Alpine Cave Bears and Climate in Marine Isotope Stage 3

Markus Fiebig[1]& Martina Pacher[2]
[1]Institut für Angewandte Geologie, Universität für Bodenkultur Wien, Peter Jordan Straße 70, A-1190 Wien, markus.fiebig@boku.ac.at
[2]Institut für Paläontologie, Universität Wien, Althanstraße 14, A-1090 Wien

Problem: Terrestrial information about Marine Isotope Stage (MIS) 3 is rare because the glacier advance during the Last Glacial Maximum (LGM) eroded a lot of the evidence from MIS 3. Numerous cave fillings in and around the Alpine arc survived this erosion. Some of the sites even lie in high alpine areas up to an elevation of 2750m a.s.l and dated in MIS 3. Climate conditins in these high Alpine areas during the cave bear occurance is unknown and needs further review.

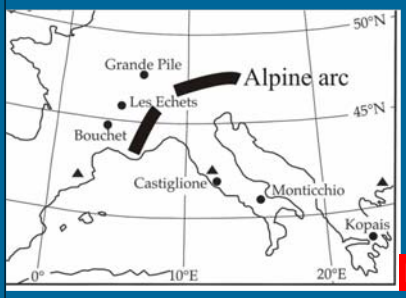


Fig. 1

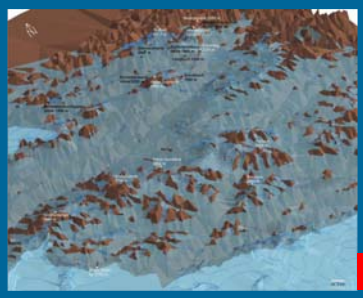


Fig. 2

Fig. 3

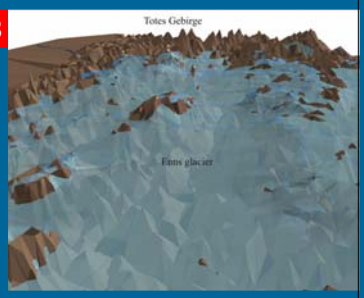
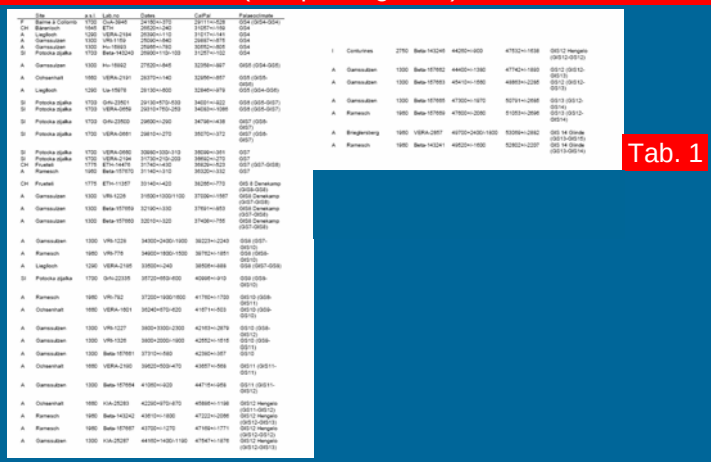


Figure 1: Sites with continuous pollen profiles in the west and south of the Alpine arc (modified after van Andel & Davies 2003:12). Figure 2: 3-D reconstruction of the LGM ice elevation in the Eastern Alps and position of selected cave bear sites (digitised after van Husen 1987). Contour lines of ice elevation have the equidistance of 100m. The Enns valley is visible in the middle of this illustration (compare figure 3). Figure 3: View of the Enns valley towards Totes Gebirge in the north-east of the Alps. The position of most of the caves of Totes Gebirge is very close to the border of the Alpine glaciation during LGM. The nunatak in the middle of the reconstruction is the Hohe Dachstein (2995m), with the red dots indicating Schottloch and Schreiberwandhöhle (compare figure 2).



Tab. 1

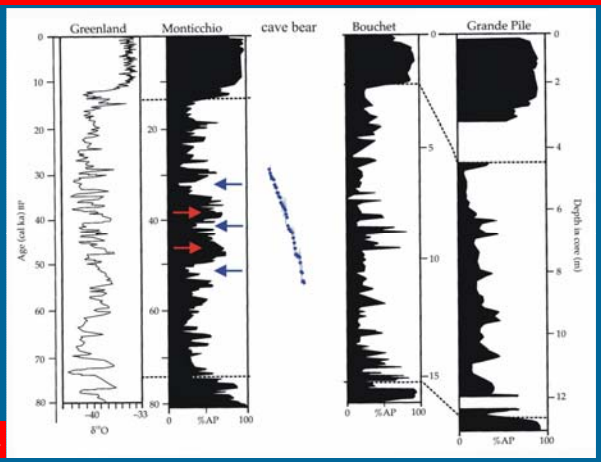


Fig. 4

Table 1: Direct radiocarbon dates for cave bear samples from selected cave sites (dates after Briant et al. (2004), Morel et al. (1997), Pacher (2003), Philippe (2003), Rabeder et al. (2005)). Palaeoclimate information from Greenland after Rousseau et al. (2006) showing the synchroneity of the data to Greenland Stadials (GS) or Greenland Ínterstadials (GIS); in brackets the range of the data considering the period of the error. Fig. 4: Severe vegetational changes are indicated in the profiles from Monticchio, Bouchet and Grande Pile (Fig. 4). Cave bears distribution in the Alpine region does not follow this pattern. Their occurrence seems to be independent from the vegetational and climatic fluctuations indicated in the pollen profiles to the south and in the west of the Alps.

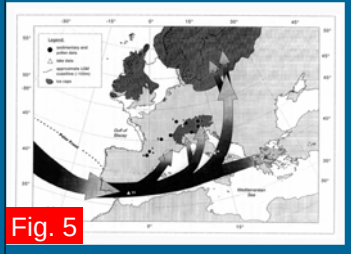


Fig. 5

In figure 5 an assumed pattern of winter atmospheric circulation during the LGM is presented. It seems that the transport of moisture towards the Alps comes mainly from the Mediterranean Sea because of a very southern position of the polar front (Florineth 1998). For other periods of the last glacial cycle, like stage 3 more westerly transport directions can be assumed. The selected pollen profiles to the south and west of the Alps (Grande Pile, Bouchet, Monticchio) are lying in the main transport direction of moisture during stage 3 and 2. Thus, it seems to be unlikely that the high Alpine climate around the cave bear sites was independent from conditions reflected in these pollen profiles.

Results: The calibrated dates of the cave bear occurrences point to a more or less even distribution (60% to 40%) over the periods of Greenland Stadials and Interstadials. Considering the whole error ranges of the dates clear statements concerning correlations especially to the very short interstadials are not possible. The comparison of the pollen profiles and the cave bear occurrences seems to confirm the cave bear distribution over stadials and interstadials. There is no correlation between the severe vegetation changes in the profiles of Monticchio, Bouchet and Grande Pile and the occupation of the high Alpine region by cave bears.