FIVE-YEAR RESULTS AND STATISTICAL ANALYSIS OF HAIL PARAMETERS FOR TWO DIFFERENT SEEDED AREAS IN WESTERN PART OF CROATIA MEASURED WITH HAILPADS

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April 27, 2007

I. INTRODUCTION

In the continental part of Croatia operational hail suppression has been conducted for more than 30 years. The protected area today is 25,177 km^2 and has about 530 hail suppression stations which are managed with eight radar centres. During 2001 hailpads were installed on all stations and hailpad polygon is established in 2002. Polygon with dimensions 30 x 20 km was located in the middle of the western part of protected area, where hail suppression system could act without limitations. The larger part of this western area is located close to the state border (Slovenia, Hungary and Bosnia and Herzegovina) and near unprotected part of Croatia. Because of forbiddance of launching rockets across the state borders, Cb-s that is spreading from west towards Croatia, enter the hail protected border area not seeded. After crossing the borders, stations begin with seeding, but because of a short time interval, the seeding nuclei were not completely active in clouds over the border area (Fukuta, 1980, Peti. 1991). The polygon is located in the middle of western part, where the Cb clouds are optimally seeded regarding

II. PRESENTATION OF RESEARCH

The modification of weather phenomena to prevent or reduce the occurrence of hail on the ground is connected with the problem of assessing the modification results among all other influences among all other influences (complexity of thunderstorms, spatial and temporal variability of hail, climatic changes and air pollution, etc.).
With the installation of hailpads in the protected area, exact data from hail characteristics were obtained. The data collected on the hailpad polygon were compared with data from the border area, were damage causing hail is very frequent. The purpose of this paper is to analyse and compare hailstone parameters measured with hailpads in two differently seeded areas. Four parameters are used in the statistical analysis – the average diameter of hailstones, number of classes (2,5-mm interval), hailstone mass and kinetic energy.

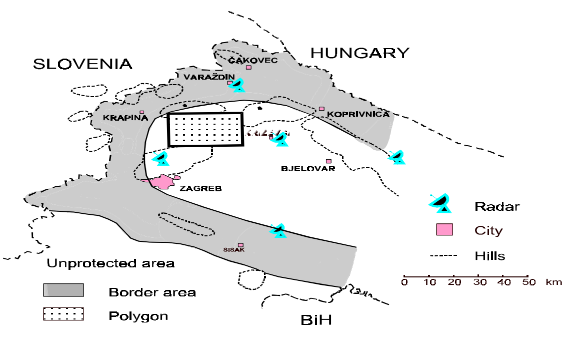

FIG. 1 Location of the polygon and the border area in western continental part of Croatia.

	Mean polygon	Mean border	Discr. R	p-level
Number of classes	3,4	3,9	0,51	0,01
Number of stones	868,5	1361,6	0,74	0,00
Average diameter (mm)	8,0	8,1	0,06	0,76
Mass of stones (g/m^2)	288,4	506,8	0,72	0,00
Kinetic energy (J/m^2)	20,8	35,8	0,54	0,01

TABLE I: Statistical analysis results for polygon and border area parameters (2002-2006).

III. RESULTS AND CONCLUSIONS

Radar data analysis (1981-2006) shows that more than 66 % of Cb cells come from western directions (W, NW and SW), at the velocity between 25 and 75 km/h.

Results of linear discriminant analysis show that there is significant difference between the hail data from border and data from polygon area, and t-test shows significant reduction of average values of all parameters (except for average diameter) regarding the border area.

These results may explain the increased number with hail and heavy damage in the border area and also that the reduction of hail parameters in the polygon area could be a positive result of seeding.

IV. AKNOWLEDGMENTS

The authors would like to thank Davor Nikolic for his comments that helped improve this manuscript.

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