



The effect of Holocene fire regime on the south-eastern European (Romania) grasslands dynamics

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Although it is widely admitted that disturbance by fire drives significant changes in the structure and diversity of tropical and North America temperate grasslands, the effect of fire on European temperate grasslands and tree-grass dynamics is poorly studied. For a better understanding of the effect of fire on temperate European open grassy systems we performed a multi proxy palaeoecological analysis (radiocarbon dating, macrocharcoal counts and morphologies, statistically defined fire metrics and pollen analysis) on a 10 meter long core profile extracted from Lake Oltina, the south-east Romania and present the first record of Holocene variability in fire regime, fuel source and fire types in extant steppe grasslands from south-eastern Europe. We identified five distinct periods in the past fire activity. Between 7000-6000 cal yr BP, the pollen based vegetation reconstruction show a mixed forest-steppe environment, whereas charcoal record reveal a fire return interval (FRI) of 70 years, fire peaks of moderate magnitude and charcoal morphologies dominated by Poaceae and other herbaceous plants. From 6000 to 3900 cal yr BP, the pollen record shows a slight increased proportion of forest, especially of *Quercus*, whereas fire became more frequent and fire events of low magnitude. The charcoal morphologies remained dominated by non-woody type, with a small increased in wood charcoal type. During the period 3900-2200 cal yr BP, the pollen record show a marked decline in forest cover, FRI increased to 90 years, fires were of high magnitude and the dominant charcoal morphologies were herbaceous type. From 2200 to 910 cal yr BP, the regional vegetation became dominated by Poaceae and steppe herbs including indicators of human impact. FRI became shorter (50 years) and characterized by fires of low magnitude, whereas charcoal morphologies show the predominance of herbs, Poaceae and deciduous leaves. The most recent period, 910 cal yr BP-present show a marked decline in fire activity, associated with charcoal morphologies predominantly of Poaceae and herbs.

Our results show a good association between the dominance of grassy ecosystem and an enhanced fire activity and demonstrate the role of the fire in the dynamics of this vegetation type. This study provides the first reconstruction of fire regime variability from the south eastern European grassy systems and as well as the value of charcoal morphologies to determine the type of fire and biomass fuel.