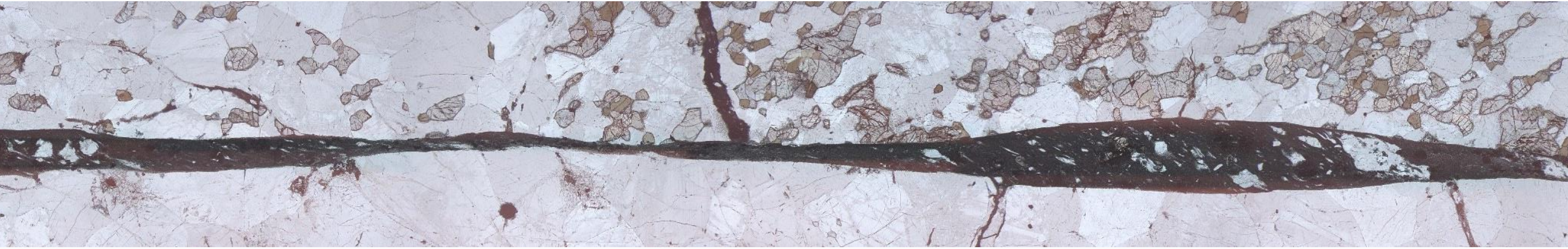


Weakening mechanisms in dry, lower-crustal pseudotachylytes



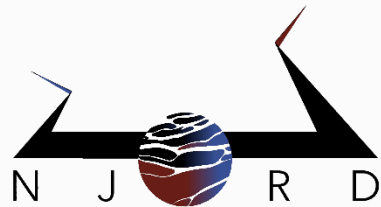
Kristina G. Dunkel

kristina.dunkel@geo.uio.no

Luca Menegon

Bjørn Jamtveit

The Njord Centre, University of
Oslo, Norway



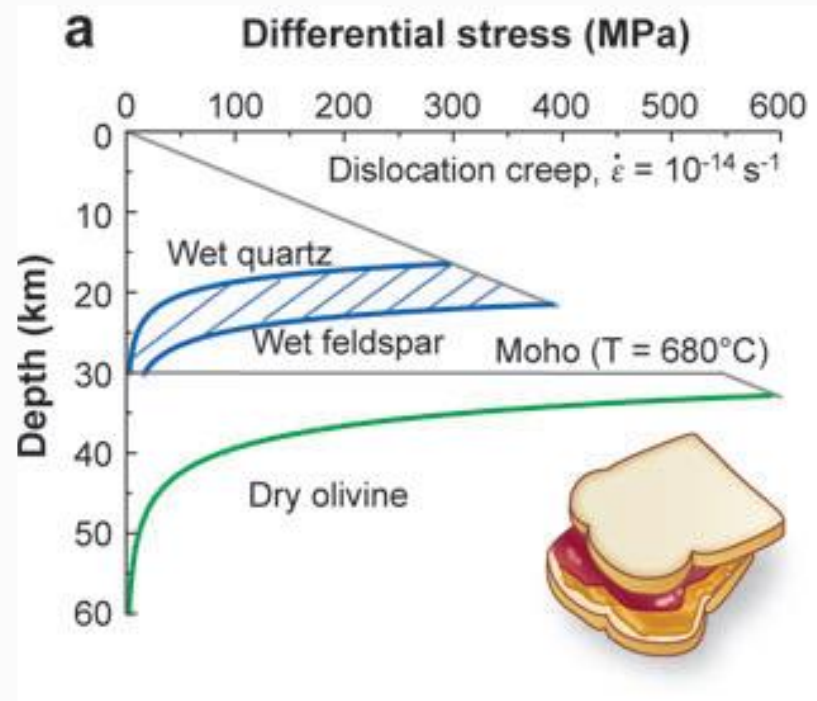
UNIVERSITY
OF OSLO



The strength of the lower crust

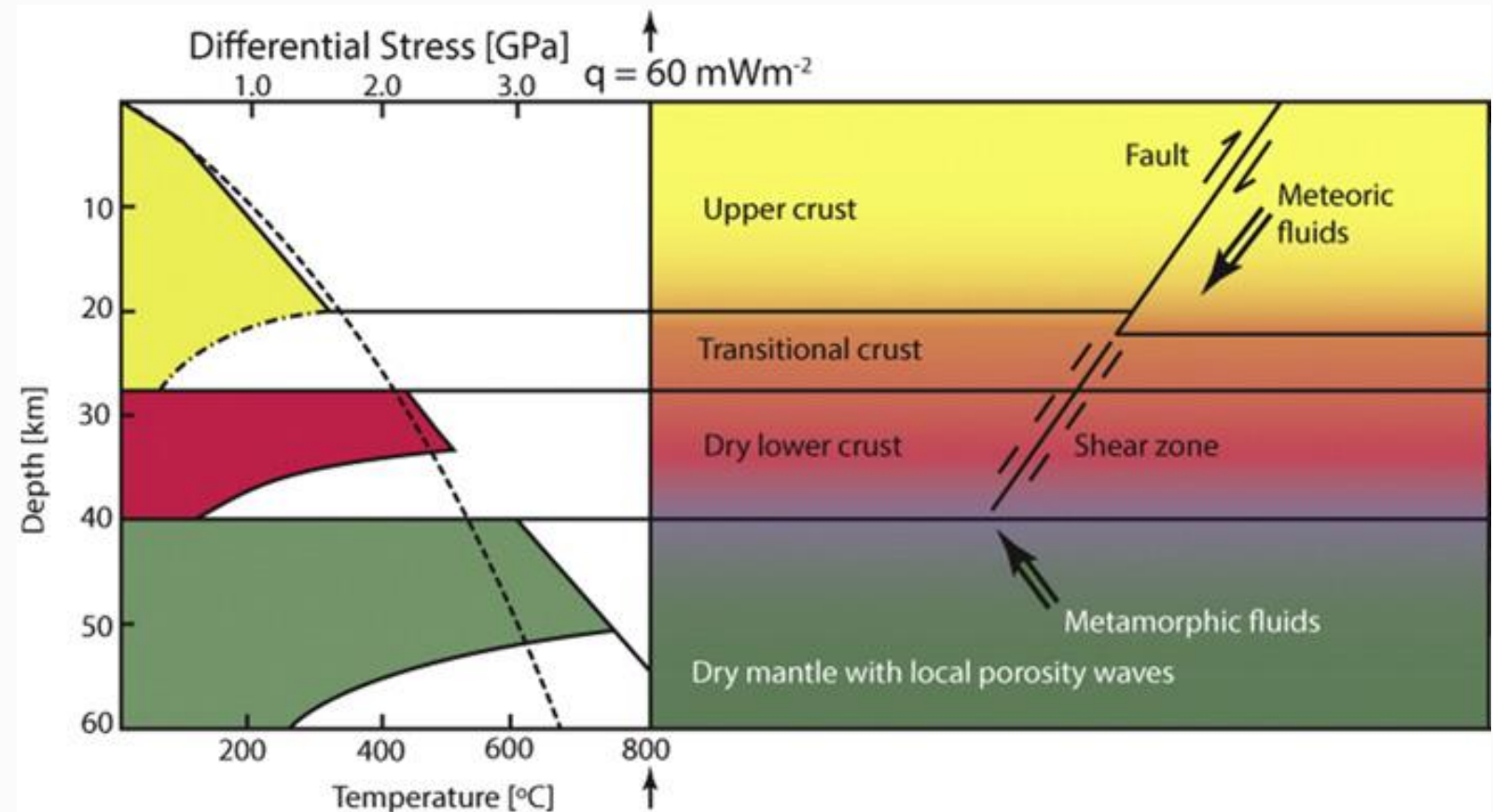
Models

Jelly sandwich



(Bürgmann & Dresen, 2008, *Annu Rev Earth Planet Sci*)

“Dried jelly sandwich” (Burov, 2013, *Mar Pet Geol*)



(Jamtveit et al., 2016, *Earth Sci Rev*)



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Weakening mechanisms in dry, lower-crustal pseudotachylytes

Weakening of the lower crust

Intro
● ●

Results/Discussion
○ ○ ○

Conclusions
○

From “dry and strong” to “wet and weak”

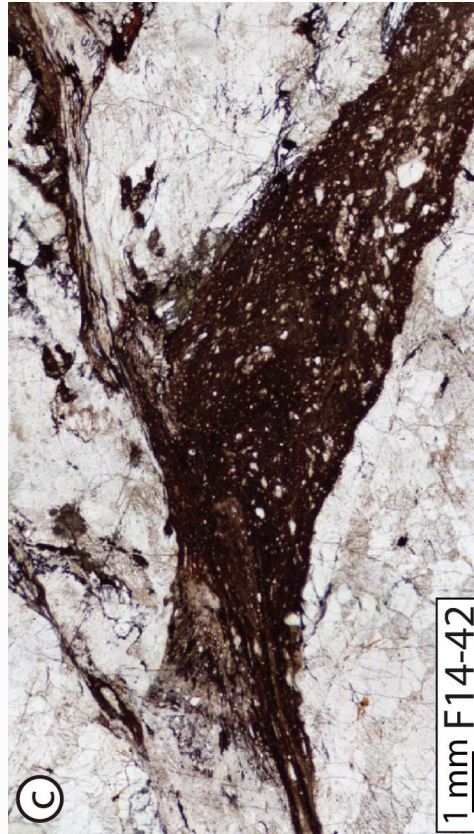
Lofoten (Northern Norway):
Nusfjord East



(Campbell et al., 2020, Nat Comm)

From “dry and strong” to “dry and weak”?

Central Australia:
Musgrave Ranges



(Hawemann et al., 2018, JGR)

Lofoten (Northern Norway):
Moskenesøya



Seismically-induced **grain size reduction** instead
of fluids as agent for the **rheological transition?**



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Weakening mechanisms in dry, lower-crustal pseudotachylytes

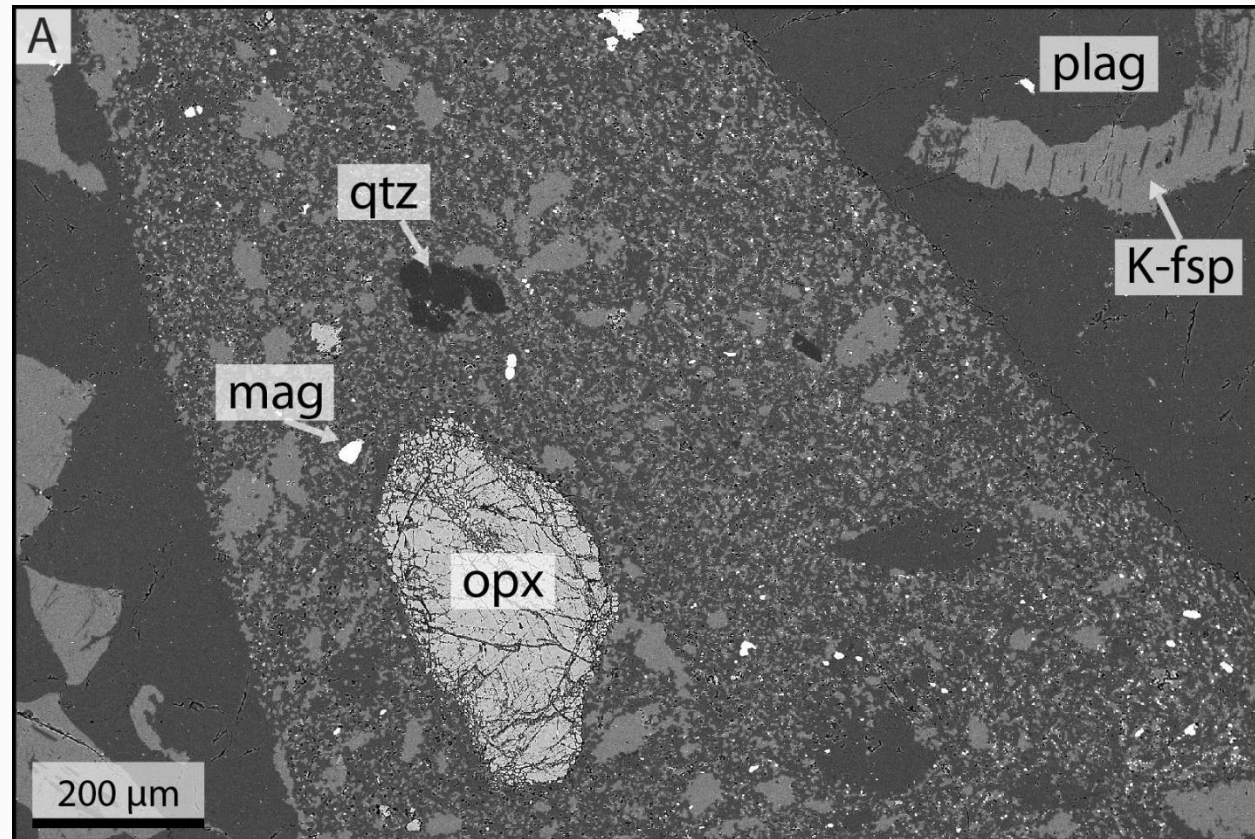
Dry, pristine pseudotachylytes

Intro
●●

Results/Discussion
●○○

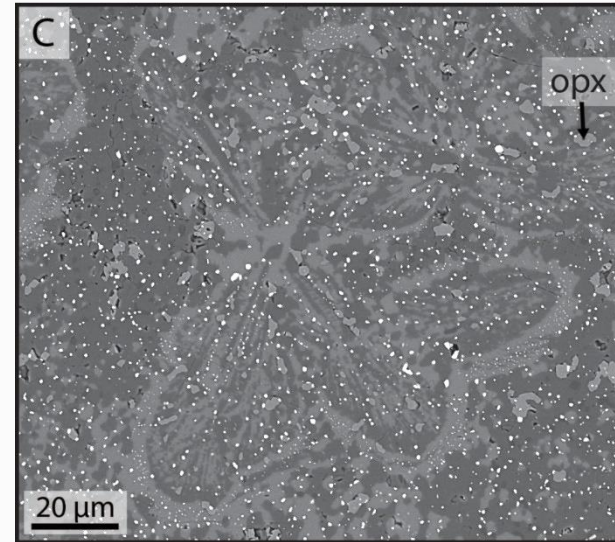
Conclusions
○

Lack of mylonitic structures

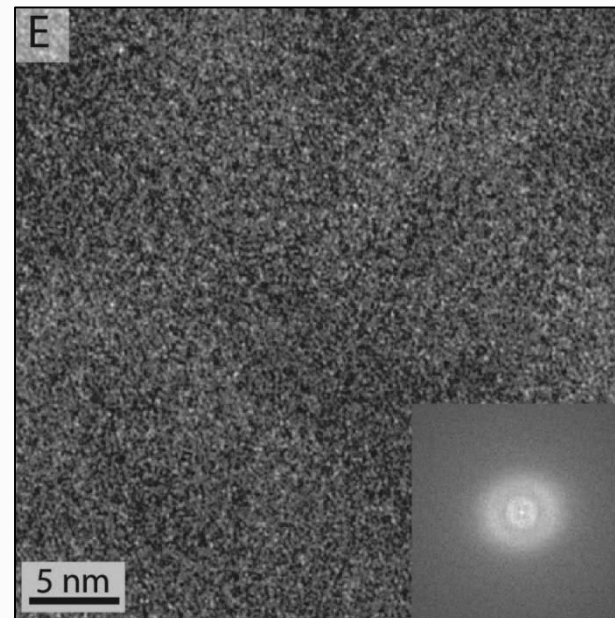


(Dunkel et al., 2021, *Geology*)

Quenching microstructures



Preservation of amorphous material

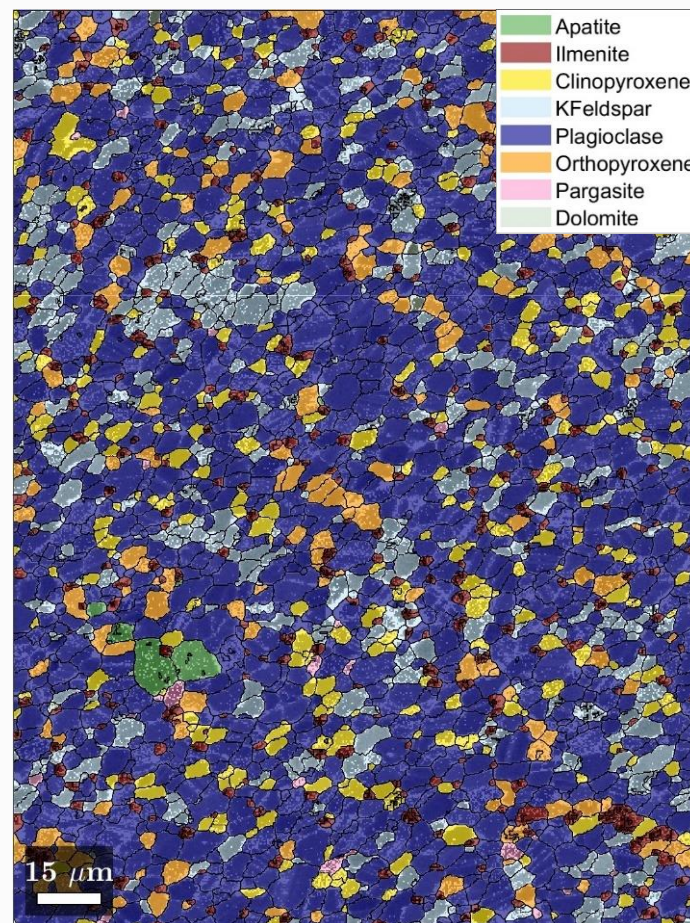
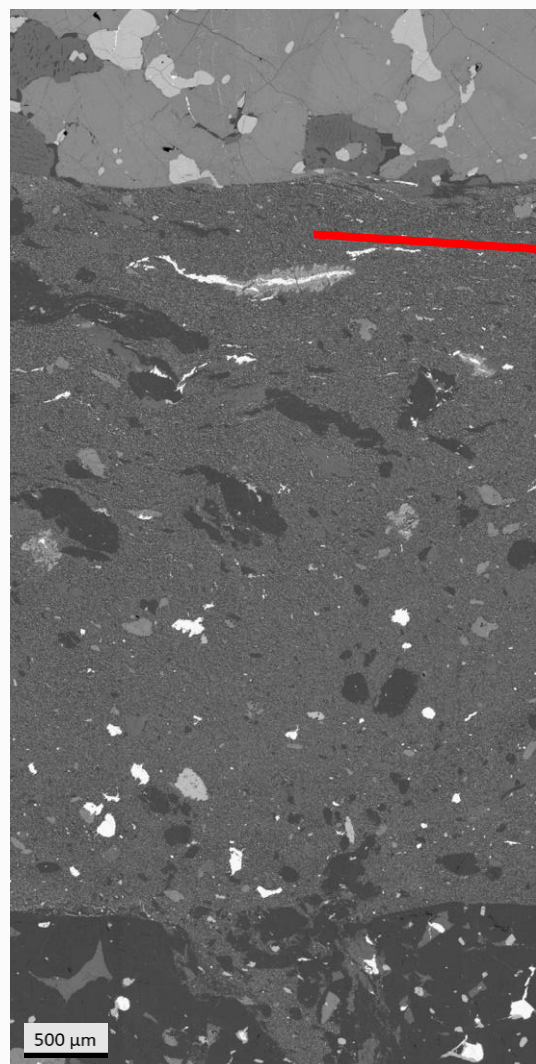


(Dunkel et al., 2021, *Phil Trans R Soc A*)

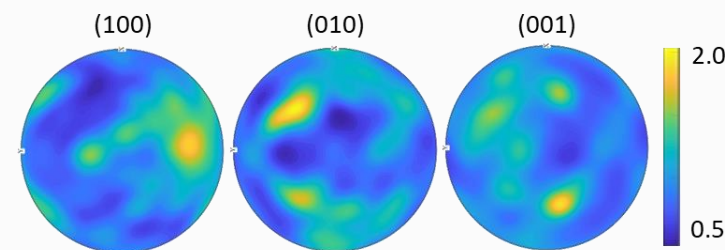
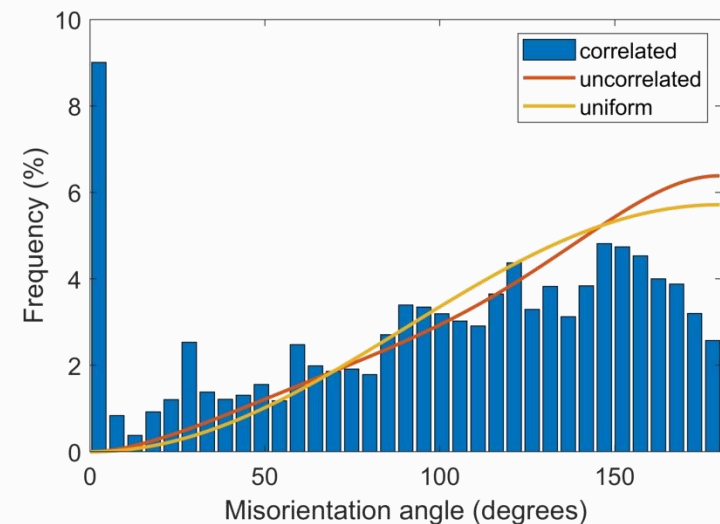


Mylonitization of dry pseudotachylytes

Incipient mylonitization



Plagioclase:

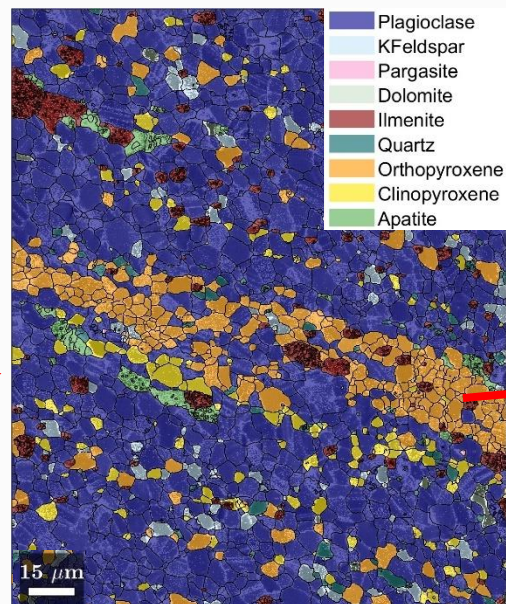
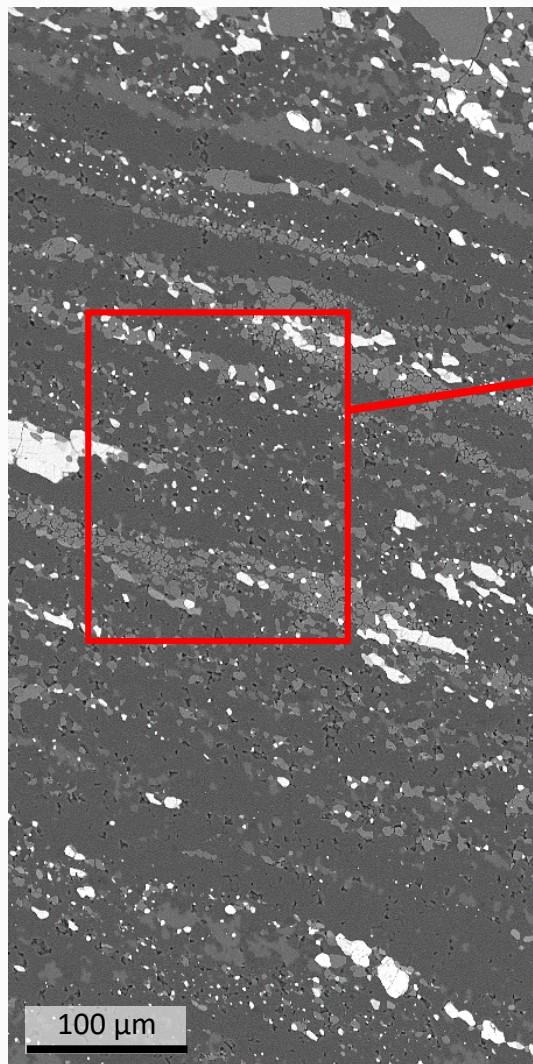


- good mixing
- lack of clear CPO
- fine grain size

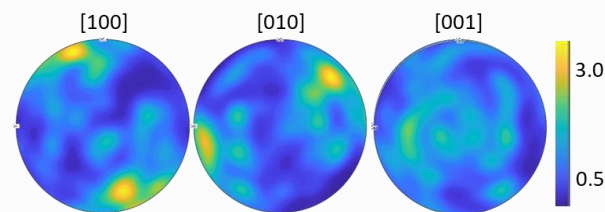
Diffusion creep and grain boundary sliding facilitated by small grain size

Mylonitization of dry pseudotachylytes

Advanced mylonitization



Orthopyroxene:



CPO in pyroxene



Diffusion creep and grain growth at ambient T (700°C) are not sufficient.

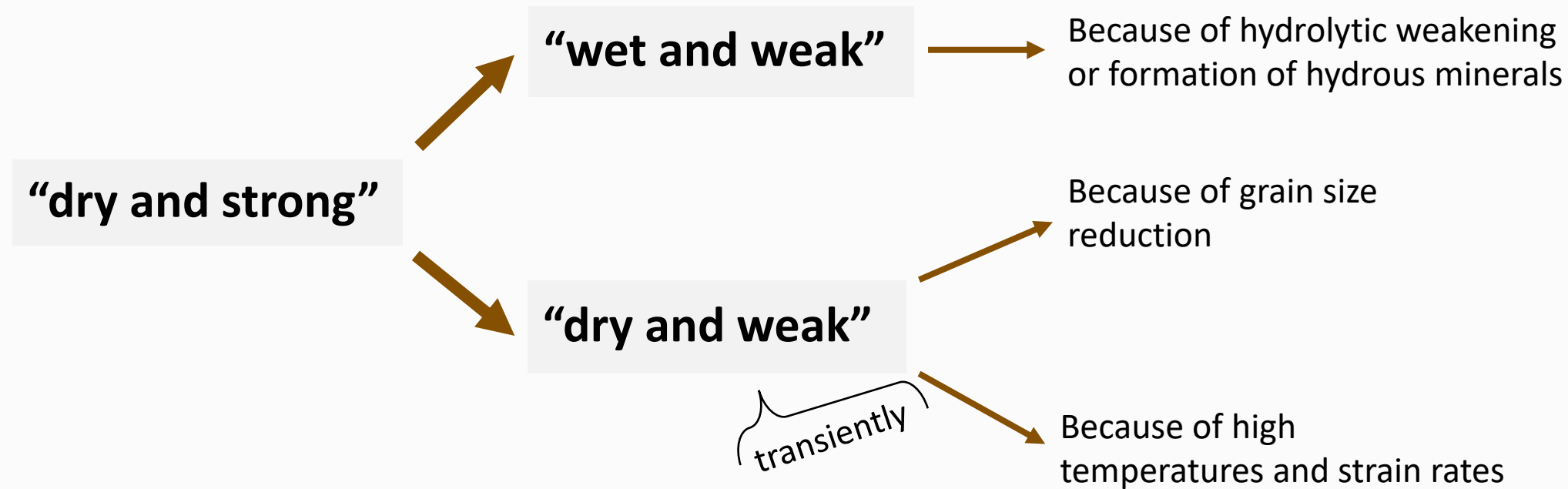
Fast, high-temperature deformation right after the seismic event?

Consistent with:

- retention of granulite-facies mineralogy
- same kinematics of pseudotachylytes and mylonites.



Mechanisms of seismically induced weakening



Abstract:



Comments and suggestions on methods to use, microstructures to look for, articles to read, are all welcome!

Use either the comment function on the EGU website or e-mail me at kristina.dunkel@geo.uio.no.

