# Testing erosional and kinematic drivers of mountain belt exhumation combining fold-and-thrust belt kinematics with thermochronology

organized by PD Dr. Rasmus Thiede, Prof. Peter van der Beek and Dr. Suryodoy Ghoshal

date: October 11th, 2023 - 16:00 to October 13th, 2023 - 13:00

place: Institute of Geosciences - University of Potsdam

October 11th, 2023, House 27, room 1.10, 3D-Lab, He-lab, 16:00-18:30

October 12th, 2023, House 25, rooms D0.01/D0.02, 9:00-13:00 and 14:00 – 18:30

October 13th, 2023, House 27, room 1.10, 9:00 – 13:00

programme: https://www..... de/de/aktuelles

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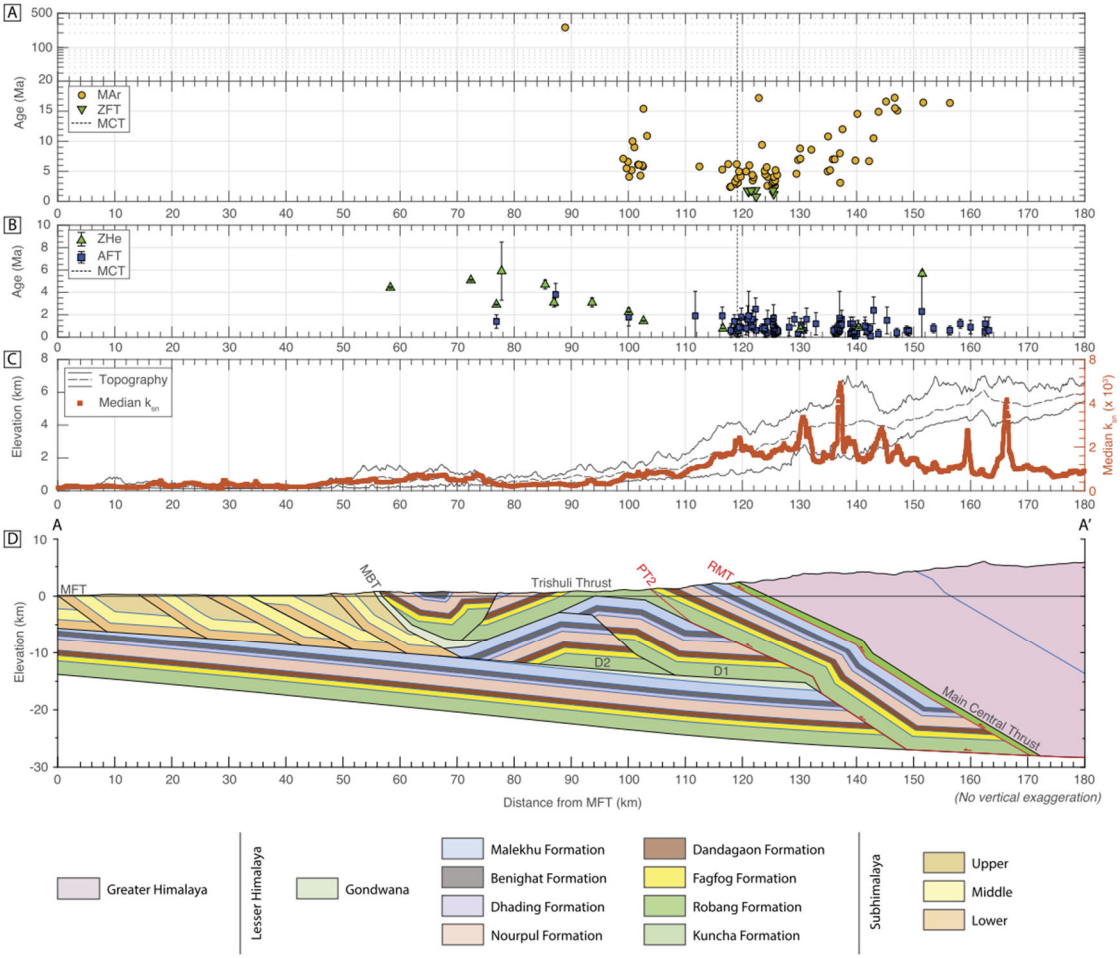


***Fig. 1 Plots of projected thermochronologic and geomorphic data along an orogen-perpendicular transect in Central Nepal, the Marsyangdi transect (Ghoshal et al., EPSL 2023). (A) Combined measured MAr (yellow) and ZFT (green, downward-pointing triangles) thermochronometer data plotted along the Marsyangdi section line; (B) Combined measured ZHe (green, upward-pointing triangles) and AFT (blue). The surface location of the MCT is marked by a black dashed line for reference, while the origin is the location of the MFT. (C) Max, min, and median swath topography along the Marsyangdi cross-section line are shown. The mean topography is shown as a solid, black line. Median ksn values calculated along the swath are shown in orange. (D) Reconstructed balanced cross-section along the Marsyangdi transect. Locations of major Out-of-Sequence thrusts are marked in red. There is no vertical exaggeration in the figure, and the topography shown is the mean topographic profile for the transect.***

## *Workshop Summary:*

Advancements in thermochronology and numerical modeling offer the potential to associate the age of thermochronometric samples to both exhumational and deformational processes and to reconstruct their pathways towards the surface over geologic time. However, understanding how these components are related during tectonic convergence forming entire mountain belts requires linking the geometry and magnitude of fault slip to the spatial distribution and amount of erosion. To address this problem, 2-D thermokinematic modelling can be applied to a forward-modeled balanced geologic cross section to predict the cooling history of samples collected from fold-and-thrust belts. Restored cross sections provide constraints on the kinematic pathways of rocks and the architecture necessary to reproduce mountain-belt growth and the exposed surface geology. By assigning ages to quantified fault displacements, a range of potential velocity vectors is produced, which can be used to calculate heat transport, erosion, rock cooling,

and thermochronometer ages. The predicted ages are verified against measured thermochronometric data to explore the utility of the data to constrain the timing, rate, and geometry of fault motion as well as spatial and temporal variations in exhumation rates across the studied range.

The workshop will discuss the different methods used in this approach, provide hands-on experience in combining forward-modelled balanced cross section, thermo-kinematic modelling using a combination of the codes MOVE® and Pecube, and include a critical in-depth discussion of the advantages and pitfalls of different approaches to model thermochronology data in mountain belts.

Workshop Schedule:

| Wednesday, October 11th | Thursday, October 12th | Friday, October 13th |
|---|---|---|
| Arrival by 4 PM | 9:00 – 13:00 | 9:00 – 11:00 |
| 16:00 – 16:30 Welcome and Opening<br><br>16:30 – 17:30<br><br>Introduction to 3D-Lab<br><br>by Gerold Zeilinger<br><br>17:30-18:30<br><br>Tour through conventional (U-Th)/He and $^{3}He/^{4}He$ labs<br><br>by Ed Sobel and Julien Amalberti | Introduction to integrating structural and thermo-kinematic modelling<br><br>by Suryodoy Ghoshal | Discussion on MOVE-Pecube approach – advantages and disadvantages compared to other approaches<br><br>By Peter van der Beek, Suryodoy Ghoshal, Rasmus Thiede |
| | 14:00 – 17:00<br><br>Thermo-kinematic models and their applications<br><br>by Suryodoy Ghoshal | 11:30 – 13:00<br><br>Update ongoing work western Himalaya<br><br>By Rasmus Thiede, Ed Sobel, Humaad Ghani |
| Joint Dinner | 17:30 – 18:30<br><br>Challenges and Advantages of $^{4}He/^{3}He$ – Thermochronology<br><br>by Cody Colleps | 13:00 Lunch (Mensa) and departure |

All who are interested are cordially invited to attend!

Kind regards,
Rasmus, Peter and Suryodoy