# ASPECTS CONCERNING THE VULNERABILITY TOWARD SQUALL OF THE TERRITORY OF THE WESTERN PLAIN OF ROMANIA, NORTH OF THE MURES RIVER

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***Abstract***

*For the present study we used meteorological data of the number of days with squall, collected from 10 weather stations, on the period 1961-2002. The vulnerability toward squall of the territory of the Western Plain of Romania, North of the Mures River was emphasized based on the values of the average annual number and the maximum annual number of days with squall. The map of the vulnerability toward squall of the plain territory was drawn, based on some vulnerability levels. The result is that the territories most vulnerable to squall phenomenon are: the lower Someşului Plain, the eastern part of the Crişurilor and Aradului Plains, west of Nădlacului Plain and Arancăi Plain. Among them, the lower Someşului Plain has the highest vulnerability. The risk to squall is present throughout the plain territory of the western part of the country. Only areas occupied by pastures or those unproductive, affected by excessive moisture, present no risk to this dangerous meteorological phenomenon.*

**Key words:** squall, vulnerability, dangerous meteorological phenomenon, climatic hazard.

## INTRODUCTION

Squalls fall into the category of the dangerous meteorological phenomena, considered climatic hazards specific to the warm semester of the year. They can sometimes occur in the cold semester of the year, but only when there are specific synoptic conditions that favour their occurrence. Squalls usually precede the cold fronts by 30-60 km (Ţuţuriga, 1987; Bogdan, Niculescu, 1999).

Squall can cause serious material damage, because of the violence with which it manifests, consisting of pulled out roofs, flattened crops, destroyed animal shelters, uprooted trees or broken branches, industrial towers or chimneys knocked down etc. Squall can results in breakage of power and telephone lines, because of its high wind speed, bringing down helicopters or hindering the takeoff or landing of aircrafts. There have been frequent cases of torn off roofs or knocked down trees, which fell on cars, damaging them or even on the people on the streets or in the cars, injuring or even killing them. It is therefore necessary to know the most frequent areas of occurrence of this dangerous meteorological phenomenon, thus which are the territories most vulnerable to squall.

## MATERIAL AND METHODS

To highlight the plain territories in the western part of the country which are most vulnerable to squall, we used meteorological data of the average and maximum annual number of days with squall, collected from 10 weather stations located throughout the Western Plain of Romania, North of the Mures River. The analysis period taken into consideration was 1961-2002 (42 years).

All the meteorological data used in the present paper were taken from the archives of the National Administration of Meteorology.

## RESULTS AND DISCUSSIONS

In the Western Plain of Romania, North of the Mures River, an annual average of 0.2-4.1 days with squall is recorded. The highest number is reported in the north of the plain (station Satu Mare), at the borderline between the plain and the Western Hills (stations Holod, Oradea and Şiria) and south of the plain (station Sânnicolau Mare). The lowest number of days with squall is registered at Arad and Ineu stations.

The maximum annual number of days with squall rose to 2-13 days, during the period 1961-2002. The value was higher at the same stations where the highest average annual number was also recorded.

The vulnerability toward squall of the territory of the Western Plain of Romania, North of the Mures River was emphasized based on the values of the average annual number and the maximum annual number of days with squall, taken from the 10 weather stations. Thus, the map of the vulnerability of plain territory was drawn according to the vulnerability levels shown in table 1. We mention that drawing the map and establishing the vulnerability levels were based on the comparison between different areas of the Western Plain of Romania, North of the Mures River and not on the comparison between those areas with other territories of the country.

*Table 1*

Levels of vulnerability to squall, in the Western Plain of Romania, North of the Mures River.

| Vulnerability | The average annual number of days with squall | The maximum annual number of days with squall |
|---|---|---|
| Low | < 0.5 | 1-2 |
| Medium | 0.5-0.9 | 3-5 |
| High | 1.0-3.9 | 6-11 |
| Very high | ≥ 4 | ≥ 12 |

In the Western Plain of Romania, North of the Mures River, the territories most vulnerable to squall phenomenon are: *the lower Someşului Plain, the eastern part of the Crişurilor and Aradului Plains*, *west of*

*Nădlacului Plain* and at South of Mures, *Arancăi Plain*. These areas have high vulnerability. Among them, the lower Someşului Plain has the highest vulnerability (fig. 1).

Ierului, Salontei Plains and the lower Crişului Alb Plain have a medium vulnerability to the phenomenon and the east of Crişului Alb Plain, at the entrance towards Zarand Depression, as well as the Mures Floodplain have a low vulnerability. The western part of Nădlacului Plain, where elevations are lower, was regarded as having the same characteristics as Arancăi Plain and therefore included to the areas with high vulnerability.

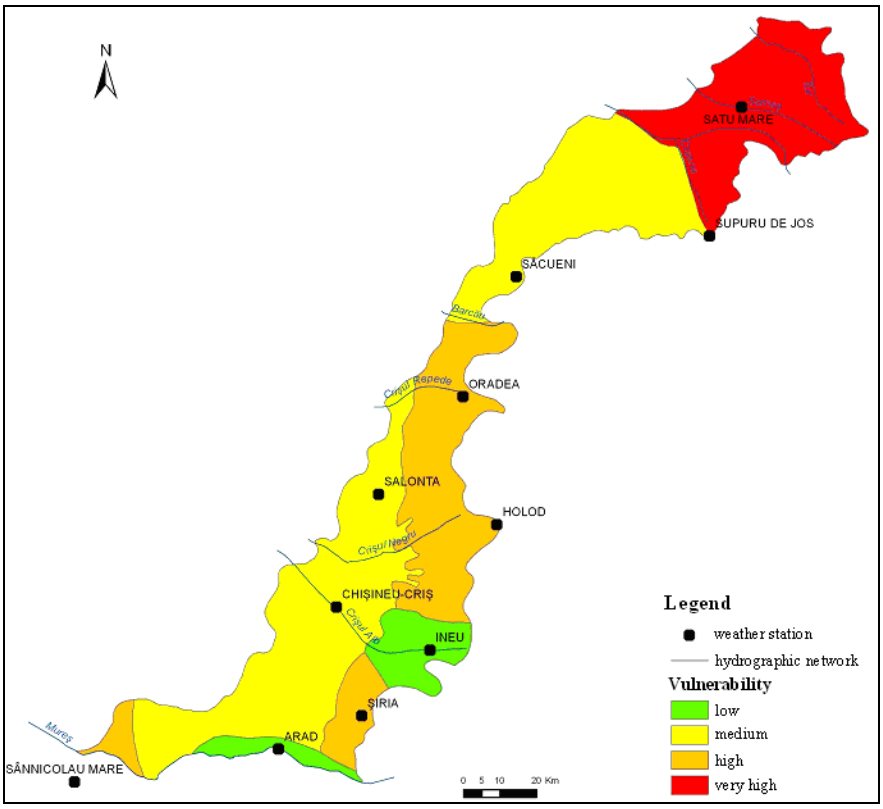


Fig. 1. Vulnerability toward squall of the territory of the Western Romanian Plain, North of the Mures River.

We must not exclude the fact that the areas considered, in the present study, as having a low or medium vulnerability are, in fact, cultivated or inhabited areas, where squalls can produce significant damage. As a result, the risk is present throughout the plain territory of the western part of the country, especially since this area represents the „expansion ground" for the strong lines of instability (squall-lines) formed in the East of the Pannonian Plain and manifested in all their magnitude, in the western territory of Romania. Only areas with pastures or the unproductive ones, affected by

excessive moisture, have a low vulnerability to this meteorological phenomenon.

**CONCLUSIONS**

The territories most vulnerable to squall phenomenon are: the lower Someşului Plain, the eastern part of the Crişurilor and Aradului Plains, west of Nădlacului Plain and Arancăi Plain. These areas have high vulnerability. The lower Someşului Plain has the highest vulnerability. The eastern part of Crişului Alb Plain and the Mures Floodplain have a low vulnerability. Since most plain territories are either under crops or inhabited, therefore areas where damages produced by squall may be important, the risk is present throughout the plains in the west of the country. Only areas occupied by pastures or those unproductive, affected by excessive moisture, present no risk to this dangerous meteorological phenomenon.

**REFERENCES**


1. Bogdan Octavia, Niculescu Elena, 1999, *Riscurile climatice din România*, Edit. Sega-Internațional, Bucureşti, 280 p.
2. Bogdan Octavia, Marinică I., 2007, *Hazarde meteo-climatice din zona temperată. Factori genetici şi vulnerabilitate – cu aplicații la România*, Edit. „Lucian Blaga", Sibiu, 422 p.
3. Bordei-Ion Ecaterina, 2009, *Rolul lanțului alpino-carpatic în evoluția ciclonilor mediteraneeni*, Ediția a II-a, Edit. Printech, Bucureşti, 138 p.
4. Cristea Maria, 2004, *Riscurile climatice din bazinul hidrografic al Crişurilor*, Edit. Abaddaba, Oradea, 186 p.
5. Măhăra Gh., Şerban Eugenia, 2008, *Climatic risk phenomena in the warm period of the year, in the Crisurilor Plain*, Analele Univ. din Oradea, Seria Geografie, tom XVIII, Oradea, pp.41-50.
6. Moldovan Fl., 2003, *Fenomene climatice de risc*, Edit. Echinox, Cluj-Napoca, 209 p.
7. Şerban Eugenia, Man T., Chiorean Cristina, 2010, *The analysis of the frequency and the trend of the squall phenomenon in the Western Romanian Plain, North of Mureş River*, Analele Univ. din Oradea, Fasc. Protecția Mediului, vol.XV, anul 15, Oradea, pp.968-975.
8. Şerban Eugenia, 2010, *Les degrés de certitude et de vulnérabilité face à la grêle sur la Plaine de l'Ouest de la Roumanie située au nord de la rivière Mureş*, XXIII$^{ème}$ Colloque de L'Association Internationale de Climatologie „Risques et changement climatique", Actes du colloque, 1-4 septembre 2010, Rennes, France, pp.577-582.
9. Şerban Eugenia, Moldovan Fl., 2010, *The causes and environmental consequences of the dangerous meteorological phenomena which occurred in the interval 18$^{th}$-20$^{th}$ May 2008, in the Western Romanian Plain*, Present Environment and Sustainable Development, vol.4, Edit. Univ.„Al.I.Cuza", Iaşi, pp.211-220.
10. Teodoreanu Elena, 2007, *Se schimbă clima? O întrebare la început de mileniu*, Edit. Paideia, Bucureşti, 319 p.
11. Țuțuriga Liana, 1987, *Aspecte privind fenomenul de vijelie în Câmpia Banato-Crişană a României*, Studii şi Cercet., Meteor., nr.1, I.M.H., Bucureşti, pp.101-113.