

# A RADAR-BASED HAILSTORM CLIMATOLOGY FOR SLOVENIA

Benedikt Strajnar<sup>1</sup> and Mark Žagar<sup>2</sup>

<sup>1</sup>University in Ljubljana, Faculty for mathematics and physics, Jadranska 19, 1000 Ljubljana, Slovenia,  
benedikt.strajnar@guest.arnes.si

<sup>2</sup>Meteorological Office, Environmental agency of Slovenia, Vojkova 1b, 1000 Ljubljana, Slovenia,  
mark.zagar@gov.si

(Dated: May 14, 2007)

## I. INTRODUCTION

Hailstorms are highly local extreme weather phenomena, but their impact to the crops, fruit trees and vines is often catastrophic, causing even total destruction. Also structures and cars can suffer severe damage from the hail.

Operating under the assumption and also the standpoint of the WMO that the success of the hail suppression activities is not objectively measurable (argued by the hail suppression activists), this study aims at providing information for economically based decision regarding planning of the optimal choice of crops, fruit trees and vines in the north-eastern Slovenia. We chose to use the available historic radar data for constructing a climatologic spatial distribution of potential hailstorms.

## II. DATA AND METHODS

Data for the analysis come from the radar, located on Mt. Lisca, 900 m a.s.l.. The period of data coverage is 5 years with a few holes due to technical difficulties. We analysed the 2D products, maximum column echo and echo top, but also the 3D information, the volume scans. Criteria for the decision about the presence of a potential hailstorm in the measured atmosphere are quite simple in case of the 2D products: various threshold values of maximum column echo, combined with the threshold for the altitude of the echo top and optional filtering to remove noise from the data. In case of the 3D information we used the criteria from Waldvogel et al. (1979).

## III. RESULTS AND CONCLUSIONS

The results of the radar data analysis are spatial maps of yearly days with occurrence of hailstorms with the criteria applied on the data. We note that the analysis of 2D and 3D data yielded very similar results. An example of the product is shown in Fig. 1, representing the average number of days in a year a hailstorm occurs over a geographic location. In this figure the results are smoothed by a 5-point filter for reducing noise, i.e. preventing the end users from believing that the spatial resolution of the product of 1 km is anywhere relevant.

This product is typically meant to enter further algorithms, such as various decision trees in order to obtain a scientifically based estimation of potential economical impact of hail to unprotected crops. Successively, cost of protecting crops with nets for example can be compared to potential damage.

## IV. AKNOWLEDGMENT

This study was supported by the Slovenian research agency project no. CRP V4-0359.

## V. REFERENCES

Waldvogel, A., B. Federer, and P. Grimm, 1979: Criteria for the Detection of Hail Cells. *J. Appl. Meteor.*, **18**, 1521-1525.

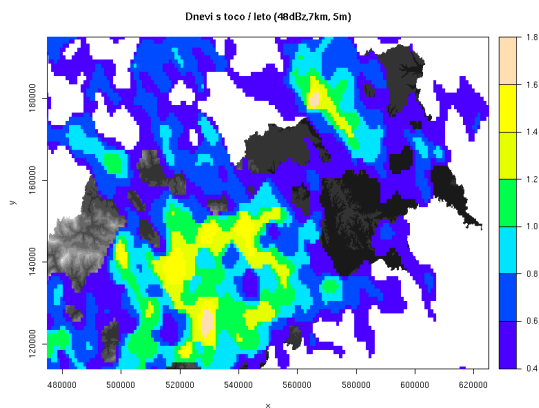


FIG. 1: Climatological occurrence of supposed hailstorms, expressed in the yearly number of days with a hailstorm.