Dating aeolian landforms using cosmogenic ^{10}Be in Hungary, Central Europe

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In the Western Pannonian Basin the widespread occurrence of ventifacts and large scale deflation features – like a system of yardangs, deflation hollows and basaltic buttes at least in part exposed by wind erosion – indicate strong wind activity during the Quaternary. This is supported by common presence of wind-blown sediments, like loess and aeolian sand. The Pleistocene glaciations are probably the most important periods of deflation, when the Pannonian Basin was a dry, periglacial area with scarce vegetation and strong winds. However, age of the wind-polished rock surfaces exposed on different geomorphic horizons of the Transdanubian Range – an uplifted low elevation (up to 750 m asl.) range in the Western Pannonian Basin – has remained unknown so far, although they can provide time constraints of landscape evolution. We used in situ produced cosmogenic ^{10}Be to determine exposure time and denudation rate of wind-polished rock surfaces and regional (basin) scale denudation rates are also inferred. In view of surface samples only, minimum exposure ages assuming no denudation are ranging from 0.09 to 1.3 My with most of the ages between 100 and 400 ky. Considering the maximum denudation rates assuming that steady state is reached, yield to rates ranging from 0.36 to 8.42 m/My. In both assumptions, allowing for all surface samples, there is a weak, maybe apparent correlation between age and/or denudation rates versus altitude; saying that the higher is older and/or more resistant. Allowing for the maximum denudation rates of samples from the depth profiles one can observe that for the uppermost samples these rates are the same within uncertainties. This evidences the fact that steady state has been reached. However, for deepest samples, denudation rates become higher. This thus implies that steady state has not been reached at those depths. Accordingly, depth profiles allow determining simultaneously both denudation rate and exposure age. Measurements of ^{10}Be concentrations along depth profiles of exposed, ventifacted rocks allow to derive a local denudation rate of 3.46-3.88 m/My and exposure ages as old as 1.5 My. Regional denudation, which occurred mainly via deflation of the loose sediments, varies between 40 and 80 m/My. Our results show that aeolian erosion in continental, periglacial areas of Central Europe played an important role in Quaternary landscape modification. Besides, the newly determined exposure ages are strong time constraints on the onset of denudation, exhumation of the Transdanubian Range, which is indicative of the minimum time of the uplift of the range.

Ecological aspects of the operational Hail Suppression Project in Serbia

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An analysis of the operational “Hail Suppression Project” in Serbia that used silver iodide dispensed from anti-hail rockets was performed for the period 1981-1986 in order to estimate the seeding agent amount reaching the surface of the target area in precipitation. The primary aim of our investigation is to estimate whether amounts of silver iodide exceeds the

threshold of 1 μg/m^2 from one seeding event, which in turn, may be of importance for an analysis of apparent afterseeding effects and environmental pollution. This period is selected due to the largest amounts of the seeding amount performed (the maximum is over 103 kg per a season, 4.4 tones per a six-year period). Our analysis is performed for areas monitored by S band radars located near Valjevo and Užice. The radar observations give us the possibility to estimate the precipitation area associated with a seeded hail cell. It is well known that this area is often much smaller than the analyzed target area independently of a storm type. Our method is based on the next assumptions: each seeding operation was performed according to the seeding criterion; both activated and non activated agent particles reach the ground; analyzed precipitation area is associated only with a single hail cell which satisfies the seeding criterion; the hailstorm precipitation efficiency is 60%; the agent particles are uniformly distributed within the accumulated precipitation area at the surface. In such way, we performed estimates of the seeding agent amount reaching the ground after seeding.

We analyzed the seeded hailstorms tracking over analyzed area from NE, SE, SW and NW direction associated with the frontal passage and individual ones. The individual hail clouds from the north-western direction require the special treatment due to the formation of the hailstreaks along the major axis of the Western Morava valley. A hailstreak has the surface ranged in the interval between 100 and 500 km^2. For each storm passage, they are observed at the approximately same locations. As expected, the tracks of the hailstorms associated with the frontal passage do not show regular spatial pattern. On the other hand, they are correlated with larger amounts of convective precipitation and silver iodide particles at the ground. Our calculations show that the amounts of the silver iodide at the ground in average are below the threshold in many cases. Our analysis, however, shows that these amounts may exceed the lower boundary more times for some frontal passages and over a single hailstreak associated with an individual hailstorm. In this occasion we must emphasize an important fact. The silver iodide amounts at the ground are underestimated due to the reason that the silver iodide particles are not uniformly distributed in the accumulated precipitation area as well as they do not fall down suddenly via precipitation after seeding starts.

Our preliminary results give the basis for further investigation of such a kind. In the next period, the total loss of the seeding material in the operational “Hail Suppression Project” was smaller. But, this does not mean that the critical threshold of silver iodide amount did not attain in some areas after one seeding event. This requires further detailed investigation for the whole target area and longer time period following the proposed method. The estimation of seeding agent amounts per seeding event only on the basis of total agent loss, the number of seeding events and for the whole target area is wrong for the reason of great underestimation of real seeding effects. Seeding scenarios with considerable amounts of the silver iodide at the ground after seeding are the warnings for ecologists to organize different observations after seeding events with extreme agent loss as well as for various microbiological observations associated with persistent effects of cloud seeding. We believe that the amounts of silver iodide may be decreased by the improvement of hail suppression methodology based on additional investigations.

The cloud drop size distribution effects on accumulated convective precipitation from a hailstorm due to the seeding performed

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Hail causes considerably damage to crops and property. In many areas of the world the cloud seeding with the goal of suppressing hail is common practice. The seeding agent is injected into the target cloud from aircraft, ground-based generators or the agent is injected into the cold peripheral parts of a cloud by rockets. The success of hail suppression activity is influenced by careful selection of seeding time, seeding dynamics, seeding agent amount and