Review of the thesis by Petr Kuneš „Human –driven and natural vegetation changes of the last glacial and early Holocene“

The thesis consists of seven published papers, Introduction and Conclusions. All papers are multi-authored; there is nowhere a statement about authorship. However, from the context it seen what is author's contribution. Part of the papers is written together with plant ecologists, part with archaeologists. The whole thesis is a stimulating reading, especially for non-specialist in the field of palaeoecology as I am.

I consider thesis in its present form as sufficient for the defension, I hope that successful. It is a good set of papers showing the potential of present palaeoecology.

My main objections and questions deal with extrapolation of data. It is fully understandable for me that it is impossible to determine particular species, only types. But it is not correct to consider only one species, which is present in our landscape now to extrapolate our knowledge to the past. The more distant (in time) the data originate, the more careful should be their evaluation.
I shall illustrate this on the third contribution, devoted to the effect of Early Holocene hunter-gatherers on vegetation. This is situated to Preboreal-Boreal period when the presence of diffent species in Central European landscape is very probable.
The authors had chosen a set of species which are anthropic indicators in late Holocene. But were they the same in Early Holocene? At least with respect to some species I am not certain.

Evidently, many species occurred together in the past, which are now confined to high altitudes (above timberline) and treeless habitats in lower altitudes (xerothermic or coastal areas). There are several groups, which could be used as examples.

Plantago lanceolata: I do not know which species have the same pollen type. But especially for higher altitudes and early Holocene I can imagine presence of such species as *Plantago atrata* or *Plantago alpina*. For Preboreal and Boreal I expect broader distribution of *Plantago maritima* (now along coasts and in the Alps) and *P. tenuiflora* (surviving in Pannonia and on the Öland and then in E. Europe (I do not know which pollen type both species belong). For the Boreal period I can also imagine the presence of *Plantago altissima*, at present a species

of floodplain meadows in Pannonia. The possibility of existence of another, mountain *Plantago* is suggested by its correlation with altitude in Fig. 9 (p.81).

Helianthemum: in Central Europe, the genus is represented at present by two groups, *Helianthemum nummularium* (which might be considered as anthropic indicator) and group of species of *H. oelandicum/H. canum/H. alpestre*. They occur in both xerothermic and alpine areas. With respect to the common occurrence of this pollen type I would like turn the attention to two morhotypes of *H. oelandicum*, one of them being wind, the other insect pollinated.

Thalictrum: there are several species, and again, some of them occurring in alpine and xerothermic communities (e.g. *H. minus* group). The other species are similarly to *Plantago altissima* members of floodplain graslands. And, *Thalictrum aquilegiifolium* is also distributed in treeless areas along the brooks and avalanche paths in mountains. All these groups are species not necessarrily connected with human activities.

Pleurospermum austriacum: this species (or it is a pollen type?) is often found in relict habitats as screes or above timberline and in forests in lower altitudes.

Silene vulgaris-type: also this species consists of types which occur in xerothermic/coastal habitats and above the timberline and set of types which certainly are indicators of anthropic activites. Does author know which pollen type have members of the *Otites* group? They have continental distribution and are probably wind-pollinated. They grow in alpine, coastal as well as in xerothermic habitats.

Calluna: above the timberline, it is a normal part of communities of the Loiseleurio-Vaccinietea and Juncetea trifidi, it is not an anthropic indicator everywhere. It is a species with high frost-resistence; this is probably reason why it is correlated with altitude (Fig. 9, p. 81).

As a last group I would like to discuss members of the genus *Artemisia*. Even in the present time, we have here species confined to natural treeles communities, again coastal, xerothermic and alpine habitats, and a set of species which indicate human activities. The species richness was probably higher, e.g. *Artemisia rupestris*, a continental species, disappeared from relic

localities in Germany during the 19th century. Such species grew in the past together, which at present do not occur in the same regions in Central Europe, what is indicated by their past hybridization: An endemic species of Baltic area, *Artemisia oelandica*, is an amphidiploid coming from hybridization of *Artemisia tanacetifolia* (at present alpine species in Central Europe, then in E Europe and Siberia) and *Artemisia laciniata*, species of xerothermic habitats in Pannonia and having large distribution area throughout Eurasia.

With respect to the broader distribution of calcium rich substrates in late Glacial and Early Holocene all species groups mentioned had probably broader distribution than today. And, also broader distribution of halophytic habitats should be considered for that time. Not all species chosen as anthropic indicators were such in that time.

Already mentioned Fig. 9 shows that several pollen types which I discussed above are correlated with altitude (*Pleurospermum, Calluna, Thalictrum*, maybe some other *Plantago* with *lanceolata*-pollen). They are a normal part of alpine and subalpine communities and not indicators of human activities.

My other remarks and questions deals with the paper devoted to the acidification process. The author's opinions are too simplified. It is not true that grazing alone leads to acidification. It is grazing connected with export of bases from the system. In general, grazing supports graminoids and grasslands are more resistant to acidification, even in comparison to some broad-leaved forest, as those dominated by oaks. Many broad leaved trees lead to the lost of cations; this depends on the chemism of humic substances produced during decomposition. Does the author know some data about the rate of podzol formation? How many generation of spruce does the process need?

Some small remarks (not for discussion)
Paper by Jankovská (2006) cited in Ch. 4 has different citation: it is a Supplement to the cited volume! This should be correct; it is a source of data!
p. 127: Sesleria is not a continental species

Průhonice, 6.5.2008 Prof. RNDr. František Krahulec, CSc.