

[Online supplementary material]

Was the Iceman really a herdsman? The development of a prehistoric pastoral economy in the Schnals Valley

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Received: 12 December 2014; Accepted: 26 February 2015; Revised: 10 March 2015

Methods: local pasture indicators

Pasture indicators are pollen types known to have a high affinity with grazing activity. For an accurate interpretation of the palynological results, it is, however, essential to apply a local calibration set of pasture indicators. A modern pollen analogue study (Festi 2012) for the Ötztal Alps provided the calibration sets for the altitudinal zones of interest and resulted in a selection of local pasture indicators for the montane and the subalpine area of the Vinschgau Valley as follows: *Artemisia*-type, *Plantago lanceolata*-type, Chenopodiaceae, Brassicaceae and Cichorioideae are indicative of grazing in the montane regions; *Rhinantus*-type, *Geum*-type, *Campanula/Phyteuma*-type Urticaceae, *Rumex acetosella* and *Plantago alpina*-type were used for the subalpine regions. An increase of these pollen types mostly indicates grazing activity, yet the interpretation needs to take in to account some crucial points:

- 1) Pollen types of pasture indicators originate from plants that are already part of the natural vegetation, so called apocrats.
- 2) Positive reaction of pasture indicator plants is based on the increased input of nutrients (Augustine & MacNaughton 1998). Higher erosion by increased precipitation may, however, result in the soil enrichment of nutrients too. As a matter of fact, some pasture indicators show a positive reaction to both irrigation and an increase in nutrients (Oeggl 1994). Therefore, in this interpretation, climate variability has to be considered, as a cold and moist climatic phase can trigger the increase of certain indicators. In this

case, other evidence of human impact is needed, i.e. conspicuous reduction of climax trees, higher fire activity, occurrence of spores from coprophilous fungi and so on.

- 3) This method is suitable for detecting a prolonged and repeated grazing impact caused by numerous herds. Occasional grazing by few domestic animals cannot be detected, as its impact on the vegetation is comparable with that of wild game, hence remaining within the natural impact of herbivores on the vegetation.

The reconstruction of the onset and expansion of the pastures presented in Figure 11 is based on the calibrated abundance of pasture indicators according to Festi *et al.* (2014), taking into account the consideration mentioned above. The calibrated abundance values of each site are shown in z-scores: periods presenting values greater than zero suggest a grazing-activity phase.

References

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