

Relative humidity monitoring

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Abstract : In this paper, the relative humidity is monitored with weather station at the UPB ISB faculty during September-December 2009. In this paper we monitored the relative humidity, we plotted the values obtained and then we made a statistical analyzing of obtained data. After analyzing the data we notices that: the lowest humidity in September was recorded on September 04, 05 September 2009 at 17:00 worth 28 % and the highest value on September 6, 7 2009 at 5:00 in the amount of 99 %, and the lowest relative humidity in October (October 15 at 16:00) was 36 % and the highest value (on October 6, and 10 October between 8:00 and 10:00) was 100%. The lowest humidity in November was 44 % (on November 14 at 14:00) and the highest value (on November 6, 7 between 24: 00 and 8:00, 9 November hour 20: 00 at 24:00) was 100% when it was cold and blow the wind. Finally, the lowest relative humidity in December (on December 10 at 12:00) was 77% and the highest (on December 3 at 1:00) was 100% when it snowed and was cold .

Key-Words: Relative humidity, Weather station, Statistical analysis of obtained data

1 Introduction

Air humidity represents the amount of water vapor which is in the atmosphere. Furthest, they come from the evaporation of surface water and superficial layers of soil, from plant and animal respiration and from some technology process. Atmospheric humidity can be expressed in 3 ways: relative, absolute and maximum. Physical sizes witch quantify air humidity are:

Absolute humidity - H_{abs} - represents the amount of water contained in a defined volume of air.

$$H_{abs} = \text{Water volume} / \text{Air volume} [g / m^3] \quad (1)$$

Saturation humidity - H_{sat} - represents the maximum amount of water that may be contained in a defined volume of air.

$$H_{sat} = \text{High water volume} / \text{Air volume} [g/m^3] \quad (2)$$

Relative humidity - H_{rel} - represents the ratio of absolute humidity and saturation humidity.

$$H_{rel} = \frac{H_{abs}}{H_{sat}} g / m^3 \quad (3)$$

Humidity - Interdependence between outdoor air and indoor air.

For weather data acquisition we using weather station shown in Figure 1, installed at the Faculty of Biotechnical Systems Engineering Bucharest, type AWS / EV made in Italy and purchasing data about: air temperature, wind speed, wind direction, atmospheric pressure, rainfall, humidity, solar radiation.

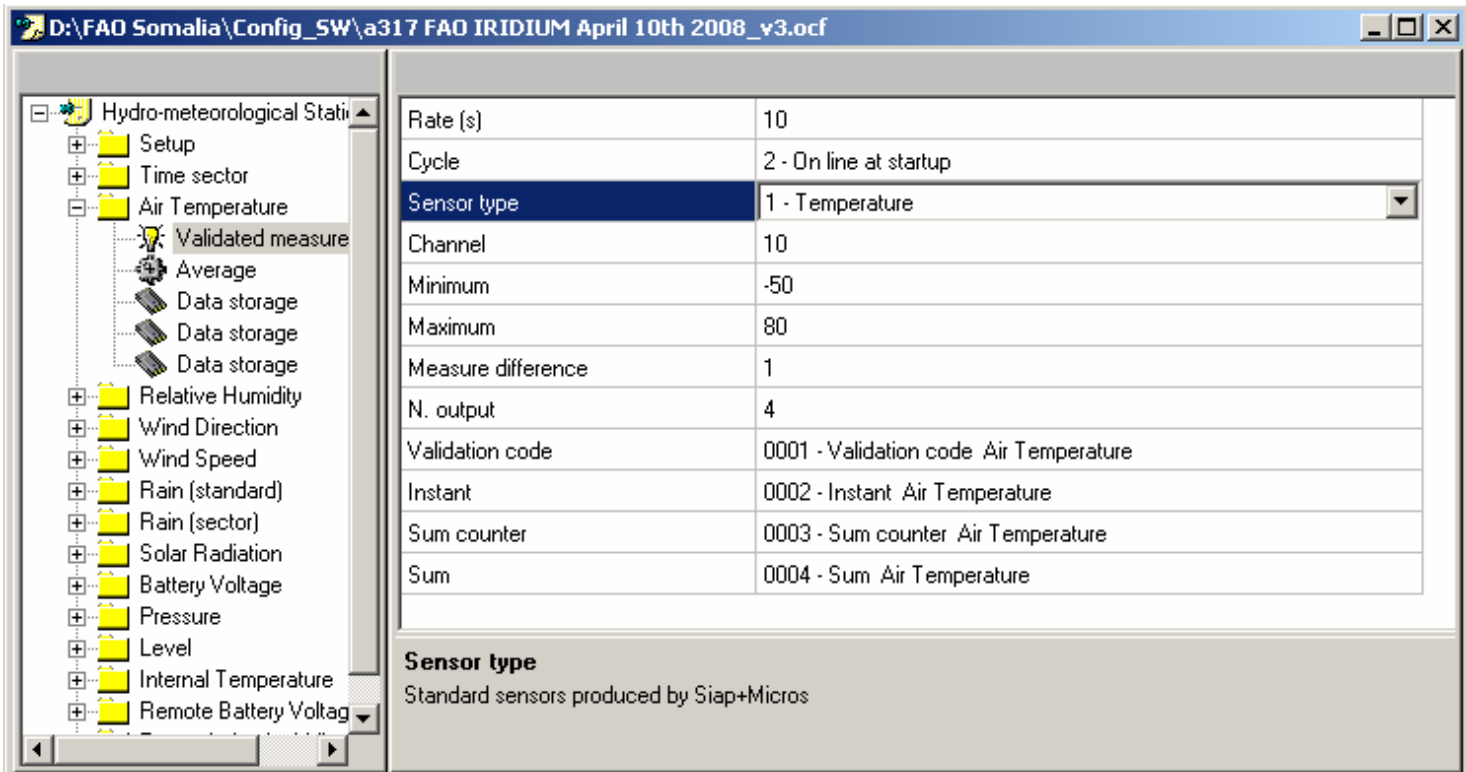
Data acquisition is done using GECO software, an operating system that runs under Microsoft Windows 95, 98, ME, Win NT, Windows 2000, XP. Meteorological data are measured, recorded and transmitted automatically in real time with specific systems and stored on computer databases. Primary meteorological data was stored in databases and was and will be the subject of evaluation process, calculated and statistical analyzed.

2 Problem Formulation

In Table 1 are indicated the measured parameters like: relative humidity, wind direction, wind speed, Rain standard and in sector, solar radiation, battery voltage, pressure, level etc. , of the weather station,

using the program GECO AWS station / EV) type AWS / EV from faculty Systems Engineering Biotechnicals, Politehnica University of Bucharest.

Table 1 Measured parameters, using the program GECO AWS station / EV) type AWS / EV



The System for environmental and metrology monitoring are presented in Figure 1.

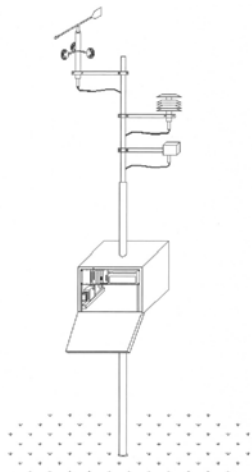


Fig. 1 System for environmental and metrology monitoring

In table 2 are indicated the air temperature, indoor air temperature, indoor relative humidity, outside relative humidity.

The values tables are recorded by weather station on November 12, 2009, 1-12 PM for atmospheric temperature and relative humidity.

So, at temperature of 6,6 °C, the air can absorb 10g water vapor /m³. Relative humidity is 83%. If the air is heated, relative humidity is halved. The same effect is observed in winter, when windows are open.

We observed the lowest relative humidity in October, November and December taking account outside temperature, indoor air temperature, indoor and outside relative humidity.

In table 3 are presented statistical analysis of relative humidity measured with the weather station on 14.09.09. In Fig. 2-6 are presented the relative humidity in September to December 2009.

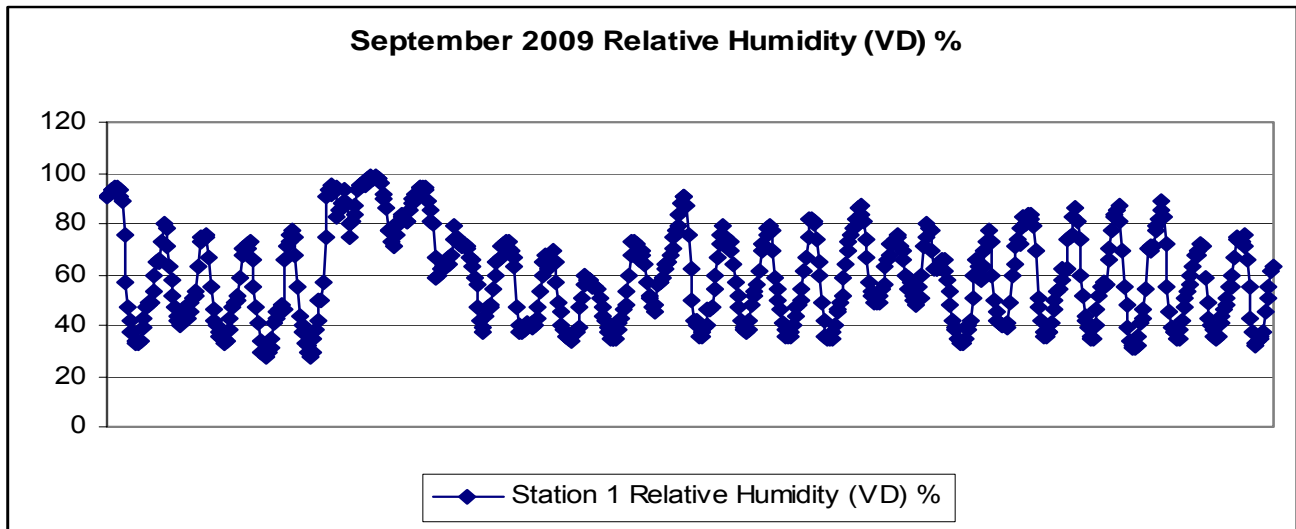


Fig. 2 Relative humidity September 2009

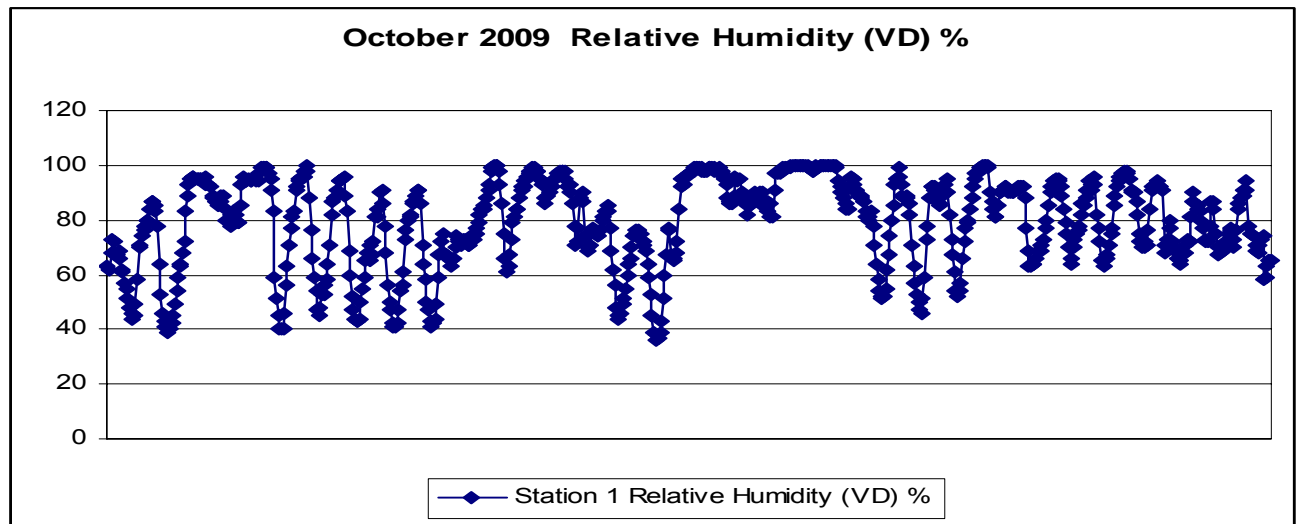


Fig. 3 Relative humidity October 2009

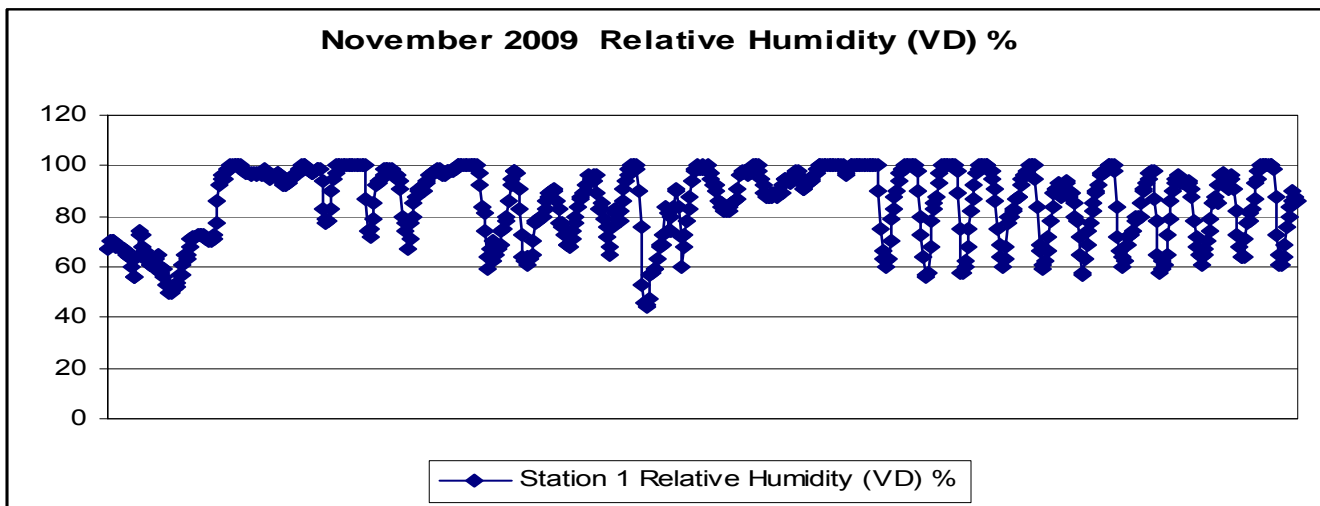


Fig. 4 Relative humidity November 2009

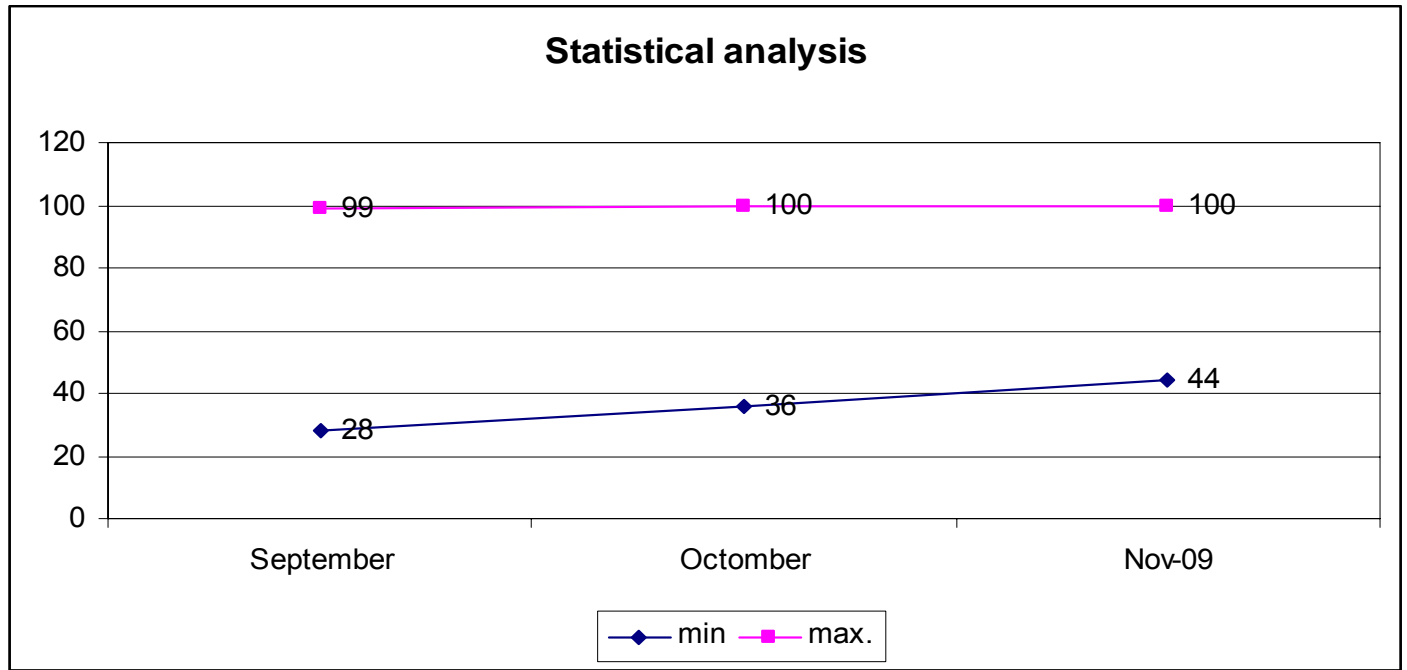
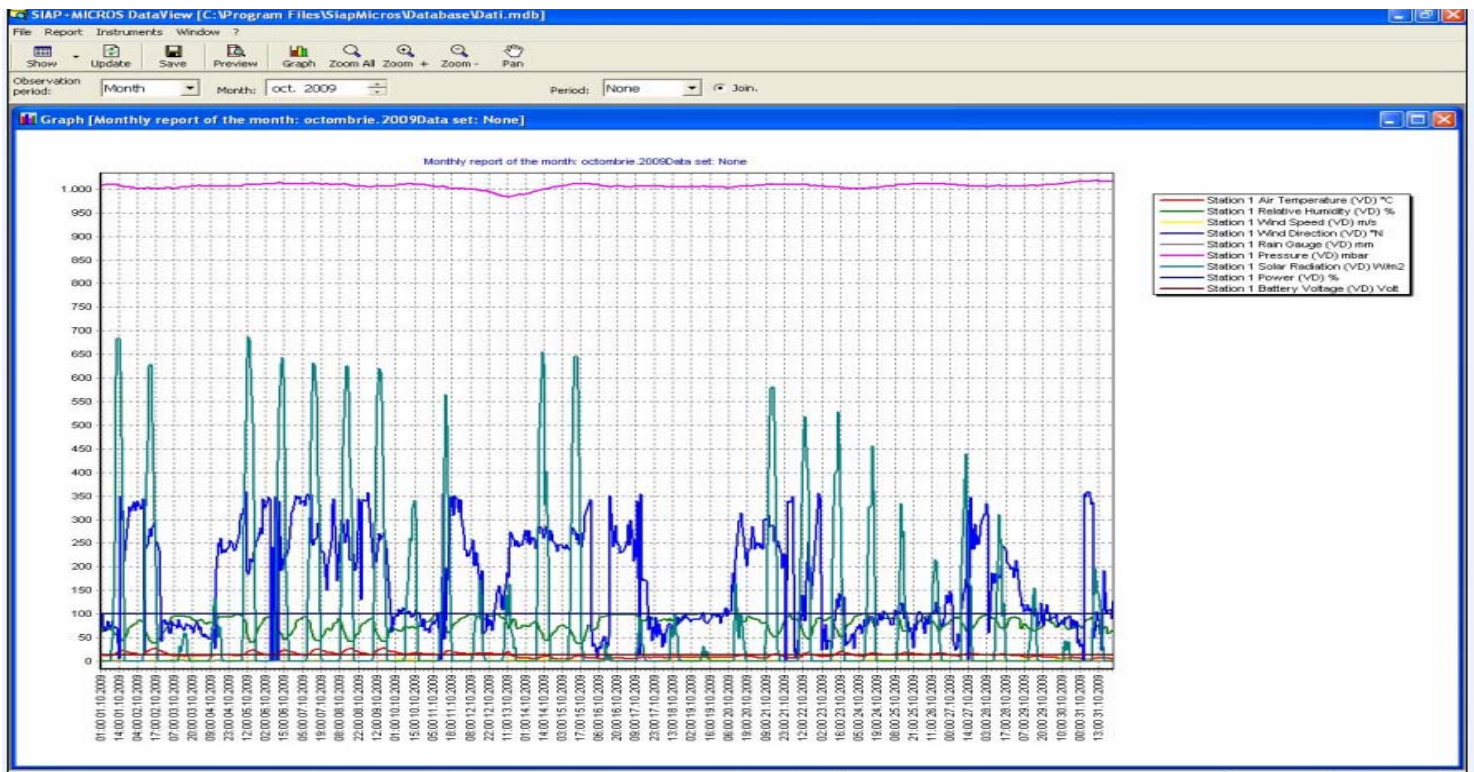


Fig. 6 Graphical representation of minimum, maximum relative humidity during September-November 2009.



4 Conclusion

Relative humidity was monitored, values obtained were plotted, statistical analysis was performed. The lowest humidity in September was recorded on September 04, 05 September 2009 at 17:00 worth 28

% and the highest value on September 6, 7 2009 at 5:00 in the amount of 99 %.

The lowest relative humidity in October (October 15 at 16:00) was 36 % and the highest value (on October 6, and 10 October between 8:00 and 10:00) was 100%.

The lowest humidity in November was 44 % (on November 14 at 14:00) and the highest value (on November 6, 7 between 24: 00 and 8:00, 9 November hour 20: 00 at 24:00) was 100% when it was cold and blow the wind.

The lowest relative humidity in December (on December 10 at 12:00) was 77% and the highest (on December 3 at 1:00) was 100% when it snowed and was cold .

Based on outside air temperature where the weather station is located and on the air temperature in the room where the computer processes the recorded data, was calculated outdoor and indoor relative humidity, we could see that the relative humidity inside is half of the relative humidity outside, at a temperature of about 22 °C and the same effect we could see it in winter when windows are open.

References:

- [1] **C. Rusanescu**, M. Rusanescu - *Acquisition techniques and environmental monitoring* in Romanian), Edit. Cartea Studenteasca, Bucharest 2010
- [2] **C. Rusanescu**, M. Rusanescu - *Elements of dynamic pollution*, Editura Cartea Studenteasca, Bucharest 2010