ThinkALPS - Thermokinematic models including Uncertainty of Geometry in the Alps

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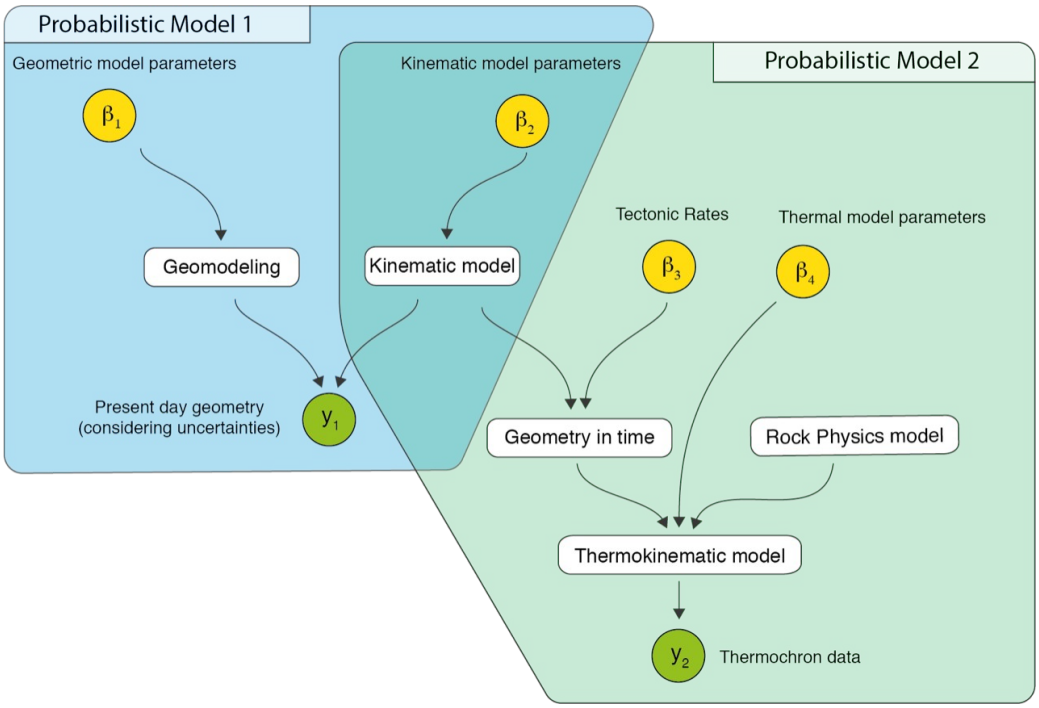
PhDs: 1 PhD position for 3 years

Thermokinematic models are key for understanding the influence of subduction polarity reversal on the evolution of the Alps, as they provide constraints on the spatial distribution and timing of exhumation. However, state-of-the-art models cannot account for uncertainty of structures at depth, which makes it impossible to determine the driving force behind detected exhumation signals. In this project, we will build routines that allow for accounting for full geometric uncertainty in thermokinematic models.



We will first apply these routines to the northern foreland fold-thrust-belt of the Alps, the Subalpine Molasse. This area is particularly suited to resolve large-scale dynamics of the orogen, as it links the Alps with its foreland, and prograding or backstepping of the orogenic front is directly linked to orogenic processes; while continuous plate convergence will result in progressive incorporation of foreland sediments in the orogenic wedge, changes in the tectonic regime would be directly witnessed in the sequence of tectonic activity as well as the geometry of the Subalpine Molasse. At the same time, the Molasse consists of foreland basin sediments, which directly record the hinterland history. Our thermokinematic models will show how unique thermochronological signals are when the uncertainty of geometry at depth is taken into account.

In a following step, we will apply our routines at the orogen scale in the Eastern Alps, in the region where a subduction polarity reversal has been conjectured. We will test whether standard thermokinematic models are indeed able to distinguish between different drivers behind exhumation signals. We will identify key regions where data for precise and accurate models are required, and will study these to provide a quantitative estimate how much deep seated processes related to slab dynamics imprint exhumation estimates in the Eastern Alps.