chemenda, A. I., Mattauer, M., & Bokun, A. N. (1996). Continental subduction and a mechanism for exhumation of high-pressure metamorphic rocks: New modelling and field data from Oman. *Earth Planet. Sci. Lett.*, *143*(1-4), 173–182. doi: 10.1016/0012-821x(96)00123-9

Chemenda, A. I., Mattauer, M., Malavieille, J., & Bokun, A. N. (1995). A mechanism for syn-collisional rock exhumation and associated normal faulting: Results from physical modelling. *Earth Planet. Sci. Lett.*, *132*, 225–232.

Chertova, M. V., Spakman, W., & Steinberger, B. (2018). Mantle flow influence on subduction evolution. *Earth Planet. Sci. Lett.*. doi: 10.1016/j.epsl.2018.02.038

Christensen, U. R. (1996). The influence of trench migration on slab penetration into the lower mantle. *Earth Planet. Sci. Lett.*, *140*(1-4), 27–39. doi: 10.1016/0012-821X(96)00023-4

Čížková, H., & Bina, C. R. (2013). Effects of mantle and subduction-interface rheologies on slab stagnation and trench rollback. *Earth Planet. Sci. Lett.*, *379*, 95–103. doi: 10.1016/j.epsl.2013.08.011

Čížková, H., & Bina, C. R. (2015). Geodynamics of trench advance: Insights from a Philippine-Sea-style geometry. *Earth Planet. Sci. Lett.*, *430*, 408–415. doi: 10.1016/j.epsl.2015.07.004

Čížková, H., Van Hunen, J., Van den Berg, A. P., & Vlaar, N. J. (2002). The influence of rheological weakening and yield stress on the interaction of slabs with the 670 km discontinuity. *Earth Planet. Sci. Lett.*, *199*(3-4), 447–457. doi: 10.1016/S0012-821X(02)00586-1

Clark, M. K., & Royden, L. H. (2000). Topographic ooze: Building the eastern margin of Tibet by lower crustal flow. *Geology*, *28*(8), 703–706. doi: 10.1130/0091-7613(2000)28⟨703:TOBTEM⟩2.0.CO;2

Clark, S. R., Stegman, D., & Müller, R. D. (2008). Episodicity in back-arc tectonic regimes. *Phys. Earth Planet. Inter.*. doi: 10.1016/j.pepi.2008.04.012

Conrad, C. P., & Hager, B. H. (1999). Effects of plate bending and fault strength at subduction zones on plate dynamics. *J. Geophys. Res. Solid Earth*. doi: 10.1029/1999jb900149

Crameri, F., Lithgow-Bertelloni, C. R., & Tackley, P. J. (2017). The dynamical control of subduction parameters on surface topography. *Geochemistry, Geophys. Geosystems*. doi: 10.1002/2017GC006821

Crowley, J. W., & O'Connell, R. J. (2012). An analytic model of convection in a system with layered viscosity and plates. *Geophys. J. Int.*, *188*(1), 61–78. doi: 10.1111/j.1365-246X.2011.05254.x

Davies, R. D., Ghelichkhan, S., Hoggard, M. J., Valentine, A. P., & Richards, F. D. (2022). Observations and models of dynamic topography : Current status and future directions. In J. C. Duarte (Ed.), *Dyn. plate tectonics mantle convect.* (chap. XX). Elsevier. doi: XXXX

Di Giuseppe, E., Van Hunen, J., Funiciello, F., Faccenna, C., & Giardini, D. (2008). Slab stiffness control of trench motion: Insights from numerical models. *Geochemistry, Geophys. Geosystems*, *9*(2), 1–19. doi: 10.1029/2007GC001776

DiCaprio, L., Gurnis, M., & Müller, R. D. (2009). Long-wavelength tilting of the Australian continent since the Late Cretaceous. *Earth Planet. Sci. Lett.*, *278*(3-4), 175–185. doi: 10.1016/j.epsl.2008.11.030

Ducea, M. N. (2016). Understanding continental subduction: A work in progress. *Geology*, *44*(3), 239–240. doi: 10.1130/focus03201239-2406.1

Duretz, T., & Gerya, T. V. (2013). Slab detachment during continental collision: Influence of crustal rheology and interaction with lithospheric delamination. *Tectonophysics*, *602*, 124–140. doi: 10.1016/j.tecto.2012.12.024

Duretz, T., Gerya, T. V., & May, D. A. (2011). Numerical modelling of spontaneous slab breakoff and subsequent topographic response. *Tectonophysics*, *502*(1-2), 244–256. doi: 10.1016/j.tecto.2010.05.024

Duretz, T., Schmalholz, S. M., & Gerya, T. V. (2012). Dynamics of slab detachment. *Geochemistry, Geophys. Geosystems*, *13*(3). doi: 10.1029/2011GC004024

Dvorkin, J., Nur, A., Mavko, G., & Ben-Avraham, Z. (1993). Narrow subducting slabs and the origin of backarc basins. *Tectonophysics*, *227*(1-4), 63–79. doi: 10.1016/0040-1951(93)90087-Z

Eakin, C. M., Lithgow-Bertelloni, C., & Dávila, F. M. (2014). Influence of Peruvian flat-subduction dynamics on the evolution of western Amazonia. *Earth Planet. Sci. Lett.*, *404*, 250–260. doi: 10.1016/j.epsl.2014.07.027

Enns, A., Becker, T. W., & Schmeling, H. (2005). The dynamics of subduction and trench migration for viscosity stratification. *Geophys. J. Int.*, *160*(2), 761–775. doi: 10.1111/j.1365-246X.2005.02519.x

Faccenna, C., & Becker, T. W. (2020). Topographic expressions of mantle dynamics in the Mediterranean. *Earth-Science Rev.*, *209*, 103327. doi: 10.1016/j.earscirev.2020.103327

Faccenna, C., Becker, T. W., Conrad, C. P., & Husson, L. (2013). Mountain building and mantle dynamics. *Tectonics*, *32*, 80–93. doi: 10.1029/2012TC003176

Faccenna, C., Di Giuseppe, E., Funiciello, F., Lallemand, S., & van Hunen, J. (2009). Control of seafloor aging on the migration of the Izu-Bonin-Mariana trench. *Earth Planet. Sci. Lett.*, *288*(3-4), 386–398. doi: 10.1016/j.epsl.2009.09.042

Faccenna, C., Heuret, A., Funiciello, F., Lallemand, S., & Becker, T. W. (2007). Predicting trench and plate motion from the dynamics of a strong slab.

Earth Planet. Sci. Lett., *257*(1-2), 29–36. doi: 10.1016/j.epsl.2007.02.016

Faccenna, C., Holt, A. F., Becker, T. W., Lallemand, S., & Royden, L. H. (2018). Dynamics of the Ryukyu/Izu-Bonin-Marianas double subduction system. *Tectonophysics*, *746*(February), 229–238. doi: 10.1016/j.tecto.2017.08.011

Faccenna, C., Oncken, O., Holt, A., & Becker, T. (2017a). Initiation of the Andean orogeny by lower mantle subduction. *Earth Planet. Sci. Lett.*, *463*. doi: 10.1016/j.epsl.2017.01.041

Faccenna, C., Oncken, O., Holt, A. F., & Becker, T. W. (2017b). Initiation of the Andean orogeny by lower mantle subduction. *Earth Planet. Sci. Lett.*, *463*, 189–201. doi: 10.1016/j.epsl.2017.01.041

Farrington, R. J., Moresi, L.-N., & Capitanio, F. A. (2014). The role of viscoelasticity in subducting plates. *Geochemistry, Geophys. Geosystems*, 4291–4304. doi: 10.1002/2014GC005507.Received

Ficini, E., Dal Zilio, L., Doglioni, C., & Gerya, T. V. (2017). Horizontal mantle flow controls subduction dynamics. *Sci. Rep.*. doi: 10.1038/s41598-017-06551-y

Flament, N., Gurnis, M., & Dietmar Müller, R. (2013). A review of observations and models of dynamic topography. *Lithosphere*, *5*(2), 189–210. doi: 10.1130/L245.1

Flament, N., Gurnis, M., Müller, R. D., Bower, D. J., & Husson, L. (2015). Influence of subduction history on South American topography. *Earth Planet. Sci. Lett.*, *430*, 9–18. Retrieved from `http://dx.doi.org/10.1016/j.epsl.2015.08.006` doi: 10.1016/j.epsl.2015.08.006

Fourel, L., Goes, S., & Morra, G. (2014). The role of elasticity in slab bending. *Geochemistry Geophys. Geosystems*, 4507–4525. doi: 10.1002/2014GC005535.Received

Funiciello, F., Faccenna, C., & Giardini, D. (2004). Role of lateral mantle flow in the evolution of subduction systems: Insights from laboratory experiments. *Geophys. J. Int.*, *157*, 1393–1406. doi: 10.1111/j.1365-246X.2004.02313.x

Funiciello, F., Faccenna, C., Giardini, D., & Regenauer-Lieb, K. (2003). Dynamics of retreating slabs: 2. Insights from three-dimensional laboratory experiments. *J. Geophys. Res. Solid Earth*, *108*(B4), 1–16. doi: 10.1029/2001jb000896

Funiciello, F., Moroni, M., Piromallo, C., Faccenna, C., Cenedese, A., & Bui, H. A. (2006). Mapping mantle flow during retreating subduction: Laboratory models analyzed by feature tracking. *J. Geophys. Res. Solid Earth*. doi: 10.1029/2005JB003792

Funiciello, F., Morra, G., Regenauer-Lieb, K., & Giardini, D. (2003). Dynamics of retreating slabs: 1. Insights from two-dimensional numerical experiments. *J. Geophys. Res. Solid Earth*, *108*(B4), 1–17. doi: 10.1029/2001jb000898

Garel, F., Goes, S., Davies, D. R., Davies, J. H., Kramer, S. C., & Wilson, C. R. (2014). Interaction of subducted slabs with the mantle transition-zone: A regime diagram from 2-D thermo-mechanical models with a mobile trench and an overriding plate. *Geochemistry, Geophys. Geosystems*, *15*, 1739–1765. doi: 10.1002/2014GC005257

Garfunkel, Z., Anderson, C. A., & Schubert, G. (1984). Mantle circulation and the lateral migration of subducted slabs. *J. Geophys. Res.*, *89*(B7), 6256–6270.

Gerardi, G., Ribe, N. M., & Tackley, P. J. (2019). Plate bending, energetics of subduction and modeling of mantle convection: A boundary element approach. *Earth Planet. Sci. Lett.*, *515*, 47–57. doi: 10.1016/j.epsl.2019.03.010

Gérault, M., Husson, L., Miller, M. S., & Humphreys, E. D. (2015). Flat-slab subduction, topography, and mantle dynamics in southwestern Mexico. *Tectonics*, *34*, 1892–1909. doi: 10.1002/2015TC003908

Gerya, T. (2011). Future directions in subduction modeling. *J. Geodyn.*, *52*(5), 344–378. doi: 10.1016/j.jog.2011.06.005

Gerya, T. (2022). Numerical modeling of subduction: State of the art and future directions. *Geosphere*, *18*(2), 503–561. doi: 10.1130/GES02416.1

Gerya, T. V., Stöckhert, B., & Perchuk, A. L. (2002). Exhumation of high-pressure metamorphic rocks in a subduction channel: A numerical simulation. *Tectonics*, *21*(6), 6–1–6–19. doi: 10.1029/2002tc001406

Ghazian, R. K., & Buiter, S. J. (2013). A numerical investigation of continental collision styles. *Geophys. J. Int.*, *193*(3), 1133–1152. doi: 10.1093/gji/ggt068

Goes, S., Agrusta, R., van Hunen, J., & Garel, F. (2017). Subduction-transition zone interaction: A review. *Geosphere*, *13*(3), 644–664. doi: 10.1130/GES01476.1

Guillaume, B., Hertgen, S., Martinod, J., & Cerpa, N. G. (2018). Slab dip, surface tectonics: How and when do they change following an acceleration/slow down of the overriding plate? *Tectonophysics*. doi: 10.1016/j.tecto.2018.01.030

Gurnis, M. (1993). Phanerozoic marine inundation of continents driven by dynamic topography above subducting slabs. *Nature*, *364*, 589–593.

Gurnis, M., Eloy, C., & Zhong, S. (1996). Free-surface formulation of mantle convection - II. Implication for subduction-zone observables. *Geophys. J. Int.*, *127*(3), 719–727. doi: 10.1111/j.1365-246X.1996.tb04050.x

Hager, B. H. (1984). Constraints on Mantle Rheology and Flow Residual Geoid: degree 2-10. *J. Geophys. Res.*, *89*(4), 6003–6015.

Hager, B. H., & O'Connell, R. J. (1978). Subduction zone dip angles and flow driven by plate motion. *Tectonophysics*, *50*, 111–133.

Heine, C., Dietmar Müller, R., Steinberger, B., & Torsvik, T. H. (2008). Subsidence in intracontinental basins due to dynamic topography. *Phys. Earth Planet. Inter.*, *171*(1-4), 252–264. doi: 10.1016/j.pepi.2008.05.008

Heuret, A., Funiciello, F., Faccenna, C., & Lallemand, S. (2007). Plate kinematics, slab shape and back-arc stress: A comparison between laboratory models and current subduction zones. *Earth Planet. Sci. Lett.*, *256*(3-4), 473–483. doi: 10.1016/j.epsl.2007.02.004

Heuret, A., & Lallemand, S. (2005). Plate motions, slab dynamics and back-arc deformation. *Phys. Earth Planet. Inter.*. doi: 10.1016/j.pepi.2004.08.022

Heuret, A., Lallemand, S., Funiciello, F., Piromallo, C., & Faccenna, C. (2011). Physical characteristics of subduction interface type seismogenic zones revisited. *Geochemistry, Geophys. Geosystems*, *12*(1), 1–26. doi: 10.1029/2010GC003230

Hirth, G., & Kohlstedt, D. L. (2003). Rheology of the Upper Mantle and the Mantle Wedge: a View From the Experimentalists BT - Geophysical Monograph Series. *Geophys. Monogr. Ser.*, *138*, 83–106.

Hoggard, M., Austermann, J., Randel, C., & Stephenson, S. (2021). Observational Estimates of Dynamic Topography Through Space and Time. (May 2020), 371–411. doi: 10.1002/9781119528609.ch15

Holt, A., & Becker, T. (2017). The effect of a power-law mantle viscosity on trench retreat rate. *Geophys. J. Int.*, *208*(1). doi: 10.1093/gji/ggw392

Holt, A., Becker, T., & Buffett, B. (2015). Trench migration and overriding plate stress in dynamic subduction models. *Geophys. J. Int.*, *201*(1). doi: 10.1093/gji/ggv011

Holt, A., Buffett, B., & Becker, T. (2015). Overriding plate thickness control on subducting plate curvature. *Geophys. Res. Lett.*, *42*(10). doi: 10.1002/2015GL063834

Holt, A. F., & Royden, L. H. (2020). Subduction Dynamics and Mantle Pressure: 2. Towards a Global Understanding of Slab Dip and Upper Mantle Circulation. *Geochemistry, Geophys. Geosystems*, *21*(7), 1–27. doi: 10.1029/2019GC008771

Holt, A. F., Royden, L. H., & Becker, T. W. (2017). The dynamics of double slab subduction. *Geophys. J. Int.*, *209*(1), 250–265. doi: 10.1093/gji/ggw496

Hu, J., & Gurnis, M. (2020). Subduction Duration and Slab Dip. *Geochemistry, Geophys. Geosystems*, *21*(4), 1–24. doi: 10.1029/2019GC008862

Hu, J., Gurnis, M., Rudi, J., Stadler, G., & Müller, R. D. (2022). Dynamics of the abrupt change in Pacific Plate motion around 50 million years ago. *Nat. Geosci.*, *15*(1), 74–78. doi: 10.1038/s41561-021-00862-6

Husson, L. (2006). Dynamic topography above retreating subduction zones. *Geology*. doi: 10.1130/G22436.1

Husson, L. (2012). Trench migration and upper plate strain over a convecting mantle. *Phys. Earth Planet. Inter.*, *212-213*, 32–43. doi: 10.1016/j.pepi.2012.09.006

Husson, L., Brun, J.-p., Yamato, P., & Faccenna, C. (2009). Episodic slab rollback fosters exhumation of HP UHP rocks. *Geophys. J. Int.*, *179*, 1292–1300. doi: 10.1111/j.1365-246X.2009.04372.x

Husson, L., Guillaume, B., Funiciello, F., Faccenna, C., & Royden, L. H. (2012). Unraveling topography around subduction zones from laboratory models. *Tectonophysics*, *526-529*, 5–15. doi: 10.1016/j.tecto.2011.09.001

Jadamec, M. A., & Billen, M. I. (2010). Reconciling surface plate motions with rapid three-dimensional mantle flow around a slab edge. *Nature*, *465*. doi: 10.1038/nature09053

Jadamec, M. A., & Billen, M. I. (2012). The role of rheology and slab shape on rapid mantle flow: Three-dimensional numerical models of the Alaska slab edge. *J. Geophys. Res. Solid Earth*. doi: 10.1029/2011JB008563

Jarrard, R. D. (1986). Relations among subduction parameters. *Rev. Geophys.*, *24*(2), 217–284. doi: 10.1029/RG024i002p00217

Kincaid, C., & Griffiths, R. W. (2003). Laboratory models of the thermal evolution of the mantle during rollback subduction. *Nature*, *425*(6953), 58–62. doi: 10.1038/nature01923

Kincaid, C., & Olson, P. (1987). An experimental study of subduction and slab migration. *J. Geophys. Res. Solid Earth*, *92*(B13), 13832–13840. doi: 10.1029/jb092ib13p13832

King, S. D. (2001). Subduction zones: Observations and geodynamic models. *Phys. Earth Planet. Inter.*, *127*(1-4), 9–24. doi: 10.1016/S0031-9201(01)00218-7

Király, Á., Capitanio, F. A., Funiciello, F., & Faccenna, C. (2017). Subduction induced mantle flow: Length-scales and orientation of the toroidal cell. *Earth Planet. Sci. Lett.*. doi: 10.1016/j.epsl.2017.09.017

Lallemand, S., Heuret, A., & Boutelier, D. (2005). On the relationships between slab dip, back-arc stress, upper plate absolute motion, and crustal nature in subduction zones. *Geochemistry, Geophys. Geosystems*, *6*(9). doi: 10.1029/2005GC000917

Long, M. D., & Silver, P. G. (2009). Mantle flow in subduction systems: The subslab flow field and implications for mantle dynamics. *J. Geophys. Res. Solid Earth*, *114*(10). doi: 10.1029/2008JB006200

Magni, V., Faccenna, C., Van Hunen, J., & Funiciello, F. (2013). Delamination vs. break-off: The fate of continental collision. *Geophys. Res. Lett.*. doi: 10.1002/grl.50090

Magni, V., Faccenna, C., van Hunen, J., & Funiciello, F. (2014). How collision triggers backarc extension: Insight into mediterranean style of extension from 3-d numerical models. *Geology*. doi: 10.1130/G35446.1

McCarthy, A., Tugend, J., Mohn, G., Candioti, L., Chelle-Michou, C., Arculus, R., … Müntener, O. (2020). A case of ampferer-type subduction and consequences for the alps and the pyrenees. *Am. J. Sci.*, *320*(4), 313–372. doi: 10.2475/04.2020.01

McKenzie, D. P. (1969). Speculations on the Consequences and Causes of Plate Motions. *Geophys. J. R. Astron. Soc.*. doi: 10.1111/j.1365-246X.1969.tb00259.x

Melosh, H. J., & Raefsky, A. (1980). The dynamical origin of subduction zone topography. *Geophys. J. R. Astron. Soc.*, *60*(3), 333–354. doi: 10.1111/j.1365-246X.1980.tb04812.x

Mitrovica, J. X., Beaumont, C., & Jarvis, G. T. (1989). Tilting of continental interiors by the dynamical effects of subduction. *Tectonics*. doi: 10.1029/TC008i005p01079

Mitrovica, J. X., Pysklywec, R. N., Beaumont, C., & Rutty, A. (1996). The Devonian to Permian sedimentation of the Russian platform: An example of subduction-controlled long-wavelength tilting of continents. *J. Geodyn.*, *22*(1-2), 79–96. doi: 10.1016/0264-3707(96)00008-7

Morra, G., Chatelain, P., Tackley, P., & Koumoutsakos, P. (2009). Earth curvature effects on subduction morphology: Modeling subduction in a spherical setting. *Acta Geotech.*. doi: 10.1007/s11440-008-0060-5

Morra, G., Quevedo, L., & Müller, R. D. (2012). Spherical dynamic models of top-down tectonics. *Geochemistry, Geophys. Geosystems*. doi: 10.1029/2011GC003843

Morra, G., Yuen, D. A., Boschi, L., Chatelain, P., Koumoutsakos, P., & Tackley, P. J. (2010). The fate of the slabs interacting with a density/viscosity hill in the mid-mantle. *Phys. Earth Planet. Inter.*, *180*(3-4), 271–282. doi: 10.1016/j.pepi.2010.04.001

Nagel, T. J., Ryan, W. B., Malinverno, A., & Buck, W. R. (2008). Pacific trench motions controlled by the asymmetric plate configuration. *Tectonics*, *27*(3), 1–11. doi: 10.1029/2007TC002183

Petersen, R. I., Stegman, D. R., & Tackley, P. J. (2017). The subduction dichotomy of strong plates and weak slabs. *Solid Earth*. doi: 10.5194/se-8-339-2017

Piromallo, C., Becker, T. W., Funiciello, F., & Faccenna, C. (2006). Three-dimensional instantaneous mantle flow induced by subduction. *Geophys. Res. Lett.*, *33*(8), 5–8. doi: 10.1029/2005GL025390

Pusok, A. J., & Kaus, B. J. P. (2015). Development of topography in 3-D continental-collision models. *Geochemistry Geophys. Geosystems*, *16*, 1378–1400. doi: 10.1002/2015GC005732

Quevedo, L., Hansra, B., Morra, G., Butterworth, N., & Müller, R. D. (2013). Oblique mid ocean ridge subduction modelling with the parallel fast multipole boundary element method. *Comput. Mech.*, *51*(4), 455–463. doi: 10.1007/s00466-012-0751-5

Replumaz, A., & Tapponnier, P. (2003). Reconstruction of the deformed collision zone Between India and Asia by backward motion of lithospheric blocks. *J. Geophys. Res. Solid Earth*, *108*(B6). doi: 10.1029/2001jb000661

Ribe, N. M. (2010). Bending mechanics and mode selection in free subduction: A thin-sheet analysis. *Geophys. J. Int.*, *180*(2), 559–576. doi: 10.1111/j.1365-246X.2009.04460.x

Rodríguez-González, J., Negredo, A. M., & Carminati, E. (2014). Slab-mantle flow interaction: Influence on subduction dynamics and duration. *Terra Nov.*, *26*(4), 265–272. doi: 10.1111/ter.12095

Rose, I. R., & Korenaga, J. (2011). Mantle rheology and the scaling of bending dissipation in plate tectonics. *J. Geophys. Res. Solid Earth*, *116*(6), 1–21. doi: 10.1029/2010JB008004

Royden, L. H., Burchfiel, B. C., & Hilst, R. D. V. D. (2008). The Geological Evolution of the Tibetan Plateau. *Science (80-.).*, *321*(August), 1054–1058.

Royden, L. H., Burchfiel, B. C., King, R. W., Wang, E., Chen, Z., Shen, F., & Liu, Y. (1997). Surface deformation and lower crustal flow in eastern

Tibet. *Science (80-.).*, *276*(5313), 788–790. doi: 10.1126/science.276.5313.788

Royden, L. H., & Holt, A. F. (2020). Subduction Dynamics and Mantle Pressure: 1. An Analytical Framework Relating Subduction Geometry, Plate Motion, and Asthenospheric Pressure: 1. An Analytical Framework Relating Subduction Geometry, Plate Motion, and Asthenospheric Pressure. *Geochemistry, Geophys. Geosystems*, *21*(7), 1–28. doi: 10.1029/2020GC009032

Royden, L. H., & Husson, L. (2006). Trench motion, slab geometry and viscous stresses in subduction systems. *Geophys. J. Int.*. doi: 10.1111/j.1365-246X.2006.03079.x

Royden, L. H., & Husson, L. (2009). Subduction with Variations in Slab Buoyancy: Models and Application to the Banda and Apennine Systems. In S. Lallemand & F. Funiciello (Eds.), (Frontiers ed., pp. 35–45). Berlin, Heidelberg: Springer. doi: 10.1007/978-3-540-87974-9_2

Ruh, J. B., Pourhiet, L. L., Agard, P., Burov, E., & Gerya, T. (2015). Tectonic slicing of subducting oceanic crust along plate interfaces: Numerical modeling. *Geochemistry, Geophys. Geosystems*, *16*, 3505–3531. doi: 10.1002/2015GC005998.Received

Sandiford, D., & Moresi, L. (2019). Improving subduction interface implementation in dynamic numerical models. *Solid Earth*, *10*(3), 969–985. doi: 10.5194/se-10-969-2019

Sandiford, D., Moresi, L. M., Sandiford, M., Farrington, R., & Yang, T. (2020). The Fingerprints of Flexure in Slab Seismicity. *Tectonics*, *39*(8). doi: 10.1029/2019TC005894

Sarr, A.-C., Solihuddin, T., Aribowo, S., Husson, L., Sepulchre, P., Pastier, A.-M., ... Susilohadi (2019). Subsiding Sundaland. *Geology*, *47*(7), e469–e469. doi: 10.1130/G46294C.1

Schellart, W. P. (2008). Subduction zone trench migration: Slab driven or overriding-plate-driven? *Phys. Earth Planet. Inter.*. doi: 10.1016/j.pepi.2008.07.040

Schellart, W. P. (2009). Evolution of the slab bending radius and the bending dissipation in three-dimensional subduction models with a variable slab to upper mantle viscosity ratio. *Earth Planet. Sci. Lett.*, *288*(1-2), 309–319. doi: 10.1016/j.epsl.2009.09.034

Schellart, W. P., Freeman, J., Stegman, D. R., Moresi, L., & May, D. (2007). Evolution and diversity of subduction zones controlled by slab width. *Nature*, *446*(7133), 308–311. doi: 10.1038/nature05615

Schellart, W. P., & Moresi, L. (2013). A new driving mechanism for backarc extension and backarc shortening through slab sinking induced toroidal and poloidal mantle flow: Results from dynamic subduction models with an overriding plate. *J. Geophys. Res. Solid Earth*, *118*(6), 3221–3248. doi: 10.1002/jgrb.50173

Schliffke, N., van Hunen, J., Gueydan, F., Magni, V., & Allen, M. B. (2021). Curved orogenic belts, back-arc basins, and obduction as consequences of collision at irregular continental margins. *Geology*, *49*(12), 1436–1440. doi: 10.1130/G48919.1

Sharples, W., Jadamec, M. A., Moresi, L. N., & Capitanio, F. A. (2014). Overriding plate controls on subduction evolution. *J. Geophys. Res. Solid Earth*, *119*(8), 6684–6704. doi: 10.1002/2014JB011163

Stadler, G., Gurnis, M., Burstedde, C., Wilcox, L. C., Alisic, L., & Ghattas, O. (2010). The dynamics of plate tectonics and mantle flow: From local to global scales. *Science (80-.).*, *329*(5995), 1033–1038. doi: 10.1126/science.1191223

Stegman, D. R., Farrington, R., Capitanio, F. A., & Schellart, W. P. (2010). A regime diagram for subduction styles from 3-D numerical models of free subduction. *Tectonophysics*, *483*(1-2), 29–45. doi: 10.1016/j.tecto.2009.08.041

Stegman, D. R., Freeman, J., Schellart, W. P., Moresi, L., & May, D. (2006). Influence of trench width on subduction hinge retreat rates in 3-D models of slab rollback. *Geochemistry, Geophys. Geosystems*. doi: 10.1029/2005GC001056

Stern, R. J. (2002). Subduction zones. *Rev. Geophys.*, *40*(4), 3–1–3–38. doi: 10.1029/2001RG000108

Stern, R. J., & Gerya, T. (2018). Subduction initiation in nature and models: A review. *Tectonophysics*, *746*, 173–198. doi: 10.1016/j.tecto.2017.10.014

Sternai, P., Jolivet, L., Menant, A., & Gerya, T. (2014). Driving the upper plate surface deformation by slab rollback and mantle flow. *Earth Planet. Sci. Lett.*, *405*, 110–118. Retrieved from `http://dx.doi.org/10.1016/j.epsl.2014.08.023` doi: 10.1016/j.epsl.2014.08.023

Stevenson, D. J., & Turner, J. S. (1977). Angle of subduction. *Nature*, *270*(5635), 334–336. doi: 10.1038/270334a0

Stöckhert, B., & Gerya, T. V. (2005). Pre-collisional high pressure metamorphism and nappe tectonics at active continental margins: A numerical simulation. *Terra Nov.*, *17*(2), 102–110. doi: 10.1111/j.1365-3121.2004.00589.x

Tetzlaff, M., & Schmeling, H. (2000). The influence of olivine metastability on deep subduction of oceanic lithosphere. *Phys. Earth Planet. Inter.*, *120*(1), 29–38. doi: 10.1016/S0031-9201(00)00139-4

Tovish, A., Schubert, G., & Luyendyk, B. P. (1978). Mantle flow pressure and the angle of subduction: Non-Newtonian corner flows. *J. Geophys. Res. Solid Earth*, *83*(B12), 5892–5898. doi: 10.1029/jb083ib12p05892

Van Dinther, Y., Gerya, T. V., Dalguer, L. A., Mai, P. M., Morra, G., & Giardini, D. (2013). The seismic cycle at subduction thrusts: Insights from seismo-thermo- mechanical models. *J. Geophys. Res. Solid Earth*, *118*(12), 6183–6202. doi: 10.1002/2013JB010380

Van Hunen, J., & Miller, M. S. (2015). Collisional processes and links to episodic changes in subduction zones. *Elements*, *11*(2), 119–124. doi: 10.2113/gselements.11.2.119

van Hunen, J., & Allen, M. B. (2011). Continental collision and slab break-off: A comparison of 3-D numerical models with observations. *Earth Planet.*

Sci. Lett., *302*(1-2), 27–37. doi: 10.1016/j.epsl.2010.11.035

Vaughan-hammon, J. D., Candioti, L. G., Duretz, T., & Schmalholz, S. M. (2022). Metamorphic facies distribution in the Western Alps predicted by petrologicalthermomechanical models of syn-convergent exhumation. *Geochemistry, Geophys. Geosystems*. doi: 10.1029/2021GC009898

Wallace, L. M., Reyners, M., Cochran, U., Bannister, S., Barnes, P. M., Berryman, K., ... Power, W. (2009). Characterizing the seismogenic zone of a major plate boundary subduction thrust: Hikurangi Margin, New Zealand. *Geochemistry, Geophys. Geosystems*, *10*(10). doi: 10.1029/2009GC002610

Warren, C. J., Beaumont, C., & Jamieson, R. A. (2008a). Formation and exhumation of ultra-high-pressure rocks during continental collision: Role of detachment in the subduction channel. *Geochemistry, Geophys. Geosystems*. doi: 10.1029/2007GC001839

Warren, C. J., Beaumont, C., & Jamieson, R. A. (2008b). Modelling tectonic styles and ultra-high pressure (UHP) rock exhumation during the transition from oceanic subduction to continental collision. *Earth Planet. Sci. Lett.*, *267*(1-2), 129–145. doi: 10.1016/j.epsl.2007.11.025

Wei, W., Zhao, D., Yu, W., & Shi, Y. (2022). Complex Patterns of Mantle Flow in Eastern SE Asian Subduction Zones Inferred From P-Wave Anisotropic Tomography. *J. Geophys. Res. Solid Earth*, *127*(5), 1–16. doi: 10.1029/2021JB023366

Wu, B., Conrad, C. P., Heuret, A., Lithgow-Bertelloni, C., & Lallemand, S. (2008). Reconciling strong slab pull and weak plate bending: The plate motion constraint on the strength of mantle slabs. *Earth Planet. Sci. Lett.*, *272*(1-2), 412–421. doi: 10.1016/j.epsl.2008.05.009

Yamato, P., Burov, E., Agard, P., Le Pourhiet, L., & Jolivet, L. (2008). HP-UHP exhumation during slow continental subduction: Self-consistent thermodynamically and thermomechanically coupled model with application to the Western Alps. *Earth Planet. Sci. Lett.*, *271*(1-4), 63–74. doi: 10.1016/j.epsl.2008.03.049

Yamato, P., Husson, L., Braun, J., Loiselet, C., & Thieulot, C. (2009). Influence of surrounding plates on 3D subduction dynamics. *Geophys. Res. Lett.*, *36*(7), 1–5. doi: 10.1029/2008GL036942

Yang, T., Gurnis, M., & Zhan, Z. (2017). Trench motion-controlled slab morphology and stress variations: Implications for the isolated 2015 Bonin Islands deep earthquake. *Geophys. Res. Lett.*, *44*(13), 6641–6650. doi: 10.1002/2017GL073989

Zhong, S., & Gurnis, M. (1992). Viscous flow model of a subduction zone with a faulted lithosphere: Long and short wavelength topography, gravity and geoid. *Geophys. Res. Lett.*, *19*(18), 1891–1894.

Zhong, S., & Gurnis, M. (1994). Controls on trench topography from dynamic models of subducted slabs. *J. Geophys. Res.*. doi: 10.1029/94jb00809