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

Ćurić M.' Janc D. and Kovačević N.

Institute of Meteorology, University of Belgrade, 11000 Belgrade, Serbia, curic@ff.bg.ac.rs

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 location of initial seeding zone. In the last decade, the cloud-resolving mesoscale models become widely used in testing the seeding criterions with respect to above parameters. The simulation of seeding effects can be done by either explicit microphysics or bulk microphysics schemes. Bulk microphysics scheme is frequently used in the cloud-resolving mesoscale models due to lower computational cost. This scheme assumes a distribution function for the cloud and precipitation size particles. The variation in accumulated convective precipitation due to the uncertainties inherent in the selection of distribution functions and their parameters must be assessed. Until now the cloud-resolving mesoscale models are used in some studies that quantify considerable sensitivity of the amount of accumulated precipitation from a hailstorm on variations of cloud drop size distribution. Main consequence of the hail suppression activity is the accumulated convective precipitation change. The selection of cloud drop size distribution is therefore critical for an adequate treatment of seeding effects.

We use the numerical model of cloud with two microphysical schemes involving the unified Khrgian-Mazin size distribution of cloud drops and a scheme involving monodisperse cloud droplet spectrum and the Marshall-Palmer size distribution for raindrops, respectively. The unified Khrgian-Mazin size distribution approximates the entire drop spectrum that splits into cloud droplets and raindrops at diameter of 100 μm. This drop size distribution is a function of two parameters: total liquid water mixing ratio and mean cloud drop spectrum radius. Sensitivity tests with respect to the amounts of seeding agent, location, time and dynamics of seeding are performed in order to investigate accumulated precipitation change in comparison with an unseeded case using both microphysical schemes. Silver-iodide agent is used in all experiments. Three mean cloud drop radii of 10, 30 and 50 μm are used in sensitivity tests with the unified Khrgian-Mazin size distribution.

Our principal findings are as follows:

For an unseeded hail cloud, the unified Khrgian-Mazin size distribution with a mean cloud drop spectrum radius of 10 μm leads to the huge increase of accumulated rain precipitation (up to 275%) and decrease in hail precipitation (-71%) compared to the counterpart with the Marshall-Palmer size distribution of raindrops and the monodisperse cloud droplet spectrum. Comparison of seeded cases with an unseeded one show the maximum increase of rain precipitation (13.7%) and decrease of hail precipitation (50.2%) if the Khrgian-Mazin size distribution is used. In general, this precipitation changes are greater than those simulated using the alternative approach. Analysis of above results leads to the conclusion that the radar reflectivity criterion alone is insufficient for decision making about hail suppression. The drop spectrum must be also known just before the agent injection due to the optimal seeding agent consumption.

The Miocene granitoid rocks of Bukulja Mt.: evidence of lower crustal anatexis in the Southern Pannonian realm

Cvetković V.[1], Poli G.[2], Christofides G.[3], Koroneos A.[3], Pécskay Z.[4], Šarić K.[1] and Erić V.[5]

[1]University of Belgrade - Faculty of Mining and Geology, Đušina 7, 11000 Belgrade, Serbia, cvladica@rgf.bg.ac.rs, kristinas@rgf.bg.ac.rs

[2]Department of Earth Sciences, University of Perugia, Piazza Universita', 06100 Perugia, Italy, polig@unipg.it

[3]Faculty of Sciences, School of Geology, Department of Mineralogy, Petrology and Economic Geology, Aristotle University, Thessaloniki, Greece, christof@geo.auth.gr, koroneos@geo.auth.gr

[4]Institute of Nuclear Research of the Hungarian Academy of Sciences (ATOMKI), Bem ter 18/c, 41001 Debrecen, Hungary, Pécskay@namafia.atomki.hu

[5] RIO SAVA Exploration, Bulevar Mihajla Pupina 10i, 11000 Belgrade, Serbia, Vladisav.Eric@riotinto.com

Peraluminous granites are often found in collision-related geotectonic frameworks and usually were attributed to various crustal melting. Their composition proved to be very important as an indicator of particular conditions or specific tectonic phases in the frame of the existence of an orogen.

The tectonic framework of the southern margin of the Pannonian realm and northern Dinarides was finally established during the Miocene. In this area, fingerprints of transitional