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

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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

tectonics, from the Oligocene post-collision, which dominated in the Dinarides, to the Miocene extension, occurring predominantly within the Pannonian/Intra-Carpathian area, may be reconciled.

In this context, granitoid rocks of Mt. Bukulja show characteristics that should be linked to specific geodynamics: (1) it is situated at the very southern margin of the Pannonian Basin, (2) it is characterized by Neogene peraluminous granitic rocks, and (3) it shows Nb-Ta-Sn metalogenetic features. Therewith, they differ from the widespread plutono-volcano-plutonic provinces in Serbia, which are dominated by Late Oligocene, mostly calc-alkaline igneous rocks related to Pb/Zn±Ag±Sb metallogeny.

The granitic mass of Mt. Bukulja crops out about 60 km southern of Belgrade as an E-W laccolite-shaped igneous body covering an area of about 40 km^2. It is concordantly intruded into low-grade metamorphosed Devonian/Carboniferous schists in the West and into Cretaceous sandy marbles, clay sandstones and limestones in the East.

The bulk of the granitoid mass is represented by medium-grained to slightly porphyritic, slightly peraluminous two-mica granite (TMG). Metaluminous hornblende-biotite and biotite-bearing (H-BG) granite and rare aplitic granite are subordinate, and the former occur as patches or enclaves of various dimensions (from several decimeters to several tens of meters) or as isolated outcrops within deep creeks. The available radiometric age suggests that TMG was emplaced around 20 Ma whereas the age of H-BG is inadequately constrained. A lamprophyre dyke (BLD) similar in composition and age to other Serbian primitive minettes with a K/Ar age of 26 Ma has been found in the vicinity of Mt. Bukulja. TMG and H-BG show similar petrographic characteristics but the evidence of magma interaction processes are found only in H-BG. In comparison to H-BG, TMG are less enriched in most trace elements including REE and have a more fractionated REE-pattern and higher Eu-anomaly. TMG display a wider range of initial Sr-Nd isotope ratios normalized on 20 Ma ($^{87}Sr/^{86}Sr_i$=0.70652-0.71368 and $^{143}Nd/^{144}Nd_i$=0.51223-0.51283) than do H-BG ($^{87}Sr/^{86}Sr_i$=0.70768-0.70781 and $^{143}Nd/^{144}Nd_i$=0.51242-0.51256). Geochemical modelling suggests that H-BG could have derived from a BLD-like melt by mixing plus fractionation processes assuming a batch of TMG-like magma as the acid end-member. On the other hand, the geochemical variability of TMG is reproduced by an AFC model with assimilation/fractionation ratio r=0.5 and with high amount of crustal component (~20-50 %) starting from the least evolved TMG rocks. In the modelling, the average composition of the least evolved TMG samples were used to represent parental magma composition whereas the composition of adjacent metamorphic rocks was adopted as possible contaminant. The composition of the least evolved TMG implies that TMG parental magma likely originated by melting of a mafic lithology such as earlier basalts underplating in the lower crust. The high proportions of assimilation along with other geochemical and geological evidence suggest that the Mt. Bukulja TMG originated within the same geotectonic setting as acid volcanics of the north Pannonian Basin. The results of this study support the hypothesis that the Mt. Bukulja pluton is related to tectonomagmatic events controlled by the early extensional phases in the opening of the Pannonian basin.

Hydrothermal methane fluxes from the soil at Sousaki (Greece)

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Methane soil flux measurements have been made in 38 sites at the geothermal system of Sousaki (Greece) with the closed chamber method. Fluxes range from –47.6 to 29,150 mg m-2 d-1 and the diffuse CH_4 output of the system has been estimated in 19 t/a. Contemporaneous CO_2 flux measurements showed a fair positive correlation between CO_2 and CH_4 fluxes but the flux ratio evidenced methanotrophic activity within the soil. Laboratory CH_4 consumption experiments confirmed the presence of methanotrophic