

# FOG AS RISK CLIMATE PHENOMENON IN DEVA

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**Abstract. - Fog as Risk Climate Phenomenon in Deva.** The survey over fog phenomenon in Deva was carried out for the period 1961-2010. For the surveyed period of time, in Deva, the annual average number of days with fog is 48.8. There are however positive and negative abnormalities. Relief features and anthropic factors represent genetic basic elements for fog occurrence in Deva area.

**Key-words:** fog, Deva area, risk phenomenon.

## 1. Introduction

Fog represents a risk climate phenomenon that is possible to occur over the entire period of the year in Deva.

Fog is usually formed through water vapour condensation at temperatures between -5 and 5°C, relative dampness of 80-100% and breeze (under 4m/s) or relative dampness of 80-100% when numerous condensation nucleus or through water vapours sublimation at temperatures of -30°C and relative dampness under 80% (Gh. Măhăra, 2001).

Fog is formed when the air is saturated in water vapours and when there are sufficient condensation nuclei. Air saturation occurs when the relative dampness reaches 100% and the air temperature comes down to the dew point. The condensation nuclei are solid and liquid microscopic particles (fine salt flour evaporated from seas and oceans through wave breaking, dust particles, grime, ash, industrial factory emissions) with hygroscopic proprieties, in the atmospheric air suspension, which favours the forming of large particles with small bending; this determines normal saturation.

In the urban area, fog is associated with other phenomena as well, like pollution, producing the phenomenon of “urban fog” or “smog”. In Deva, taking into account its geographical position over Mureş couloir, radiation fog occurs very frequently. Radiation fog is formed even when a hot air mass reaches Deva over another one already there, radiatively-cooled, forming advective-radiative fog.

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## 2. Methodology

For the survey of the fog phenomenon in Deva, pieces of information from Deva meteorological station over the period 1961-2010 were used. The information referring to the number of days with fog for the following cities: Iași, Timișoara, Constanța, Brașov and Cămpina were collected from the book *Clima României (Romania Climate)*, 2008.

The survey analyses indicators that refer to the average multiannual number of days with fog, the abnormalities of the annual number of days with fog related to the multiannual average and the average monthly number of days with fog. The comparative analysis of the number of days with fog in certain cities positioned diversely on the territory of Romania has the role of highlighting the importance of the geographical position and relief in the occurrence of fog on the territory of Romania.

## 3. Results

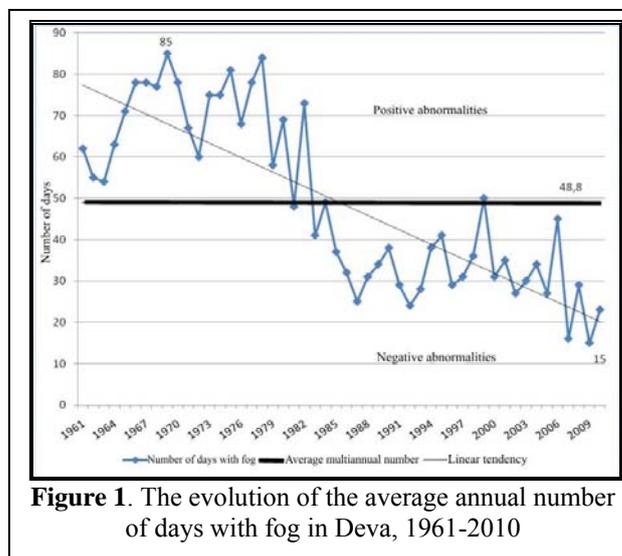
### 3.1. The average multiannual number of days with fog

On the territory of Romania, the average multiannual number of days with fog varies according to the action of diverse baric centres that are present throughout Europe and have influence on the territory of Romania. The average multiannual number of days with fog in the surveyed cities varies according to their geographical position related to the main baric centres and according to the geographical position in the country. The highest number of days with fog is recorded in the western cities and in the coast area, while in the eastern part of Romania, the number of days with fog is less (figure 1). The high number of days with fog in Timișoara is conditioned by the western oceanic influences that produce a high level of humidity, an essential element in the condensation and fog formation process. In Constanța the high annual number of days with fog is influenced by the position of the Black Sea, which favours a high level of humidity. In Iași, the lower number of days with fog is determined by the mild continental climate which is characterized by the predominance of the low humidity anticyclonic condition over the whole year (table 1). In Oradea, the average multiannual number of days with fog is 36.4 days (Aurelia, Dumiter, 2007).

**Table 1.** The average number of days with fog.

City	Iași	Timișoara	Constanța	Deva	Cămpina
Average annual.					

no. of days with Fog					
	34.4	52.9	52.1	49	37.5

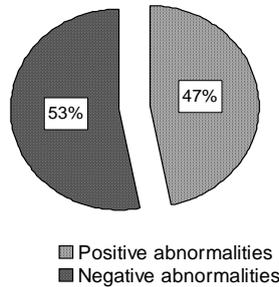


**Figure 1.** The evolution of the average annual number of days with fog in Deva, 1961-2010

In Deva, for the period between 1961-2010, the average multiannual number of days with fog is 48.8. The highest number of days with fog was recorded in 1969: 85 days. Over 80 days with fog were recorded in 1978: 84 days; and 81 days in 1975. The lowest number of days with fog was recorded in 2009: 15 days, while, in 2007, 16 days with fog. The low number of days with fog that occurred after 2005 is determined by the installing

of filters for the polluting emissions, thus reducing the level of pollution because, when the level of pollution is high, fog occurrence is more frequent. For the period between 2000-2010, the number of days with fog was lower than 50 days. Between 1961-2010, a difference can be made in Deva concerning the number of days with fog between 1961-1982 and between 1983-2010 (figure 1). The time between 1961-1982 is characterized by predominantly higher values of the number of days with fog than the multiannual average. This situation is determined by modifications in the structures of economical activities, having new industrial branches that favoured the increase of pollution level. The presence of polluting agents in the atmosphere favours fog occurrence because it represents condensation nuclei for the atmosphere water vapours. The second period of time is characterized by the reduction of the annual number of days with fog. This situation was determined, especially after 1989, by the reduction of economical activities caused by the industrial factories disappearance and restructuring. In this respect, we have to mention the production decrease at the Mintia-Deva Steam power plant and restructuring of Chişcădağa processing unit of building materials. We also mention that the two economical units are located near Deva, so the polluting emission influences the air composition within the surveyed area.

For the period of time between the years 1961-2010 in Deva, the general tendency of the number of days with fog is to decrease, which is beneficial concerning the risk aspect that fog can determine.



**Figure 2.** The frequency of the number of days with fog abnormalities in Deva.

In regard to the multiannual average (48.8 days with fog), in Deva area there were positive and negative abnormalities. For the years 1961-2010, 53.1% of the years are characterized by negative abnormalities while 46.9% of the years are characterized by positive abnormalities (figure 2). The highest value of the positive abnormalities was 36.6 days in 1969 while, in 2009, the highest negative abnormality was recorded: 33.8 days. The

abnormalities value is important because it indicates the limits within which the number of days with fog can vary in Deva area.

### 3.2. The average monthly number of days with fog

The highest average monthly number of days with fog in Deva is recorded in October, for 18 days. The lowest is in March with an average of 1.3 days. Other high values of the days with fog are recorded during the cold seasons because the reduced temperatures and the anticyclonic condition favours the maintenance of the polluting particles in the atmosphere that can represent condensation nuclei in the process of fog formation. We mention that the anticyclonic condition in the cold seasons is given by the influence of the polar mobile anticyclones. The highest number of days with fog in the cold season is recorded in January; 6.9 days, which determines also the highest frequency of fog occurrence in the cold season.

In spring, the average monthly number of days with fog decreases due to air masses instability and stressed thermodynamic convection. Under these circumstances, the low number of days with fog in March (1-3 days), April (1-5 days) and May (2-3 days) is justified. In April, we also have the minimum monthly number of days with fog, which is 4 days. In summer, in Deva area, the

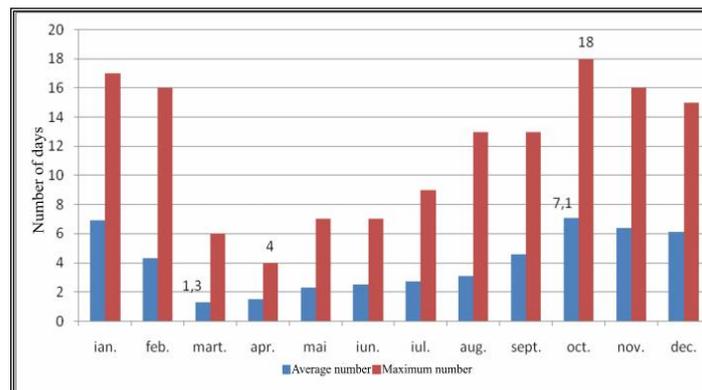
number of days with fog is somewhat higher than in spring and lower than in autumn and winter. This situation is determined by the influence of the anticyclones formed in the tropical and subtropical latitudes, which determines a reduced humidity in the air. Beginning with September, the average monthly number of days with fog starts to increase because the radiation processes favours radiation fog occurrence. Thus is explained the maximum monthly number of days with fog in October; 18 days (figure 4).

**Table 2.** The average and maximum monthly and yearly number of days with fog in Deva, 1961-2010.\*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Average No.	6.9	4.3	1.3	1.5	2.3	2.5	2.7	3.1	4.6	7.1	6.4	6.1	48.8
Frequency	14.2	8.9	2.6	3	4.8	5.1	5.5	6.4	9.4	14.5	13.1	12.5	100

\*Source: Archive A.N.M.

The monthly frequency of the number of days with fog has the highest values in October. Under these circumstances, the highest possibility to have a higher number of days with fog in Deva is recorded October. Seasonally, the highest probability to have fog is recorded in the cold season (table. 2).



**Figure 4.** Annual variation of the average and maximum number of days with fog in Deva, 1961-2010.

### 3.3. Risk aspects

Fog represents the climatic phenomenon with a probability of occurrence over the entire year in the area of Deva. Through its intensity and occurrence duration, fog is a risk phenomenon within the surveyed area because it determines:

- visibility decrease; it determines frequent road accidents, the risk level is stressed when it is associated with other phenomena, like: ice and snow.
- modifications in the air quality due to the polluting particles that are present in the foggy atmosphere affect population health;
- trouble with human body, reduced temperatures that are accompanied by wind presses normal breathing and weakens some tissue resistance.
- it carries viruses (on greater distances) that can lead to epidemics, specially radiation fog (Octavia Bogdan, 1999).

#### **4. Conclusions**

The average multiannual number of days with fog for the period 1961-2010 is 48.8 days. The highest number of days with fog was recorded in 1969: 85 days. The lowest number of days with fog was recorded in 2010: 15 days. In Deva area, fog phenomenon has a formation average frequency of 3% in April and 14.5% in October.

The average monthly number of days with fog varies in Deva area according to monthly thermic characteristics. During the cold season months, a higher number of days with fog is recorded, while during the warm seasons, the number of days with fog is lower.

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