UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

Dipartimento di Scienze Chimiche e Geologiche

TECTONICS DURING EARLY STAGES OF CONTINENTAL COLLISION AND SIMILARITIES TO SUBDUCTION ZONES: INSIGHTS FROM THE CENTRAL EUROPEAN ALPS

Lunedì 18 Giugno 2018 ore 15:00

Aula Uint.5 Via Campi 103, 41125 Modena

Dr. Armin Dielforder

Helmholtz Centre Potsdam

GFZ German Research Centre for Geosciences

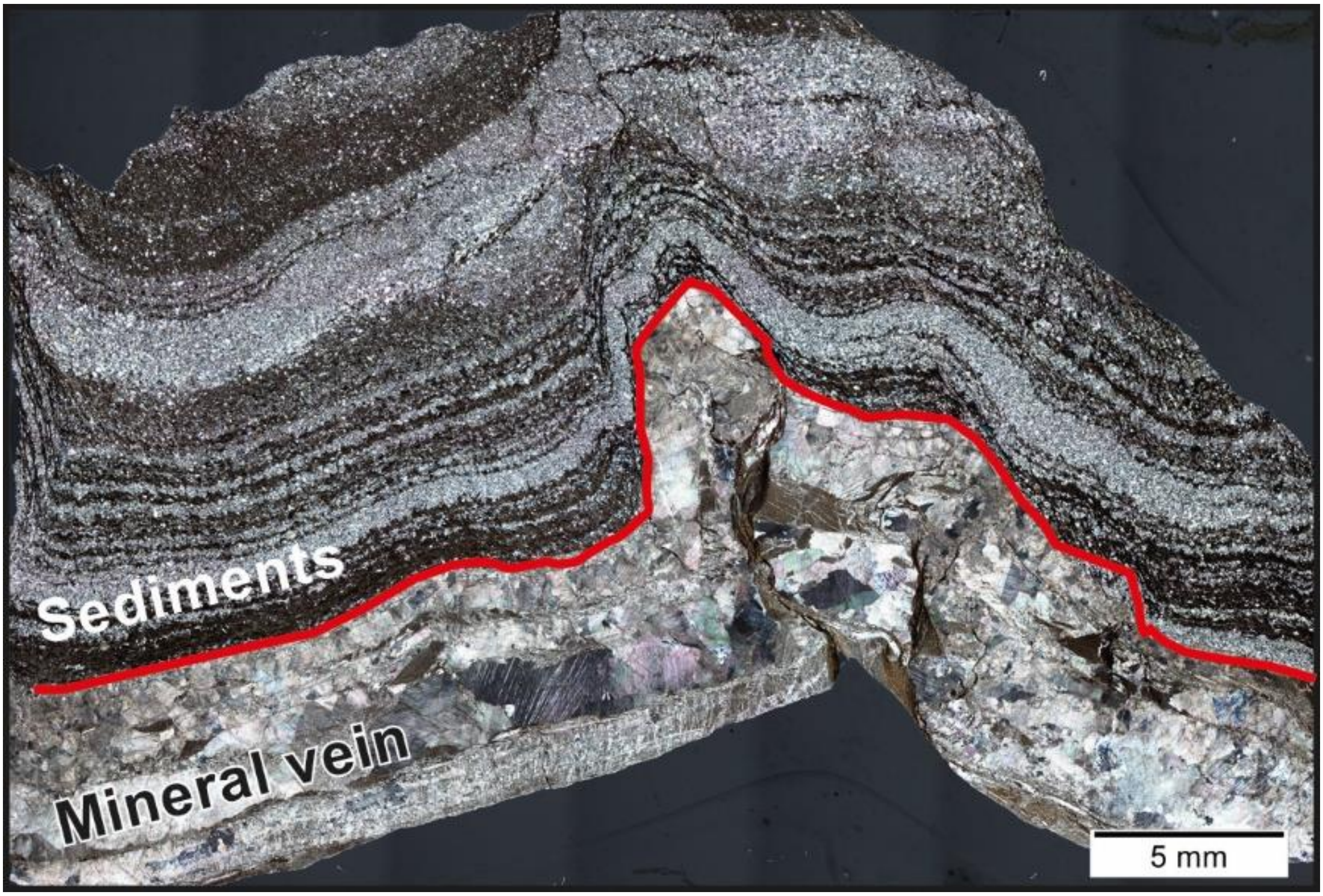

Figure: Mixed brittle-ductile deformation of sediments at temperatures below ~150 ºC. The mineral vein records brittle fracturing, the folding ductile deformation by particulate flow and pressure solution. The mixed brittle-ductile deformation is indicative for deformation at varying strain rates.

Abstract: The tectonics of collision zones and subduction zones are often considered to differ substantially. One supporting argument for this perception is the difficulty in subducting continental crust, which is often explained by buoyancy forces and greater resistive forces in collision zones than in subduction zones. However, comparatively little is known about the strength and mechanical properties of the plate interface and the surrounding at collision zone and its relevance for the tectonic evolution of collisional orogens.

I discuss these aspects based on the example of the central European Alps. I first present insights into the structural development of marine foreland basin sediments that were accreted to the Alpine orogenic wedge during early stages of continental collision. The structural and tectonic evolution of the accreted units shows many similarities to the evolution of accretionary wedges at subduction zones. Based on the structural data, I discuss how the development relates to changes in the rheology during prograde diagenesis and metamorphism as well as to varying strain rates.

In a second part, I present a Coulomb wedge approach that allows to reliably constrain the strength of plate boundary faults (megathrusts) by taking the geometry of wedge internal faults, like major out-of-sequence thrusts, into account. I apply the approach to the European Alps and Himalayas and show that the collision megathrusts are similarly weak as subduction megathrusts. The inferred strengths imply that the megathrusts transfer only little stress into the overlying orogenic wedge. Using the example of the European Alps, I discuss how this may have favored the onset of extensional tectonics in the interior of the orogenic wedge around 20 Ma, when the Alps had grown to mean elevations ≥2,000 m.