

### Motivation

- Deep convection yielding severe weather phenomena (hail, ice-sleet, flash floods, thunder) is frequent in Serbia during the warmer part of year, i.e. April to September.
- Hail suppression operations in Serbia were continuously performed in 50 years period (1967-2017), from April 15<sup>th</sup> to October 15<sup>th</sup>, over a territory of 77,498 km<sup>2</sup> with only one interruption in 1999 due to NATO bombing of Serbia. (Before the inclusion of Vojvodina into the hail suppression system in 2011 the protected territory was 55,045 km<sup>2</sup>)



- The main goal of hail suppression is to decrease the diameter of hailstones and thereby mitigate any potential damage to crops and other material goods.

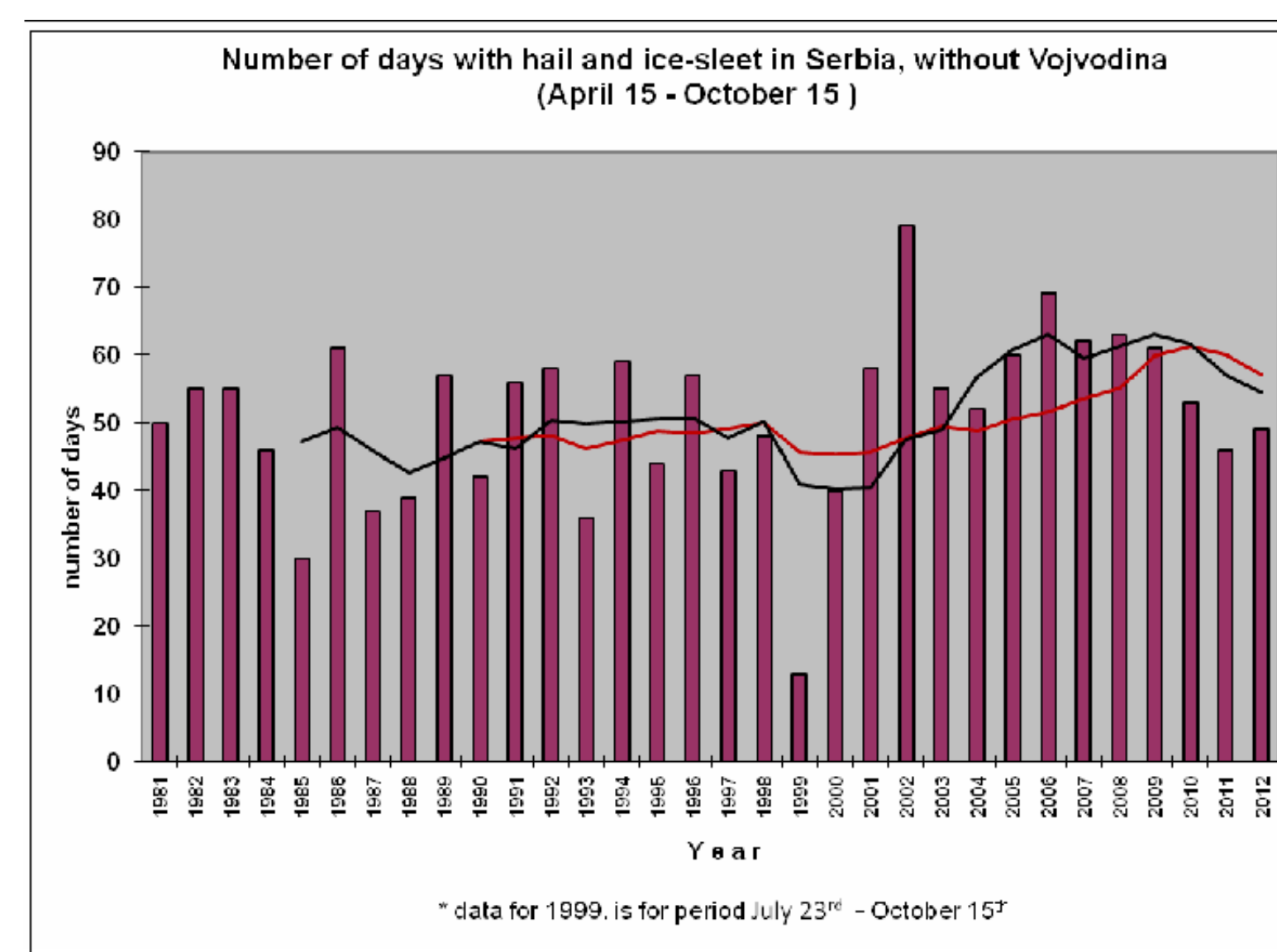
## Trend of hail occurrence in Serbia in the period 1981-2012



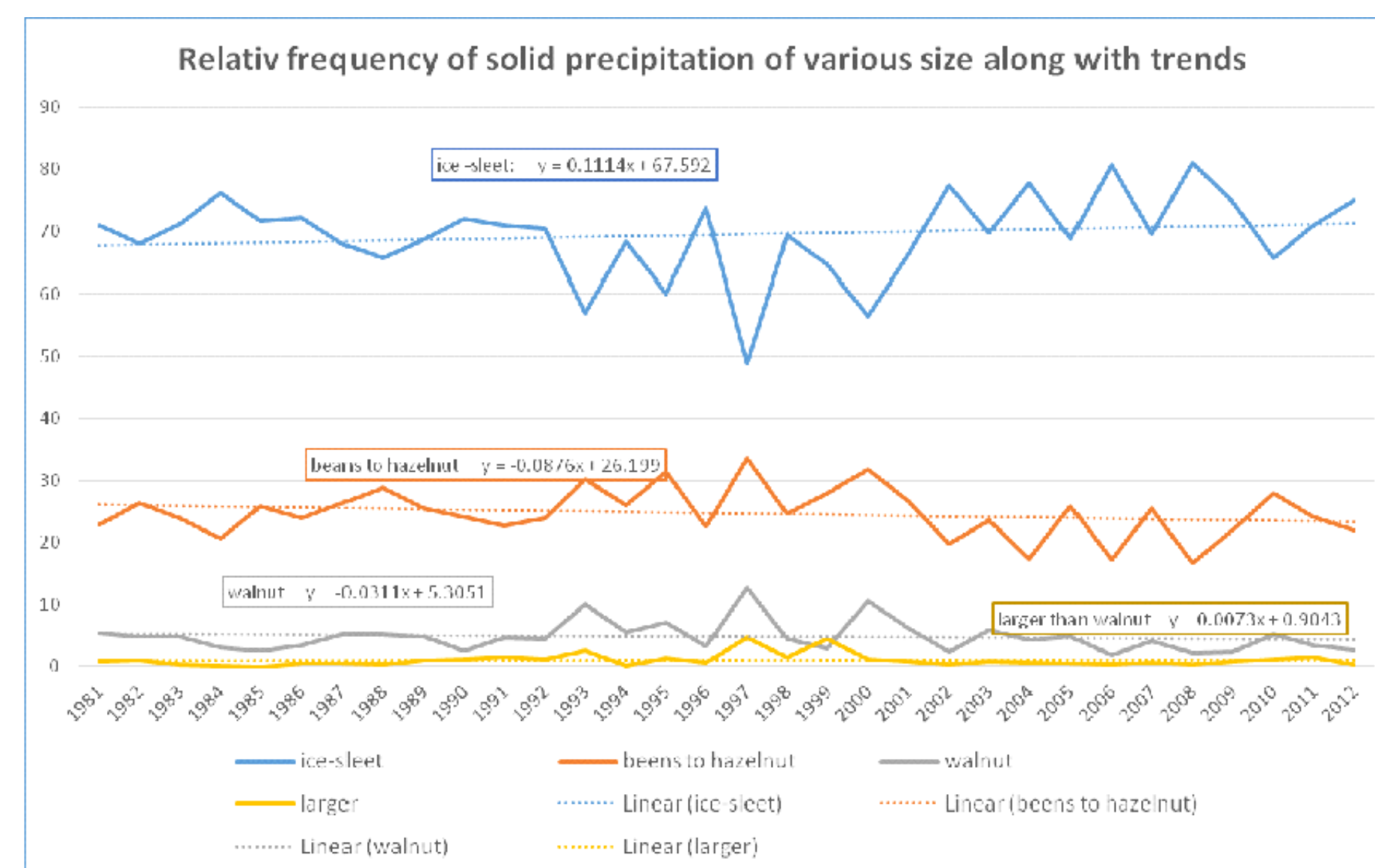
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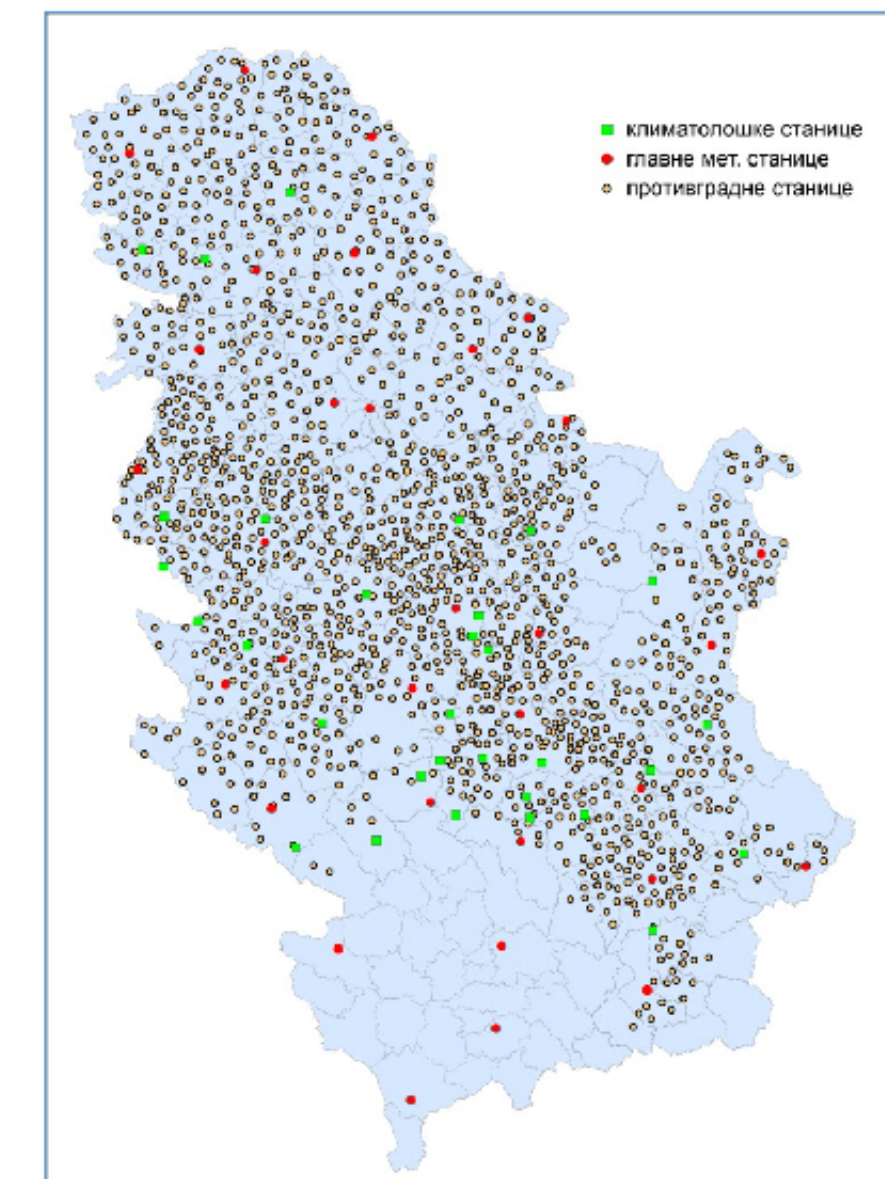
Both the 5 years and 10 years moving average show an increase of the number of days with hail in the last ten years of the analyzed period.



There is no significant trend in hailstone size frequency, but:

- the proportion of the ice-sleet slightly increased
- the proportion of the beans to hazelnut sized hailstones slightly decreased

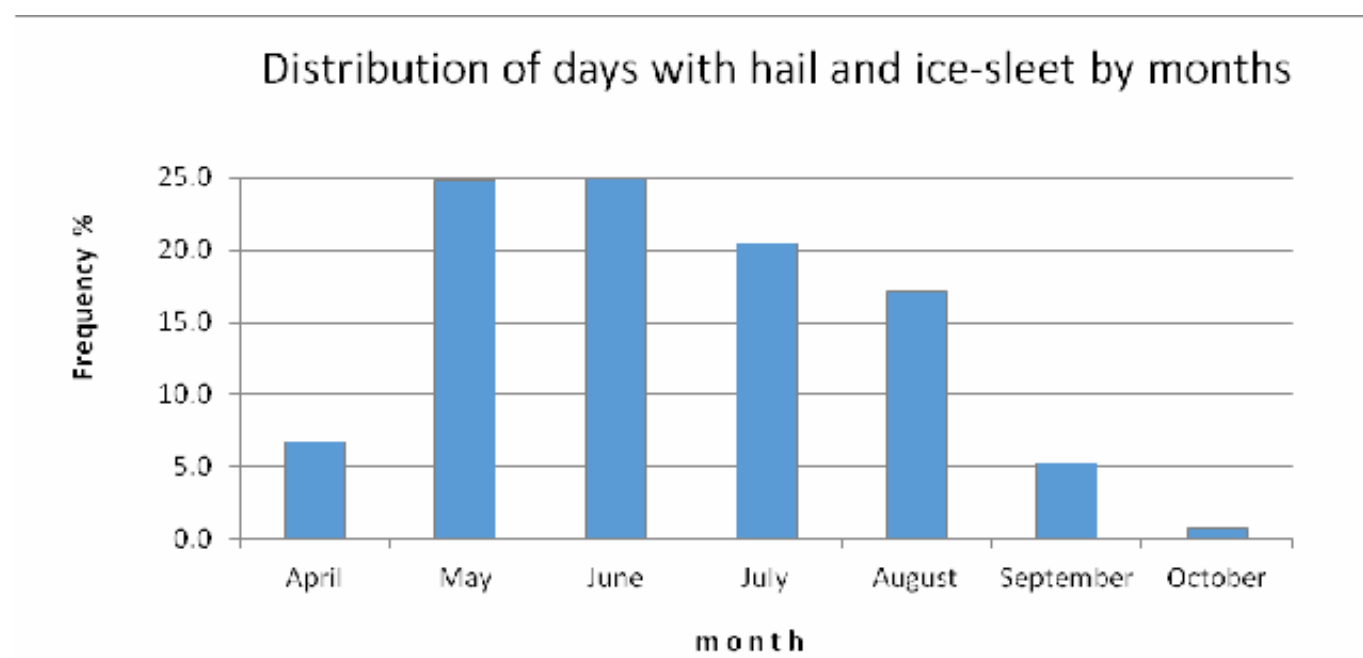
### Data



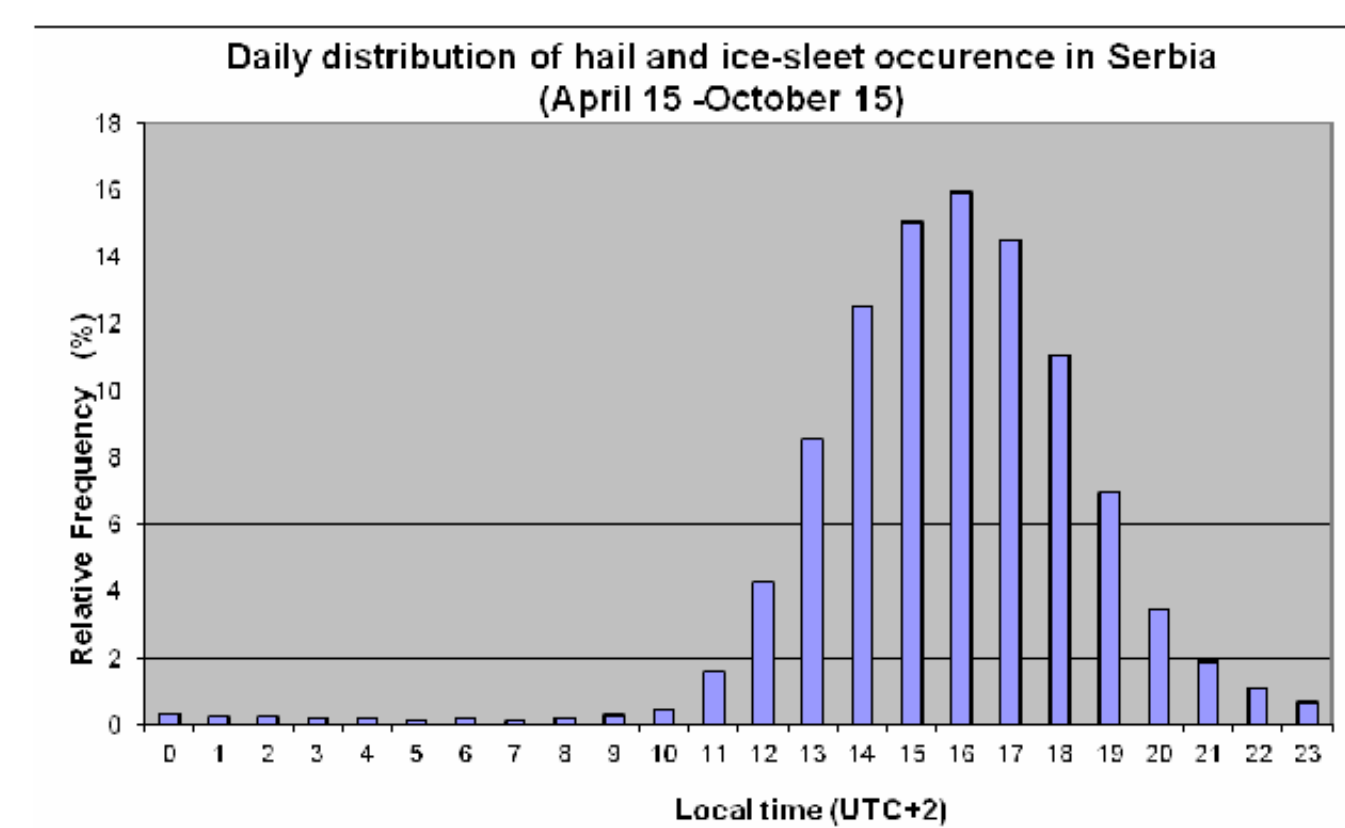
Meteorological stations, climatological stations and hail suppression launching sites in Serbia. We used data collected on launching sites (e)

- The observers in the hail suppression system reported the data of occurrence of hail, ice-sleet, rain, shower; thunder and severe wind, as well as their prevailing size.
- Analyzed data:
  - ✓ Whole territory for 12 years: 2001-2012.
  - ✓ Territory without Vojvodina for 32 years: 1981-2012.

- After the quality control of the data, we have disposed of 43,180 sets of data for hail and ice-sleet occurrence, 39,166 sets for 32 years without Vojvodina and 20,898 sets for 12 years for the whole territory.

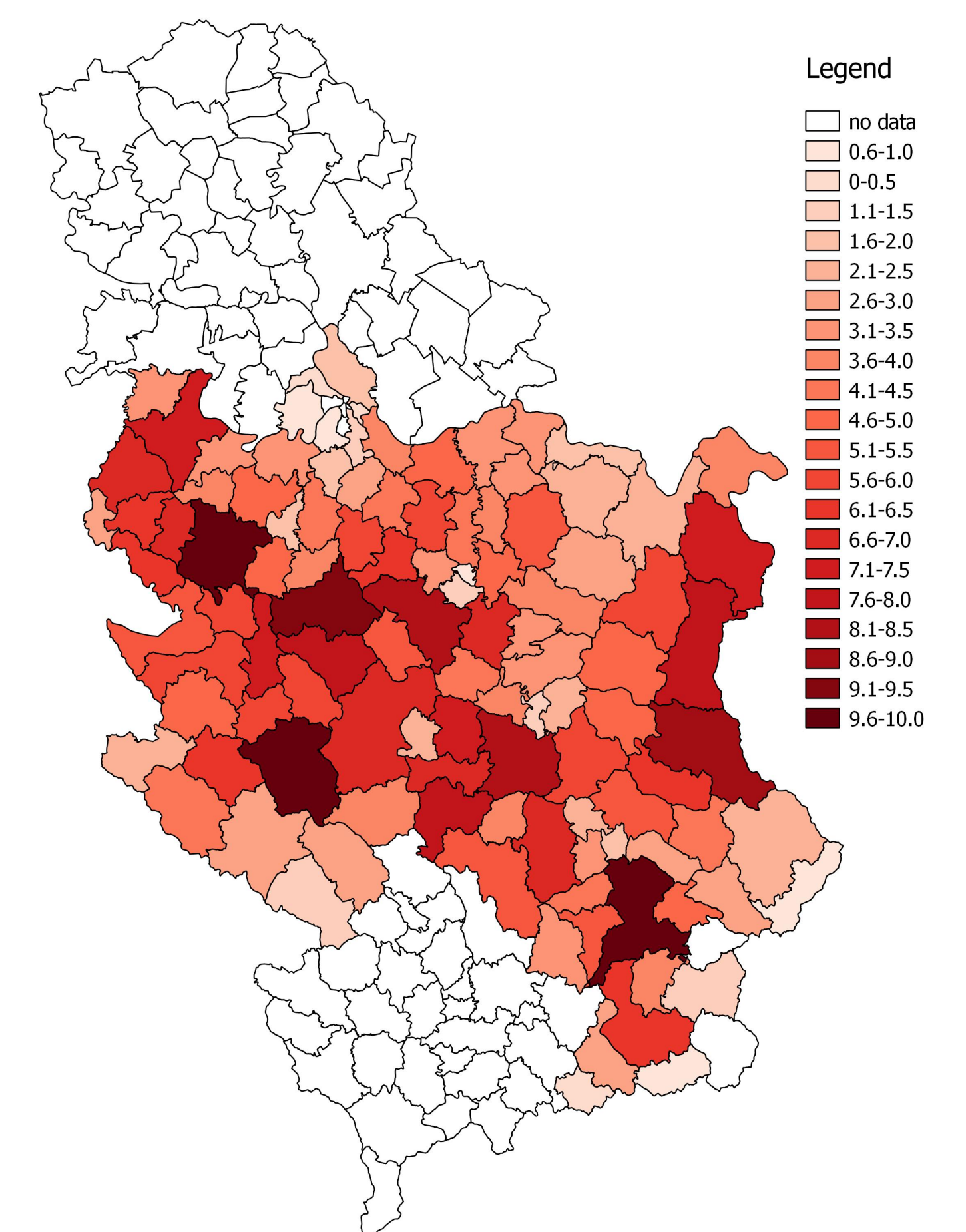


Almost half of the days with hail/ice-sleet occurrence is in May-June.

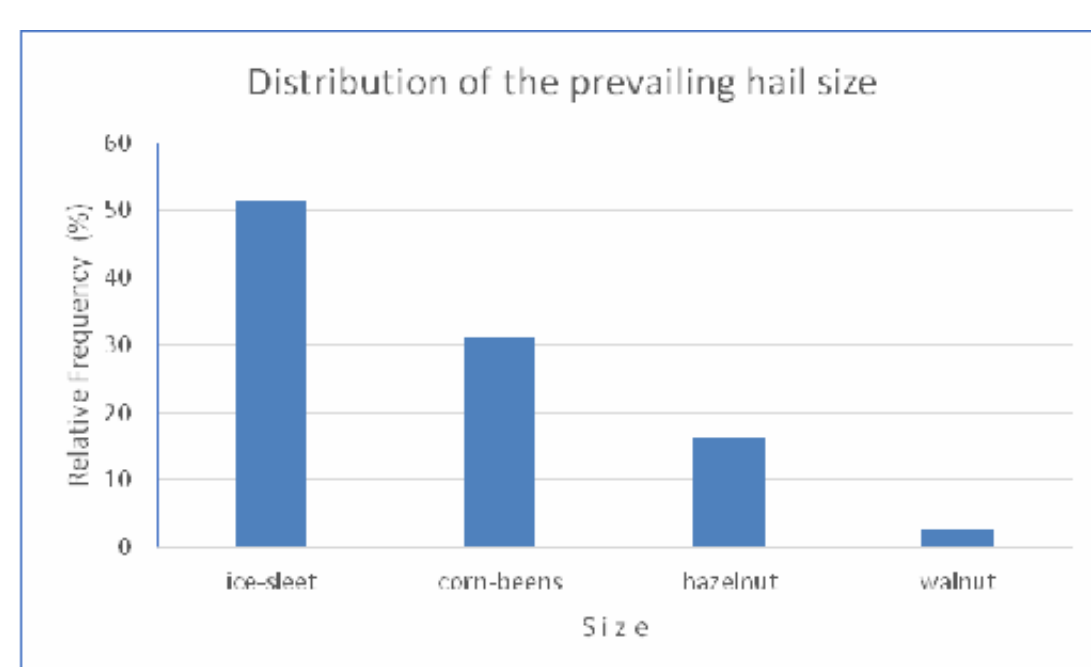
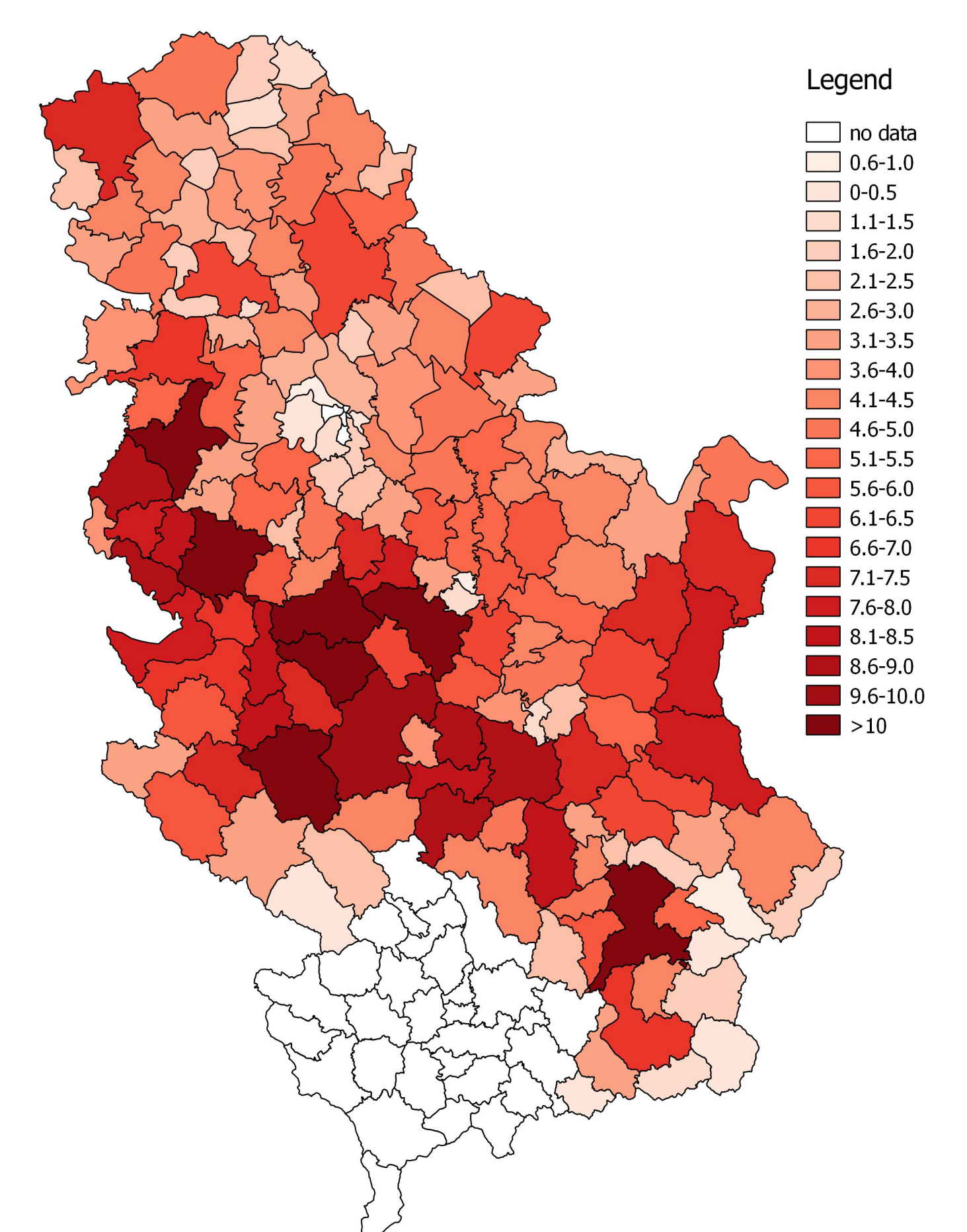


More than 45% of hail/ice-sleet occurrences observed between 3 pm and 5 pm (Local time).

Annual number of days with hail and ice-sleet in Serbia in period 1981-2012.



Annual number of days with hail and ice-sleet in Serbia in period 2001-2012.



Relative frequency of hailstones greater than walnut size is less than 0.5%.



### Conclusion

- The minimum of the annual number of days with the hail and/or sleet was 30 in the year 1985 (no hail suppression in Vojvodina).
- The maximum of the annual number of days with the hail and/or sleet was 83 in the year 2002 (including data from Vojvodina).
- In the last 12 years (2001-2012), an increase of the hail and/or sleet occurrence is observed, with an average value of 57.5 days (without Vojvodina).
- The most days with hail/ice-sleet was in May and June.
- The most frequently hail/ice-sleet events occurred afternoon, from 14-17 LT (UTC+2).

We thank mr. Ivan Bulić for assistance with logical control of the data and graphical support.