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From Structures to Mountain Belt Dynamics – a global and multidisciplinary perspective

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Understanding the formation of mountain belts requires integrating quantitative insights on multiple scales. While this has long been known, it is now possible to enlarge the scales of observation by exploiting global data sets, making use of data sets covering large regions, or including automated data analysis. At the same time the lower limit of observation is pushed farther, and by now structures can be routinely analyzed at the micro- or even nano-scale over large areas making use of digital imaging techniques.

In this talk I will present results from a variety of geological settings illustrating the use of large data sets for better understanding of mountain belt dynamics. To this end, I will integrate micro-structural work, numerical and analog models, and regional studies of fault geometries and their time evolution constrained by digital field techniques and low-temperature thermochronometry. A particular focus will be laid on the role of mechanical heterogeneity and strain localization through time. It is shown that in some regions geodynamic processes are responsible for local fault geometries, while in others much more local factors such as rheological contrasts of individual layers or even the changes of rheology through time plays a major role. Multiscale studies exploiting digital techniques and including the dimension of time provide an exciting avenue for state of the art and future geological studies.