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Presenter Information

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'Alpine meadows' of the Tibet Plateau are a synanthropic pseudoclimax

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Key words : grazing, *Kobresia* sedge mats, Qinghai-Tibet Plateau, rangeland ecology

Introduction Alpine meadows (Atlas of Tibet 1990) extent over the humid south-eastern half of the Tibetan Plateau covering ca. 450,000 km² with 2-3 cm tall golf course-like Cyperaceae mats. The turfs of the endemic *Kobresia pygmaea* protect the headwaters of major Asian rivers against erosion, and are the most important rangelands for the Tibetan yak pastoralists. Their distribution ranges between 38°N and 28°N. They form the earth's highest plant communities (5960 m, Miehe 1989) and occupy south-facing pastures down to relative 800 m in the forest belt of the outer declivity of the Plateau. With respect to their large altitudinal range of nearly 3000 m and a latitudinal distribution of 1400 km the *Kobresia* pastures show a great uniformity in structure. They are widely believed to be natural (e.g. Song et al. 2004) despite the overall presence of livestock. We challenge this assumption.

Results and discussion The most elucidating feature is that the dominating species have their main above-surface phytomass beyond the grazing reach of large herbivores. The dominance of these small species is apparently grazing induced. Results from grazing exclosures in the southern and north-eastern highlands that we have maintained since 1997 and 2002, respectively revealed that taller grasses emerging from a bud bank overgrow the Cyperaceae mats once grazing ceases (see Figure 1).

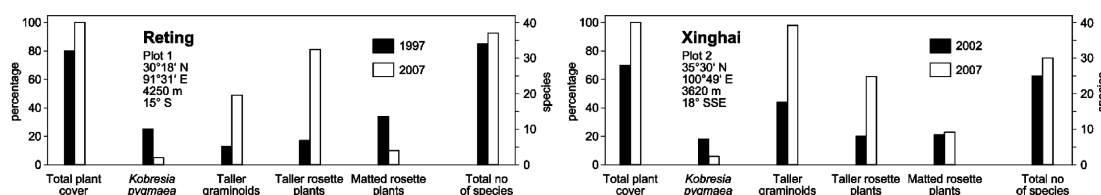


Figure 1 Changes of grassland structure after grazing exclosure.

Experiments in the Haibei Alpine Meadow Research Station (37°37'N/101°19' E, 3200 m) revealed that the relatively tall *Kobresia humilis-Festuca*-grassland is replaced by *Kobresia pygmaea* and rosette plants under increased grazing pressure. Reverse trends are experienced here as well: Controlled low stocking rates resulted in the recovery of taller forage plants while rosettes and cushions of grazing weeds disappear (Zhou et al., 2005). Palaeo-ecological findings of identified charcoal (Kaiser et al., 2007) and pollen-analyses (Herzschuh et al., 2006) support the conclusion that early pastoralists burned forests to get rangelands. It is, however, not clear whether forests were directly replaced by mats of *Kobresia pygmaea*. First ¹⁴C datings of *Kobresia pygmaea*-bearing topsoils are available from 31°29'N/92°00'E (ca. 4500 m) and 30°04'N/86°56'E (ca. 5050 m): Macroremains and pollen extracted from the turfs give evidence of a modern turf genesis. Bulk-soil datings from the lowermost part of the turfs have a Late Holocene age comprising the last c. 2000 years. The turfs result from the transformation of pre-existing topsoils comprising a secondary penetration and accumulation of roots (Kaiser et al., 2008).

Conclusions Palaeo-ecological investigations, surveys of forest relics, preliminary results of grazing exclosures and the dominance of certain plant life forms support our view that the *Kobresia* pastures are a synanthropic pseudoclimax replacing tall grassland and forests. The turf cover as well is grazing induced.

References

- Atlas of Tibet Plateau (1990). Institute of Geography, Chinese Academy of Sciences. Beijing.
- Herzschuh et al. (2006). Temperature variability and vertical vegetation shifts during the last ~ 50,000 yr in the Qilian Mountains. *Quaternary Research* 66, 133-146.
- Kaiser et al. (2007). Holocene paleosols and colluvial sediments in Northeast Tibet (Qinghai Province, China): properties, dating and paleoenvironmental implications. *Catena* 69, 91-102.
- Kaiser et al. (2008). Turf-bearing topsoils on the central Tibetan Plateau, China: pedology, botany, geochronology. *Catena* (in press).
- Miehe (1989). Vegetation patterns on Mt. Everest as influenced by monsoon and föhn. *Vegetatio* 79, 21-32.
- Song et al. (2004). Distributions of dominant tree species on the Tibetan Plateau under current and future climate scenarios. *Mountain Research and Development* 24, 166-173.
- Zhou et al. (2005). Alpine grassland degradation and its control in the source region of the Yangtze and Yellow Rivers, China. *Grassland Science* 51, 191-203.