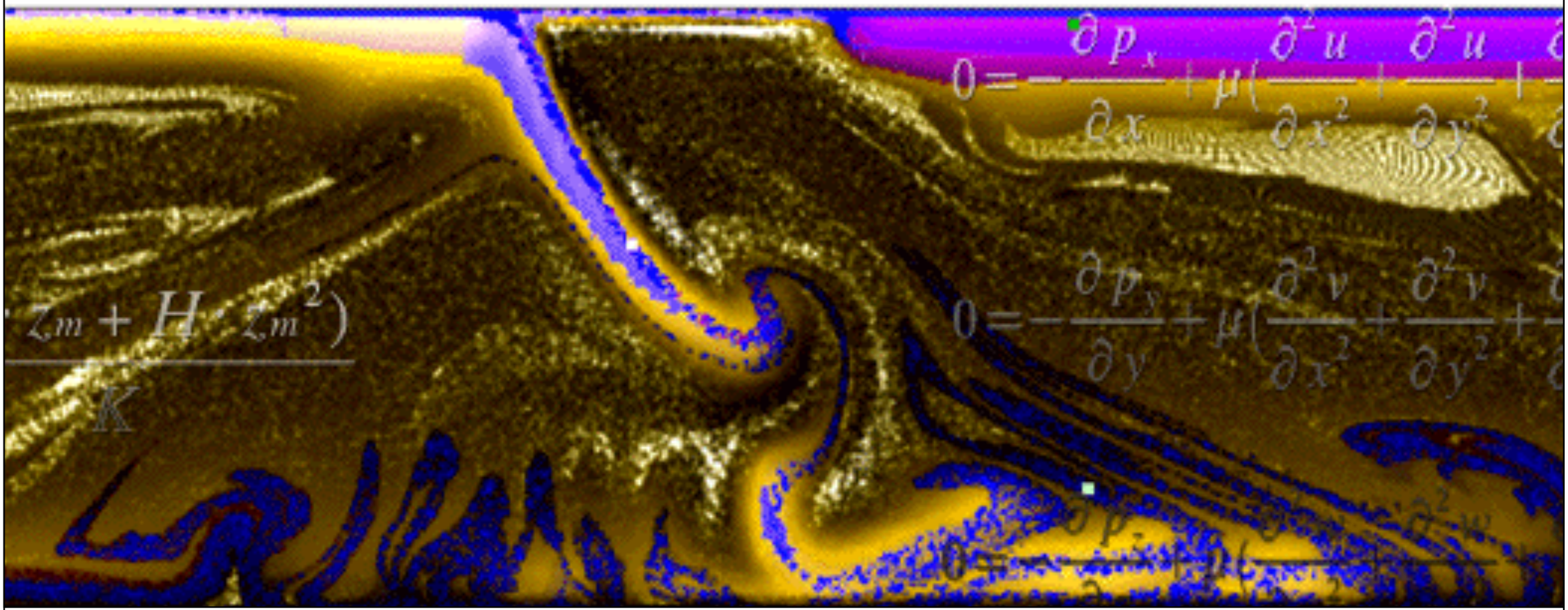
GEO-3101-3801

Video Presentation Week 12



In Week 12, GEOS 3101-3801 students working in group of 3 will deliver a 4 to 5 minutes long video podcast on a subject of particular interest to them but relevant to GEOS-3101-3801.

Gorges d'Heric, in a Variscan metamorphic core complex, Montagne Noire, South France

Menu

1. INTRODUCTION - Don't be fooled by the short length of the podcast. To produce a meaningful 4 to 5 minutes long podcast you will have to digest a relatively large volume of information. Only then, you will be able to present your topic in an engaging, concise and articulate manner. These podcasts aim at senior undergraduates, not first year students. Your podcast must be delivered in an Internet-compatible format on a USB (Universal Serial Bus) key, along with a one-page summary. To be safe, please provide your podcast in two formats (avi, mpeg, mov, etc). A webcam, a smartphone, a basic movie editor and some imagination are all you need to build an engaging podcast presentation. These podcasts will be presentated, discussed and peer assessed in week 12.

Dextral shear, Barberton Greenstone Belt, South Africa

2. ASSESSMENT CRITERIA

A: GENERAL PRESENTATION (30%)

1/ Introduction- effective in laying the groundwork - 5 %

The first 20 sec are crucial to grab the attention of your audience and introduce the subject of your presentation.

2/ Delivery- smooth and well paced - 10 %

Avoid packing to much information, and do not rush or speak too fast.

3/ Grammar and word choice- 5 %

Remember that you are scientists: an hypothesis and a theory are two very different concepts.

4/ Timing- Finish in time - 5 %

5/ Summary/conclusion- reinforced key points - 5 %

B: VISUAL AIDS (20%)

1/ Could you read / comprehend them- 10 %

2/ Sequence- was it appropriate? 5 %

3/ Effectiveness in supporting conclusions- 5 %

C: CONTENT & ORGANIZATION (40%)

1/ Significance- new and useful information 10 %

2/ Logical and smooth progression 10 %

3/ Relevance- of presented material to the task 10 %

4/ Conclusions- well-supported and documented 10 %

D: AUDIENCE RESPONSE (10%)

1/ Questions- measure the audience interest 5 %

2/ Replies- questions well handled 5 %

nb: Humor is one way to engage with the audience. However, keep in mind that the prime objective of this exercise is not to entertain, but to educate your peers.

3. EXCERCISE SCHEDULE

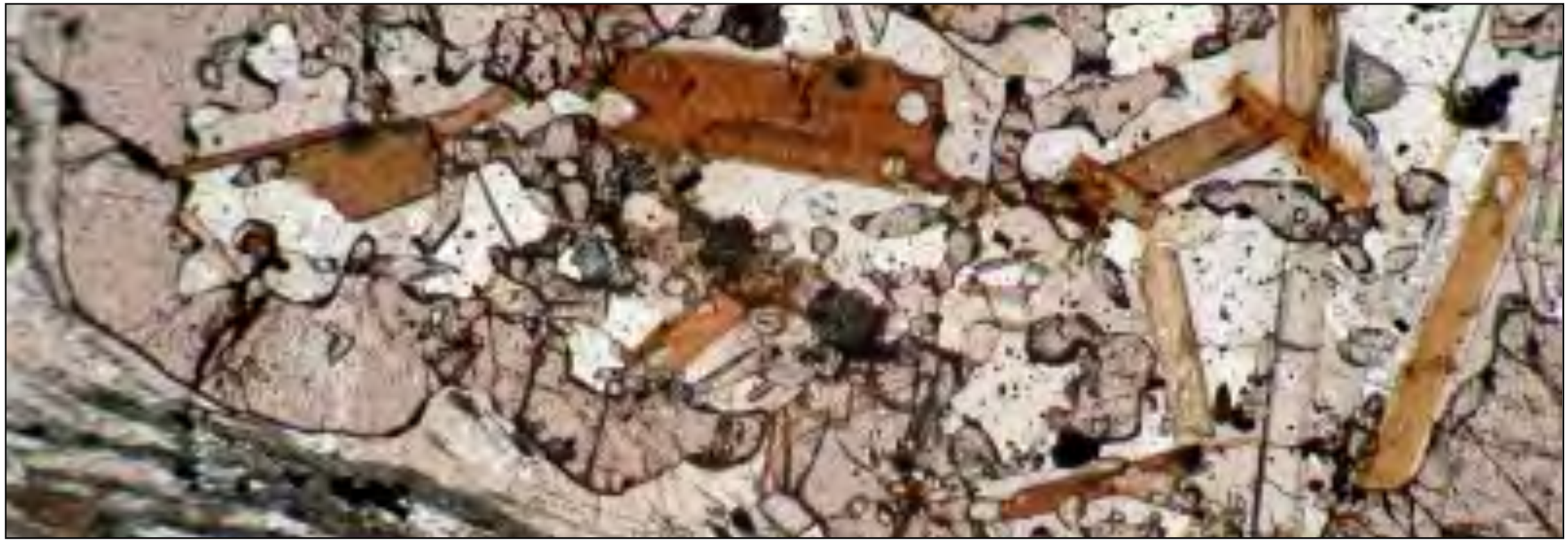
Week 6 - Organize yourself in group of 3 students, and choose a topic carefully - not too broad or narrow - cf. list in the next sections. Send to Patrice the title of your topic and the name of your teammates.

Week 6 to 8 - Read materials, and over a one hour meeting decide on the content and the structure of your podcast.

Week 9 - Organize a 30 min meeting with Patrice to pitch the synopsis of your presentation, get feedback on its content and structure, and get advice on the technology to use.

Week 10 to 12 - Production of your podcast.

Topics- Metamorphic Geology



Was there a secular nature to metamorphism?

Brown, M., 2007. Metamorphic Conditions in Orogenic Belts: a Record of Secular Change. International Geology Review, 49, 193-234.

Hargraves, R. B., 1986, Faster spreading or greater ridge length in the Archean: Geology, v. 14, p. 750–752.

Jahn, B., Caby, R., and Monie, P., 2001, The oldest UHP eclogites of the world: Age of UHP metamorphism, nature of protoliths, and tectonic implications: Chemical Geology, v. 178, p. 143–158.

Valley, J. W., 2005, A cool early earth? Scientific American, v. 293, p. 58–65.

Blueschists – why are they special?

Ernst, W. G., 1972, Occurrence and mineralogic evolution of blueschist belts with time: American Journal of Science, v. 272, p. 657–668.

Ernst, W. G., 2005, Alpine and Pacific styles of Phanerozoic mountain building: Subduction-zone petrogenesis of continental crust: Terra Nova, v. 17, p. 165–188.

Maruyama, S., and Liou, J. G., 1998, Initiation of ultrahigh-pressure metamorphism and its significance on the Proterozoic–Phanerozoic boundary: The Island Arc, v. 7, p. 6–35.

The extremities of metamorphism: UHT and UHP (2 topics)

Chopin, C., 2003, Ultrahigh-pressure metamorphism: tracing continental crust into the mantle: Earth and Planetary Science Letters, v. 212, p. 1–14.

Smith, D. C., 1984, Coesite in clinopyroxene in the Caledonides and its implications for geodynamics: Nature, v. 310, p. 641–644.

Hacker, B. R., 2006, Pressures and temperatures of ultrahigh-pressure metamorphism: Implications for UHP tectonics and H2O in subducting slabs: International Geology Review, v. 48, p. 1053–1066.

Harley, S. L., 1989, The origins of granulites—a metamorphic perspective: Geological Magazine, v. 126, p. 215–247.

Hollis, J. A., Harley, S. L., White, R. W., and Clarke, G. L., 2006, Preservation of evidence for prograde metamorphism in UHT HP granulites, South Harris, Scotland:Journal of Metamorphic Geology, v. 24, p. 263–279.

O'Brien, P.J. & Rötzler, J., 2003. High-pressure granulites: formation, recovery of peak conditions and implications for tectonics. Journal of Metamorphic Geology, 21, 3-20

Roles for fluids: open vs. closed system mineral equilibria

Camacho, A., Lee, J. K. W., Hensen, B. J., and Braun, J.,2005, Short-lived orogenic cycles and the eclogitization of cold crust by spasmodic hot fluids: Nature, v.435, p. 1191–1196.

Clarke, G. L., Daczko, N. R., Klepeis, K. A. & Rushmer, T. 2005: Roles for fluid and/or melt advection in forming high-P mafic migmatites, Fiordland, New Zealand. Journal of Metamorphic Geology, 23, 557-67.

Phillips, G. N. 1980. Water activity changes across an amphibolite-granulite facies transition, Broken Hill, Australia. Contributions to Mineralogy and Petrology, 75, 377-386.

Janardhan, S., Newton, R. C. & Smith, J. V. 1979: Ancient crustal metamorphism at low PH2O: charnockite formation from Kappaldurga, south India. Nature, 278, 511-14.

What gets left behind from partial melting?

Chappell, B. W. & White, A. J. R. 1974: Two contrasting granitic types. Pacific Geology, 8, 173-4.

White, R.W. & Powell, R., 2002. Melt loss and the preservation of granulite facies mineral assemblages. Journal of Metamorphic Geology, 20, 621-632.

White, A.J.R., Allen, C.M., Beams, S.D., Carr, P.F., Champion, D.C., Chappell, B.W., Wyborn, D. & Wyborn, L.A.I., 2001. Granite suites and supersuites of eastern Australia. Australian Journal of Earth Sciences, 48, 515-530.

Collins, W.J. 1996. Lachlan Fold Belt granites: products of three-component mixing. Transactions of the Royal Society of Endinburgh, 87, 171-181.

Collins, W. J. 1998: Evaluation of petrogenetic models for Lachlan Fold Belt granitoids: implications for crustal architecture and tectonic models. Geology, 30, 535-8.

Magma segregation and ascent mechanisms

Clemens, J. D. & Mawer, C. K. 1992: Granitic magma transport by fracture propagation. Tectonophysics, 20, 339-60.

Connolly, J. A. D., Holness, M. B., Rubie, D. C. & Rushmer, T. 1997: Reaction-induced microcracking: An experimental investigation of a mechanism for enhancing anatectic melt extraction. Geology, 25, 591-4.

Daczko, N. R., Clarke, G. L. & Klepeis, K. A. 2001. The transformation of two-pyroxene hornblende granulite to garnet granulite: simultaneous melting and fracturing of the lower crust, Fiordland, New Zealand. Journal of Metamorphic Geology, 19, 547-60.

Hutton, D. H. W. 1992: Granite sheeted complexes: evidence for the dyking ascent mechanism. Transactions of the Royal Society of Edinburgh: Earth Sciences, 83, 377-82.

Hutton, D. H. W. 1982: A tectonic model for the emplacement of the Main Donegal granite, NW Ireland. Journal of the Geological Society of London, 139, 615-31.

Using accessory minerals to date metamorphism

Daniela Rubatto, Zircon trace element geochemistry: partitioning with garnet and the link between U-Pb ages and metamorphism, Chemical GeologyVolume 184, Issues 1-2, 15 March 2002, Pages 123-138

Fitzsimons, J.C.W., Kinny, P.D., Wetherley, S. & Hollingsworth, D.A., 2005. Bulk chemical control on metamorphic monazite growth in pelitic schists and implications for U-Pb age data. Journal of Metamorphic Geology, 23, 261-277.

Harley, S. L., Kelly, N. M. & Möller, A. 2007: Zircon behaviour and the thermal histories of mountain chains. Elements, 3, 25-30.

Topics- Tectonics & Geodynamics

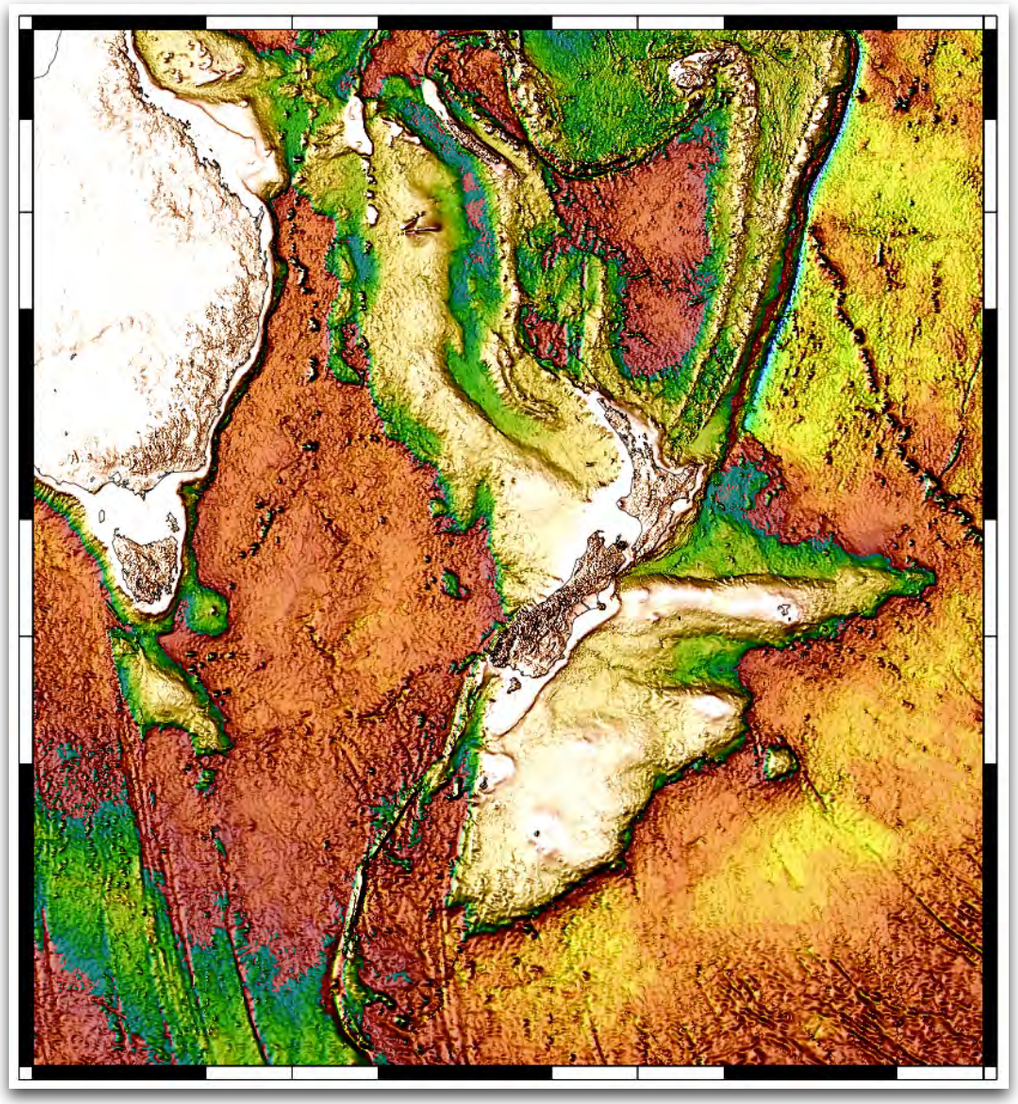


Plate margin fragmentation and the detachment of continental ribbons can be seen as the product of mantle wedge dynamics.

Each individual chapter from "Van Der Pluijm, B.A. & Marshak, S., 2004. Earth Structure: An Introduction to Structural Geology and Tectonics" can used as a basis for a 4-5 mn video podcast, in addition to the following broader topics:

Mantle Convection and Mantle Dynamics

Tackley, 2000: Mantle Convection and Plate Tectonics: Toward an Integrated Physical and Chemical Theory. Science, v.288, 2002-20007

Romanowicz, B, Yuancheng Gung, 2002: Superplumes from the Core-Mantle Boundary to the Lithosphere: Implication for Heat Flux. Science, v. 296, 513-516.

Zhong, S, and M. Gurnis, 1995: Mantle Convection with Plates and Mobile, Faulted Plate Margins. Science, v.267, 838-843.

Scoppola, B, D. Boccaletti, M. Bevis, E. Carminati and C. Doglioni, 2006: The Westward Drift of the Lithosphere: A rotational drag? G.S.A. Bulletin, v.118, 199-209.

Conrad, C. and C. Lithgow-Berteloni, 2002: How Mantle Slabs Drive Plate Tectonics, Science, v. 298, 207-209.

Cizkova, H., J. van Hunen, A. P. van den Berg, 2002: The Influence of Rheological Weakening and Yield Stress on the Interaction of Slabs with th 670 km discontinuity. Earth Planetaru Scince Letters, v.199, 447-457.

van den Berg, A., P. E.S.G., Rainey and D. A., Yun, 2005: The Combined Influences of Variable Thermal Conductivity, Temperature- and Pressure-Dependent Viscosity and Core-Mantle Coupling on Thermal Evolution. Earth Planetary Science Letters, v. 149, 259-278.

Coltice, N., B.R., Phillips, H. Bertrand, Y. Ricard and P. Rey, 2006: Global Warming of the Mantle at the Origin of Flood Basalts over Supercontinents. Geology, 35, 391-395.

Continental Break-Up and Sedimentary Basins

Gernigon, L., S. Planke, J.C. Ringenbach and B. Le Gall, 2006: Tectonic and Deep Crustal Structures along the Norwegian Volcanic Margin: Implications for the "Mantle Plume or Not" debate. www.MantlePlumes.org

Gernigon, L., J.C. Ringenbach, S. Plank, and B. Le Gall, 2004: Deep Structures and Breakup along Volcanic Rifted Margins: Insights from Integrated Studies along the outer Vøring Basin (Norway). Marine and Petroleum Geology, v. 21, 363-372.

Gernigon, L., F. Lucazeau, F. Brigaud, C. Ringenbach, S. Plank, and B. Le Gall, 2006: A Moderate Melting Model for the Vøring Margin (Norway) Based on Structural Observations and a Thermo-kinematical Modelling: Implications for the Meaning of the Lower Crustal Bodies. Tectonophysics, v.412, 255-278.

Geoffroy, L. 2005: Volcanic Passive Margins. Comptes Rendus Geoscience, v.337, 1395-1408.

Corti, G., M. Bonini, S. Conticelli, F. Innocenti, P. Manetti and D. Soukoutis, 2003: Analogue Modelling of Continental Extension: a Review Focussed on the relations Between the Patterns of Deformation and the Presence of Magma. Earth Science Reviews, v.632, 169-247.

Corti et al., 2003, Geophysical Research Letters

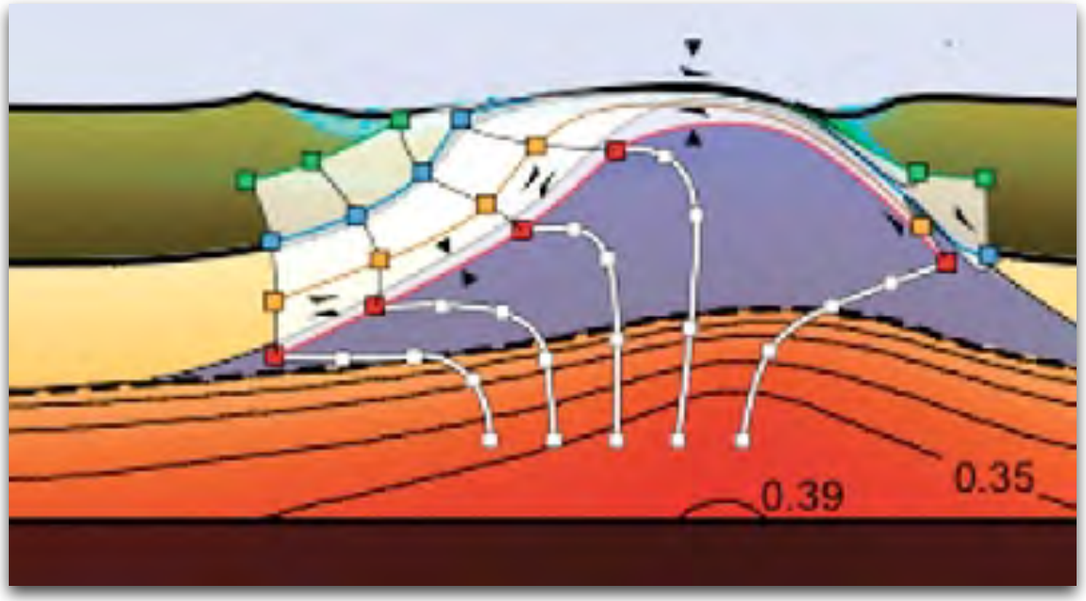
Wijns, C., Weinberg, R., Gessner, K. & Moresi, L. 2005: Mode of crustal extension determined by rheological layering. Earth Planetary Science Letters v. 236, 120-134.

Rey, P. 2001: From Lithospheric Thickening and Divergent Collapse to Active Continental Rifting. in Miller, J.A., Buick, I.S., Hand, M., and Holdsworth, R.E., (eds), Continental Reworking and Reactivation, Journal of the Geological Society of London, v.184.

Mountain Belts Processes

Wittlinger G., P. Tapponnier, G. Poupinet, Jiang Mei, Dhi Danian, G. Herquel and F. Mason, 1998: Tomographic Evidence for Localized Lithospheric Shear along the Altyn Tagh Fault. Science, v. 282, 74-76.

Shapiro, N.M., M.H. Ritzwoller, P. Molnar and V. Levin, 2004: Thinning and Flow of Tibetan Crust Constrained by Seismic Anisotropy. Science, v.305, 233-236



Royden L. H. B. C. Burchfield, R. W. King, Erchie Wang, Zhiliang Chen, Feng Shen and Yuping Liu, 1997: Surface Deformation and Lower Crustal Flow in Eastern Tibet, Science, v. 276, 788-790.

Rey, P., O. Vanderhaeghe, and C. Teyssier, 2001: Gravitational Collapse of the Continental Crust: Definition, Regimes and Mode. Tectonophysics, v. 342, 435-449.

Boutelier, D., A. Chemenda and C. Jorand 2004: Continental Subduction and Exhumation of High-Pressure rocks: Insights form Thermo-mechanical Laboratory Modelling. Earth Planetary and Science Letters, v. 222, 209-216.

Stockhert, B., and T. V. Gerya, 2005: Pre-collisional high-pressure metamorphism and nappe tectonics at active continental margins: a numerical simulation. Terra Nova, v.17, 102-110.

Tikoff, B., C. Teyssier, C. Waters: 2002. Clutch tectonics and the partial attachment of lithospheric layers. EGU Stephan Mueller Special Publication Series, 1, 57–73.

Rey, P. and N. Coltice, Geology, 2008: Neoarchean lithospheric strengthening and the coupling of Earth's geochemical reservoirs. Geology, v.36, 635-638.

Duclaux, G., Rey, P., Guillot, S., and Ménot, R.P., 2007, Orogen-parallel flow during continental convergence: Numerical experiments and Archean field examples: Geology, v. 35, p. 715–718.

Rey P., and G. Houseman, 2006: Lithospheric scale gravitational flow: the impact of body forces on orogenic processes from Archaean to Phanerozoic. In Buiter, S. J. H. & Schreurs , G. (eds) 2006. Analogue and Numerical Modelling of Crustal-Scale Processes. Geological Society, London, Special Publications, 253, 153–167.

Heat Generation and Heat Transport

Anderson, D. 2005: Energetics of the Earth and the Missing Heat Source Mystery. www.MantlePlume.org

Burg J.P. and T.V. Gerya, 2005: The role of viscous heating in Barrovian metamorphism of collisional orogens: thermomechanical models and application to the Lepontine Dome in the Central Alps. J. Metamorphic Geology. v.23, 75-95.

Rey, P., P. Philippot and N. Thébaud, 2003: Contribution of mantle plumes, crustal thickening and greenstone blanketing to the 2.75–2.65 Ga global crisis Precambrian Research, v.127, 43-60.

Coltice, N., B.R., Phillips, H. Bertrand, Y. Ricard and P. Rey, 2006: Global Warming of the Mantle at the Origin of Flood Basalts over Supercontinents. Geology, 35, 391-395.

Rheology of the Continental and Oceanic Lithospheres (2 topics)

Kohlstedt, D.L., B. Evans and S.J. Mackwell, 1995: Strength of the Lithosphere: Constraints Imposed by Laboratory Experiments. Journal of Geophysical Research, v.100, 17587-17602.

Fernandez, M. and G. Ranalli, 1999: The role of rheology in extensional basin formation modeling. Tectonophysics, v. 282, 129-145.

Burov, E.B. and A.B. Watts, 2006: The Long-Term Strength of Continental Lithosphere:"Jelly Sandwich" or "Crème Brûlée"? G.S.A. Today, v.6, 4-10.

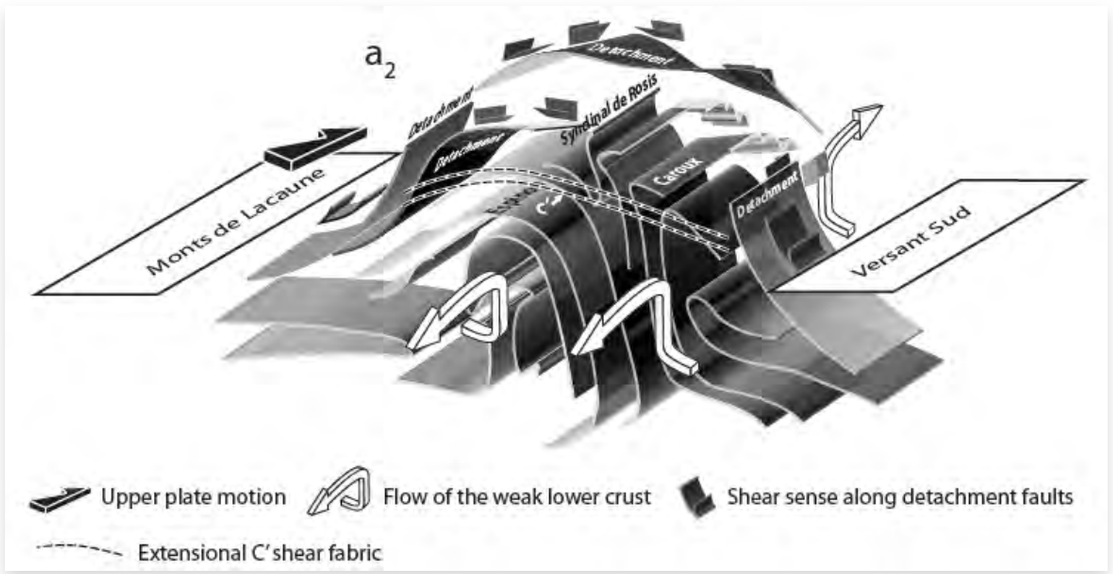
Jackson, J. 2002: Strenght of the Continental Lithosphere: Time to Abandon the Jelly Sandwich? GSA Today, v. Sept, 4-9.

Pysklywec, R. N. and A. R. Cruden, 2004: Coupled crust-mantle dynamics and intraplate tectonics: Two-dimensional numerical and three-dimensional analogue Modeling. Gcubed, v.5, 1-22.

Unworth, M.J., A.G. Jones, W. Wei, G. Marquis, S.G. Gokarn, J.E. Spratt, and the INDEPTH-MT team, 2005: Crustal rheology of the Himalaya and Southern Tibet inferred from magnetotelluric data. Nature, 438, 78-81.

Watts, A.B. and S. Zhong, 2000: Observations of ¯exure and the rheology of oceanic lithosphere. Geophys. J. Int. v.142, 855-875.

Dyksterhuis, S., P. Rey, D. Müller and L. Moresi, 2007: Effects of initial weakness on rift architecture. In Karner, G. D., G. Manatschal, and Pinheiro, L. M. (eds) Imaging, Mapping and Modelling Continental Lithosphere Extension and Breakup. Geological Society, London, Special Publications, 282, 443 – 455.



Tectonic Forces and Body Forces

Wittlinger G., P. Tapponnier, G. Poupinet, Jiang Mei, Dhi Danian, G. Herquel and F. Mason, 1998: Tomographic Evidence for Localized Lithospheric Shear along the Altyn Tagh Fault. Science, v. 282, 74-76.

Hammond W.C. and W. Thatcher, 2004: Contemporary tectonic deformation of the Basin and Range province, western United States: 10 years of observation with the Global Positioning System. Journal of Geophysical Research, v.109, 1-21.

Hammond W.C. and W. Thatcher, 2005: Northwest Basin and Range tectonic deformation observed with the Global Positioning System, 1999 – 2003, Journal of Geophysical Research, v.110, 1-12.

Flesch L.M., W.E. Holt, A.J. Haines and Bingming Shen-Tu, 2000: Dynamics of the Pacific-North American Plate Boundary in the Western United States. Science, v.287, 834-836.

Lallemand S. and A. Heuret, 2005: On the relationships between slab dip, back-arc stress, upper plate absolute motion, and crustal nature in subduction zones. G-Cubed, v.6, 1-18.

Huisman R.S., Y. Y. Podladchikov, and S. Cloetingh, 2001: Transition form Passive to Active Rifting: Relative Importance of Asthenospheric Doming and Passive Extension of the Lithosphere. Journal of Geophysical Research, v. 106, 11271-11291.

Davis and Kuznir, 2002: Are buoyancy forces important during the formation of rifted margins?. Geophys. J. Interior, v. 149, 524-533

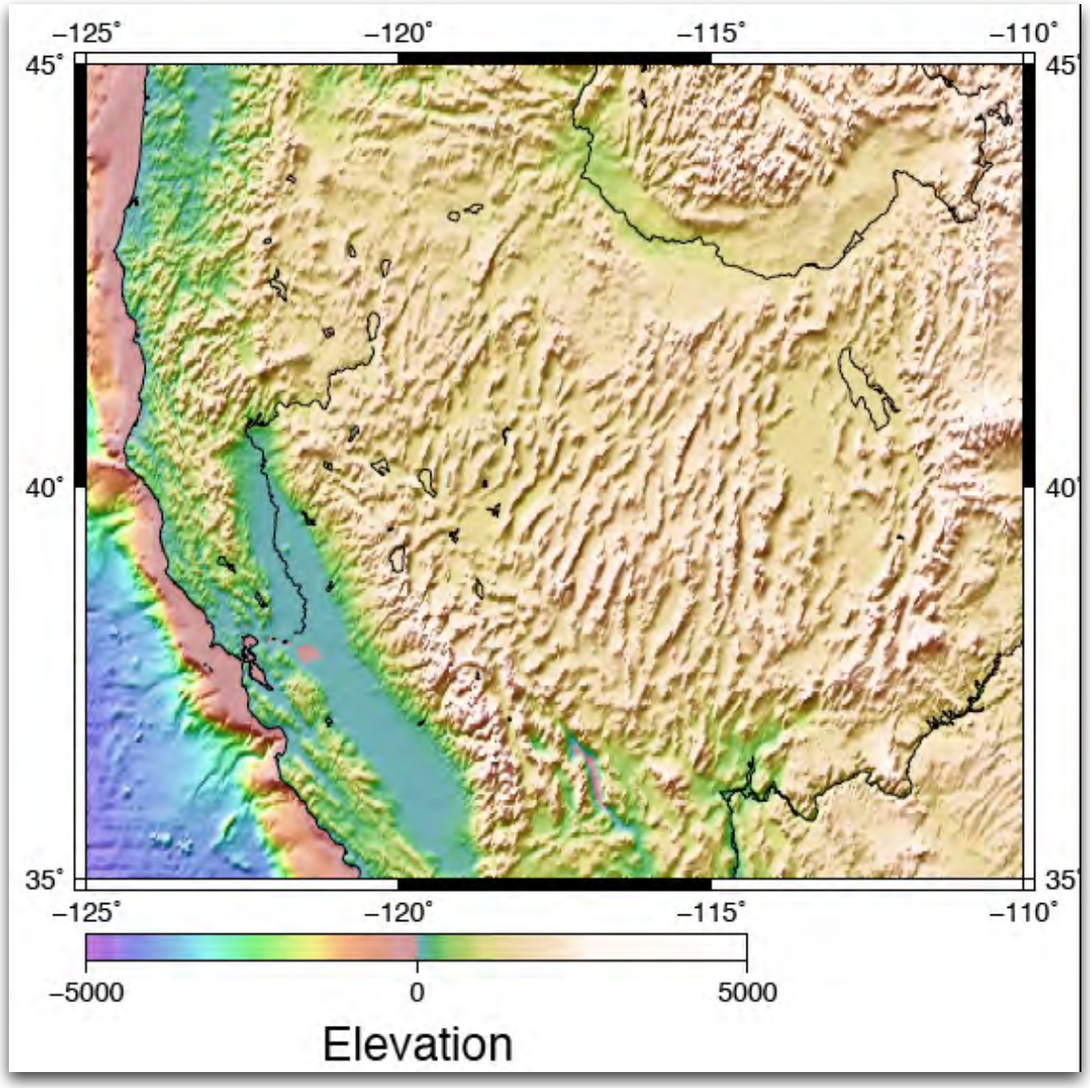
Husson, L. and Y. Ricard, 2004. Stress balance above subduction: Application to the Andes. Earth Planetary Science Letters, 222, 1037-1050.

Rey, P. 2001: From Lithospheric Thickening and Divergent Collapse to Active Continental Rifting. in Miller, J.A., Buick, I.S., Hand, M., and Holdsworth, R.E., (eds), Continental Reworking and Reactivation, Journal of the Geological Society of London, v.184.

Rey P., and G. Houseman, 2006: Lithospheric scale gravitational flow: the impact of body forces on orogenic processes from Archaean to Phanerozoic. In Buiter, S. J. H. & Schreurs , G. (eds) 2006. Analogue and Numerical Modelling of Crustal-Scale Processes. Geological Society, London, Special Publications, 253, 153–167.

Rey, P., O. Vanderhaeghe, and C. Teyssier, 2001: Gravitational Collapse of the Continental Crust: Definition, Regimes and Mode. Tectonophysics, v. 342, 435-449.

Duclaux, G., Rey, P., Guillot, S., and Ménot, R.P., 2007, Orogen-parallel flow during continental convergence: Numerical experiments and Archean field examples: Geology, v. 35, p. 715–718.



The landscape of the "Basin & Range" province of the SW USA is the product of both crustal and mantle processes.

Textbooks & Background Reading

Bucher, K. & Frey, M., 1994. Petrogenesis of Metamorphic Rocks. Springer. Comprehensive rewrite of Winkler's dated but valued text.

Deer, Howie & Zussman,1992. An Introduction to the Rock Forming Minerals, 2nd edition. Longman. Standard reference for mineralogy and mineral chemistry.

Dickin, Radiogenic Isotope Geology. Cambridge. Recent text for isotopic petrology and geochronology.

Kearey & Vine, 1990. Global Tectonics. Blackwell. Excellent summaries of geodynamics, though a rewrite was released in 2008 (Kearey, Vine & Klepeis).

Marshak, S., 2008. Earth, Portrait of a Planet, 3rd edition. Norton & Co., New York.This is the recommended first year text and covers many basic issues very well.

Rollinson, H.1993. Using geochemical data. Longman. Great summaries of isotopic petrology, geochemistry and the uses of trace element data in petrology.

Spear, F.S., 1993. Metamorphic Phase Equilibria and P-T-t paths. Mineralogical Society of America, Monagraph. Detail on what the title suggests, but this will take some time for you to get in.

Van Der Pluijm, B.A. & Marshak, S., 2004. Earth Structure: An Introduction to Structural Geology and Tectonics. A great book for undergraduates.

Vernon, R.H. & Clarke, G.L., 2008. Principles of Metamorphic Petrology. Cambridge.

Wilson, M. 1989. Igneous Petrogenesis, A Global Tectonic Approach. Chapan & Hall Chapters 1-3 provide an excellent petrologic background.

Winter, 2001. Igneous and metamorphic Petrology. Good coverage of some fundamental issues.

Yardley, B.W.D., 1989. An Introduction to Metamorphic Petrology. Longman. An excellent and compact reference.