Rheology of the lithosphere

Seminar info and schedule

For the fall semester 2016 we'll focus our reading and discussions on the rheology of the lithosphere. We'll start with a few papers about models of the rheological structure of the lithosphere, then dive into some literature about the rock mechanics experiments that provide the material property values used in rheology models. Depending on how things evolve, we also plan to start reading papers about tectonic inheritance and how past deformation may condition future deformation. Most likely this will occur later in the fall.

Seminars will take place at 12-14 in room **D501** of the Exactum. You may also want to see more information about the general format of the seminar.

A tentative schedule of readings is below.

Date	Discussion leader(s)	Topic and papers	Paper rating
8.9.2016	n/a	Organizational meeting.	
15.9.2016	Lars	**An introduction to the rheological models of the lithosphere** • Jackson, J., 2002. Strength of the continental lithosphere: time to abandon the jelly sandwich?. *GSA today*, 12(9), pp.4-9 Supplemental reading • Brace, W.F. and Kohlstedt, D.L., 1980. Limits on lithospheric stress imposed by laboratory experiments. *Journal of Geophysical Research: Solid Earth*,*85*(B11), pp.6248-6252 • E.B. Burov, 2015. 6.03 - Plate Rheology and Mechanics, In *Treatise on Geophysics* (Second Edition), edited by Gerald Schubert,, Elsevier, Oxford, pp.95-152	**3.3**
22.9.2016	Jorina	**The "jelly sandwich" versus "crème brûlée" lithosphere** • Burov, E.B. and Watts, A.B., 2006. The long-term strength of continental lithosphere:" jelly sandwich" or" crème brûlée"?. *GSA today*, 16(1), p.4 Supplemental reading • Brace, W.F. and Kohlstedt, D.L., 1980. Limits on lithospheric stress imposed by laboratory experiments. *Journal of Geophysical Research: Solid Earth*,*85*(B11), pp.6248-6252 • E.B. Burov, 2015. 6.03 - Plate Rheology and Mechanics, In *Treatise on Geophysics* (Second Edition), edited by Gerald Schubert,, Elsevier, Oxford, pp.95-152	**3.8**
29.9.2016	Lorraine	**Lithospheric structure and rheology in Italy** • Panza, G.F. and Raykova, R.B., 2008. Structure and rheology of lithosphere in Italy and surrounding. *Terra Nova*, 20(3), pp.194-199 Supplemental reading • Thurber, C. and Ritsema, J., 2015. 1.10 - Theory and Observations - Seismic Tomography and Inverse Methods, In *Treatise on Geophysics* (Second Edition), edited by Gerald Schubert,, Elsevier, Oxford	**2.3**
6.10.2016	Benoît	**Strength of the European lithosphere** • Tesauro, M., Kaban, M.K., Cloetingh, S.A., Hardebol, N.J. and Beekman, F., 2007. 3D strength and gravity anomalies of the European lithosphere. *Earth and Planetary Science Letters*, 263(1), pp.56-73 Supplemental reading • None	**2.4**
13.10.2016	Dave	**Uncertainty in rheological flow laws** • E.B. Burov, 2015. 6.03 - Plate Rheology and Mechanics, In *Treatise on Geophysics* (Second Edition), edited by Gerald Schubert,, Elsevier, Oxford, pp.95-152 (only sections 6.03.4, 6.03.7, and 6.03.8) Supplemental reading • None	**3.8**

~~20.10.2016~~ Postponed to 3.11.2016	Eemu	**Experimental constraints on mantle rheology** • Karato, S.I. and Wu, P., 1993. Rheology of the upper mantle: A synthesis. *Science*, 260(5109), pp.771-778 Supplemental reading • Hirth, G. and Kohlstedt, D.L., 1996. Water in the oceanic upper mantle: implications for rheology, melt extraction and the evolution of the lithosphere. *Earth and Planetary Science Letters*, 144(1), pp.93-108	
~~17.11.2016~~ Postponed to 24.11.2016	Lars	**Experimental constraints on mantle rheology II** • Mei, S., Suzuki, A.M., Kohlstedt, D.L., Dixon, N.A. and Durham, W.B., 2010. Experimental constraints on the strength of the lithospheric mantle. *Journal of Geophysical Research: Solid Earth*, *115*(B8) Supplemental reading • Bürgmann, R. and Dresen, G., 2008. Rheology of the lower crust and upper mantle: Evidence from rock mechanics, geodesy, and field observations. *Annual Review of Earth and Planetary Sciences*, *36*(1), p.531	
1.12.2016	Jorina	**Experimental constraints on mantle rheology III** • Kranjc, K., Rouse, Z., Flores, K.M. and Skemer, P., 2016. Lowtemperature plastic rheology of olivine determined by nanoindentation. *Geophysical Research Letters*, *43*(1), pp.176-184 Supplemental reading • Schuh, C.A., 2006. Nanoindentation studies of materials. *Materials Today*, *9*(5), pp.32-40	

Papers under consideration

General background

- Burov, E.B., 2011. Rheology and strength of the lithosphere. Marine and Petroleum Geology, 28(8), pp.1402-1443
- Kirby, S.H., 1983. Rheology of the lithosphere. Reviews of Geophysics, 21(6), pp.1458-1487

Rock mechanics/experimental stuff

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Field/geophysical studies

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Tectonic inheritance papers

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Intraplate (or local) rheological strength

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Seismicity arguments for various rheology models