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# **Apatite fission track and (U-Th)/He thermochronology on the Ardennes and Bohemian Massifs: towards a better paleogeography of Western Europe during Cretaceous**

I. Bour<sup>1</sup>, J. Barbarand<sup>1</sup>, M. Pagel<sup>1</sup>, C. Gautheron<sup>1</sup>, J. Yans<sup>2</sup>, Y. Gunnell<sup>3</sup>

1. Université Paris-Sud, UMR CNRS 8148 IDES, Bâtiment 504, 91405 Orsay cedex, France
2. Facultés Universitaires Notre-Dame de la Paix, 61 rue de Bruxelles, 5000 Namur, Belgium
3. Université Denis-Diderot Paris 7, UMR CNRS 8591 Laboratoire de Géographie physique, 1 place Aristide-Briand, 92190 Meudon, France

In Western Europe, Apatite Fission Track (AFT) data indicate that important uplift and denudation have occurred since Cretaceous in basement areas. These uplift and denudation events are related in age to the opening of the Atlantic and the Pyrenean and Alpine orogenies. Even in zones where there are no structural observations indicating Pyrenean and Alpine deformation at the outcrop scale, the AFT modelling show a regional denudation, far from the orogenic zone.

There are still important massifs where knowledge is not sufficient to make interpretations precisely on the scale of the European continent such as the Ardennes and Bohemian massifs. Such approaches would also result in a new comprehension of the European paleogeography.

The Ardennes (Belgium and France) and Bohemian (Germany, Austria and Czech Republic) massifs comprise metamorphic basement and sedimentary Paleozoic domains structured during the Hercynian orogeny. They were surrounded by Mesozoic sedimentary basins (Paris basin, Lower Saxony basin, Polish basin, Bohemian basin, SW Germanic basin). The extension of the sedimentary formations on the basement is unclear as limit between basement and basin depends on the level of erosion. The lack of sedimentary deposits on top of these basements is often assumed to be due to high elevation of these basements during sedimentation. However geological information and fission-track data across Europe suggest that these basements have been buried.

The sampling was carried out on Hercynian areas of the Ardennes and Bohemian massifs. Fission Track (FT) thermochronology have been performed on these samples (U-Th)/He are in progress.

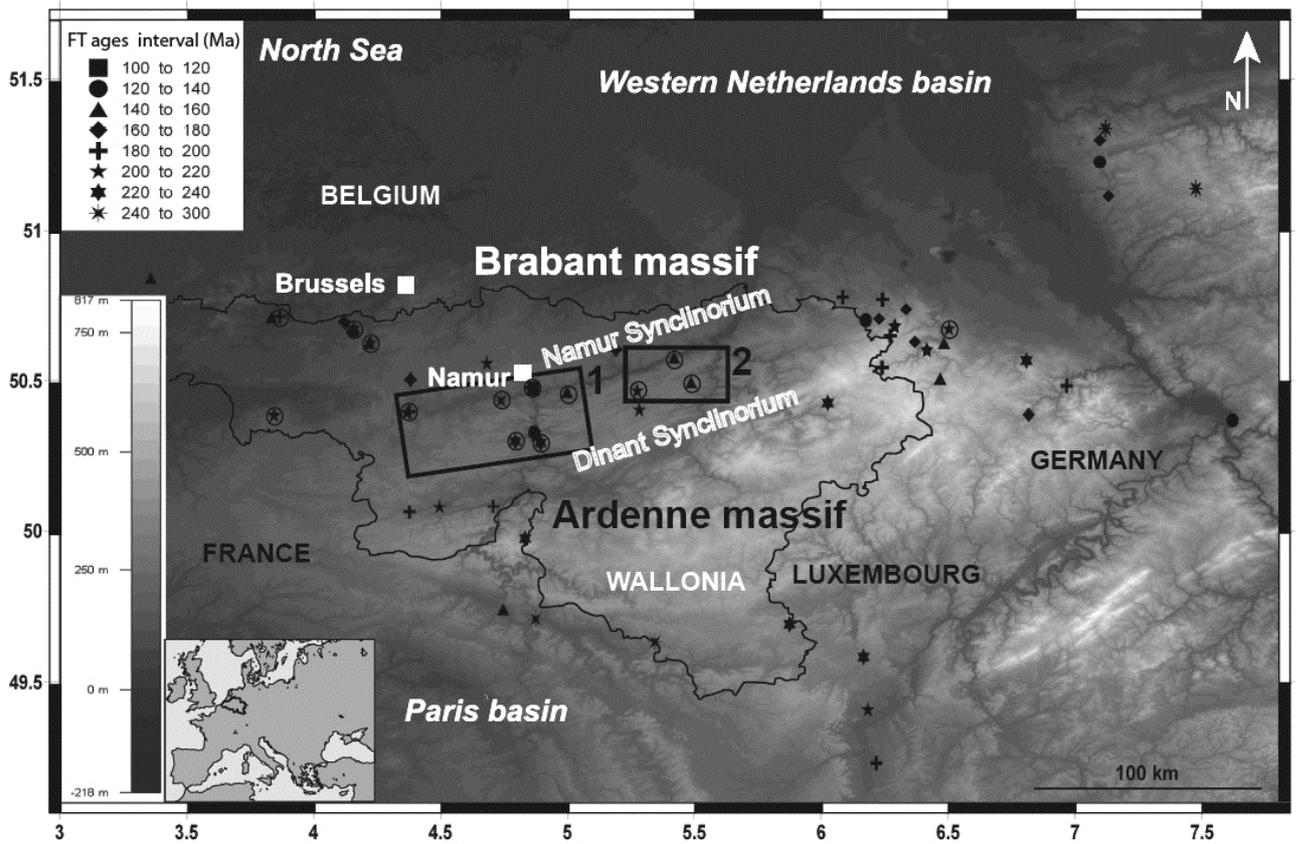
For the Northwestern Ardennes (Dinant and Namur zones), AFT ages range from  $140\pm 13$  to  $258\pm 18$  Ma (Fig. 1) with AFT lengths between 12 and 13.2  $\mu\text{m}$ . AFT ages in the Bohemian Massif show a large dispersion, from  $76\pm 5$  to  $324\pm 15$  (Fig. 2). AFT ages for samples close to the border are younger than for samples in the core of the Massif (191 Ma to 225 Ma in the Erzgebirge and 73 to 140 Ma in the Fichtelgebirge). Mean AFT lengths are between 11.4 and 14.1  $\mu\text{m}$ .

For the Ardennes Massif, modelling of AFT data (Fig. 1), using AFTSolve (Ketcham et al., 2000) and taking into account regional geological context, suggests two stages of temperature increase during Upper Carboniferous and Upper Cretaceous (Campanian). These temperatures increase are interpreted as the increase of burial by deposition of Upper Carboniferous and Upper Cretaceous sediments. They are followed by two stages of temperature decrease during Late Permian and Late Cretaceous and Tertiary. These results are in agreement with an Upper Cretaceous cover that has been eroded during Late Cretaceous and Tertiary. AFT ages decrease irregularly from the south to the north.

For the Bohemian massif (Fig. 2), the temperature-age paths obtained by modelling underline polyphased thermal record. The observed differences across the Bohemian Massif are interpreted to be due to regional tectonics events (massif segmented into different structural units), various thickness of sedimentary deposits depending on the previous paleotopography, deposition of Upper Jurassic and Upper Cretaceous marine sediments which are presently eroded.

## References

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○ this study  
 others: bibliographic data (Glasmacher et al., 1998 ; Karg et al., 2005 ;  
 Van den Haute and Vercoutere, 1990 ; Vercoutere and Van den Haute, 1993; Carter, personal com.)

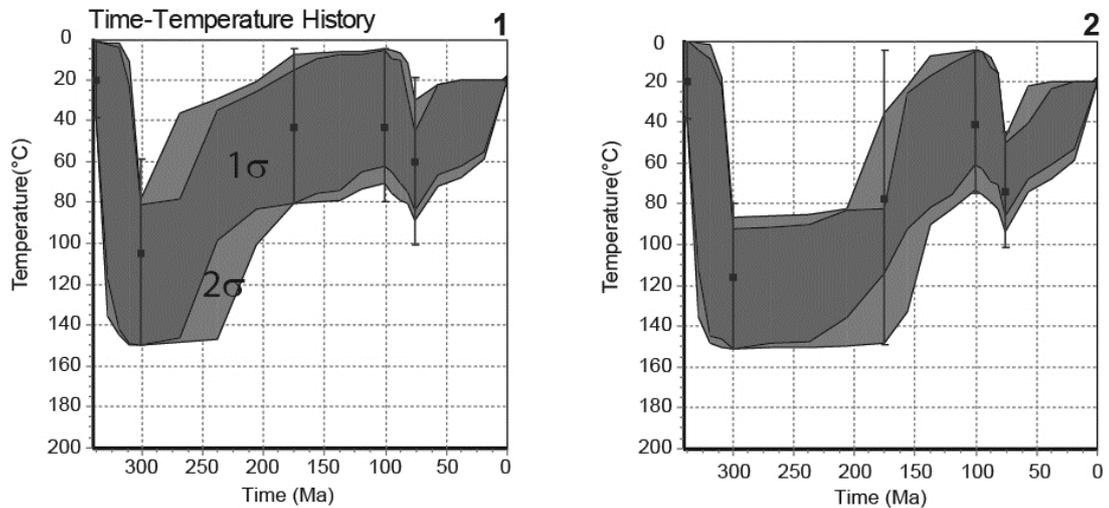


Fig.1: Ages FT distribution and thermic history in Ardenne massif.

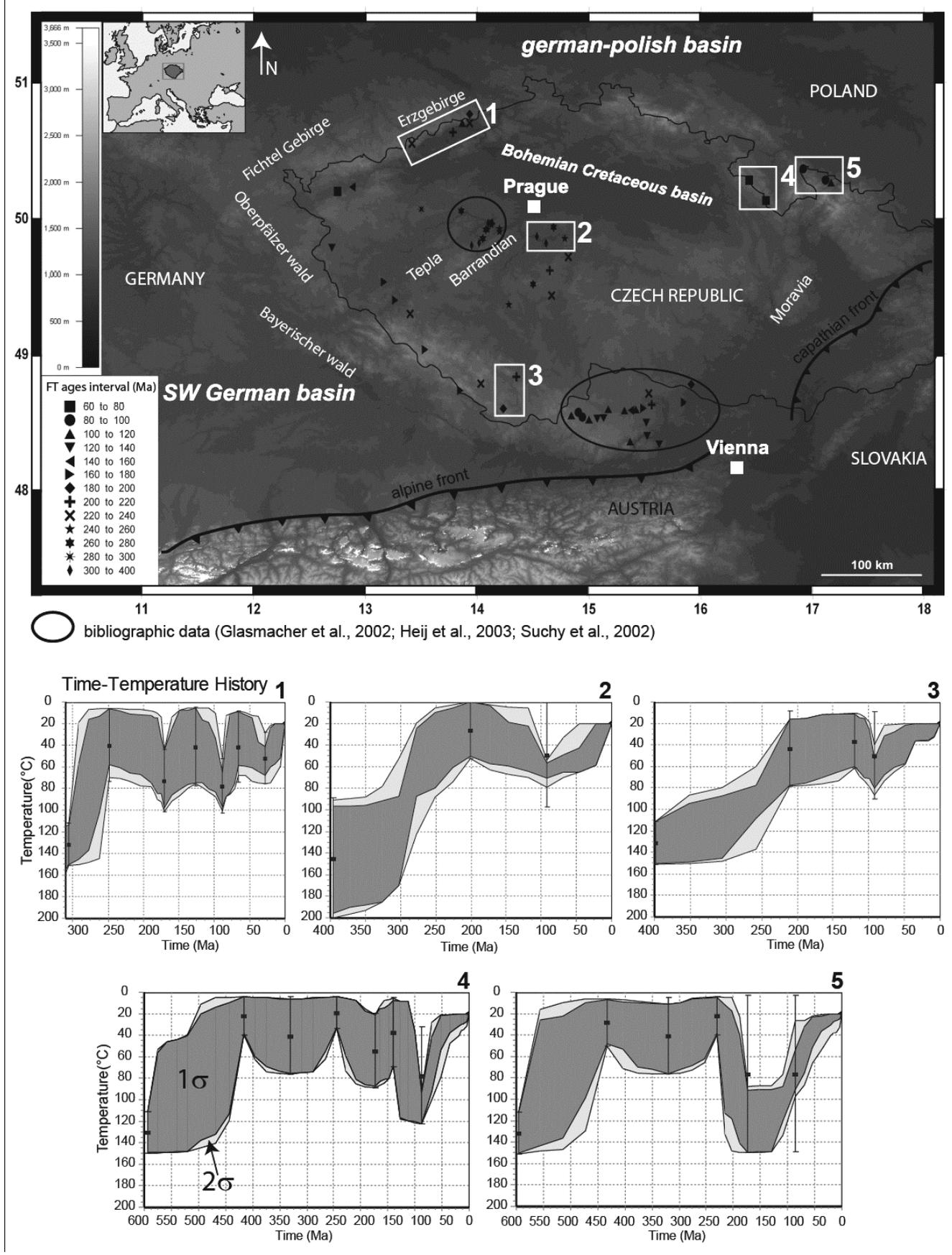


Fig.2: Ages FT distribution and thermic history in Bohemian massif.