

# LOCAL CLIMATE OF ARDECHE MIRES

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## Abstract

In order to complete Meteo-France data at a local scale for mires water management, it has been decided with their naturalist manager (CREN Rhône-Alpes) to set two climatologic stations on two mires situated on the Ardèche plateau, east border of Massif Central, mainly for precipitation measurements. The two sites are completely different. Sagne Redonde (Lanarce), is a maar bottom mire. Montselgues is a gathering of tiny mires very close to the top of a 1000 meters high spur. We measure a few parameters for real use and to complete observation of official meteorological array, data collect and station management must be easy for non specialists, such as naturalists, cost has to be low, at the level of manager finances. The two stations measure temperature in a miniature meteorological shelter, precipitations via a rain gauge and piezometric level.

First results confirm the interest of this local setting. Sagne Redonde is a true frost hollow where air temperature minima can be lower by 7°C compared to other plateau stations, while rain amount is not very different. Montselgues mires have air temperatures very similar to Meteo France references, but annual precipitations are lower by 25% compared to the nearest Meteo France station. Piezometric reactions are very different too.

*Keywords* : local climate, mire management, Ardeche plateau

## INTRODUCTION

Mire managers, generally today naturalists, need a better understanding of water balance and circulation within peat as well between watershed and mire. With forest control, it is one of their major tasks when there is not immediate threat toward the site. For that reason, it is necessary to get actual data, but official network doesn't include mire site for soil properties are too different from the standards of OMM.

In the first part, we shall present the regional characteristics of the Ardeche Plateau, the mires we are studying, the reason why we decided to set a new climatological observatory in that region, the type of climatological station, the details of implementation and the rules for surveying and maintenance, both very important for naturalists managers, non meteorological specialists.

In the second one, we will present some preliminary results which confirm local variations of air temperature and precipitations.

In the third one, we will state of the utility of these data for local managing.

We will conclude on the reproductibility of this project.

## 1 WHY LOCAL MEASUREMENTS ON THE ARDECHE PLATEAU ?

### 1.1 Local characteristics and data climatologic needs

Ardeche plateau is mostly a granitic one, with basaltic rocks. Height is about 1000-1400 meters. Due to important rain and low permeability of soils, mires are frequent but generally small.

The site of Sagne Redonde is a 17 ha wide mire in a crater maar. The greatest part of peat has been removed and excavations are full of water. The care of the mire manager is to decide whether to let peat reconsitute or leave free water, both interesting for biodiversity. Water seems not to be a problem, but we have to know if water circulation is normal or if maar characteristics induce underground inputs or outputs. We also need to know if mire acts as a temporary water storage.

The site of Montselgues is an array of tiny mires scattered almost on the top of a spur. Peat thickness is small, generally 40 cm, maximum is one meter. It appears that these mires are frequently dry, especially

during the near mediterranean summer of this region. Despite heavy rains in autumn, water availability seems to be a problem. Water storage in rocks as well in peat is not important. For that reason, we wanted to have good values of precipitations and check their influence on piezometric levels. More, it seems that some features of plant communities are not in accordance with presumed temperature.

There is a Meteo France meteorological array on the plateau, and our mires are close to very reliable stations, Issanlas (Sagne Redonde at 2 km) and Loubaresse (Montselgues at 8,5 km), with data collected respectively since 1955 and 1951. Loubaresse is well known in this region as it shows regularly very high level of precipitations. As Ardeche plateau is a barrier between mediterranean and oceanic domains, local variations are very high. Annual rain amount may vary from 900 mm to 2000 mm within 20 kms. So, especially in the case of Montselgues, we need a measure on the site itself.

One other reason for implementation is we need continuous measurements. Reactions of water table can be very quick as filling out of mire water content.

## **1. 2 Local measurements**

The two devices have to comply with three exigences :

- low cost with meteorological standards, fitted to manager budget, typically 3000 €
- reliability in accordance to setting in natural ecosystem
- possibility of checking by non-specialists

We exposed precendently the reason why we measure rain and temperature. We would like to evaluate evapotranspiration for Meteo France has only one station on the whole Ardeche plateau where this parameter is calculated. Unfortunately, for economical and practical reasons, it is difficult to get enough data on the site for this calculation. So, we have to either use the Meteo-France data with local empiric correction or use empirical formula, such as Coutagne or Turc ones.

The devices consist of a Alcyr data acquisition unit, powered by batteries, manufactured in France, one pt100 probe under cup miniature shelter and one raingauge. In Sagne Redonde, we also have a piezometric probe linked to the data unit while, in Montselgues, we have a Ott Thalimedes limnimeter.

We use a standard rain gauge. That means that snow is underestimated during winter, but it is almost impossible to use a snowmelting raingauge without a big electricity power, which means a doubling of cost. This is a problem in Sagne Redonde, where winter is very long and snowfall frequent ; this is not really in Montselgues.

In Sagne Redonde, The station is settled on the mire, with the piezometric probe in the tiny river which collects the water out of the mire. There is no fences around the installation. A very few people go there and it's hard to see the apparatus. No particular disturbance has been noticed.

In Montselgues, the station is located at the exit of the village, with also no fences. A great lot of people go there, but there is no particular damage too, for village people, involved in environmental managing, take care of it. We just had problems with wild pigs.

Checking and data collect are made every two months. A manual piezometric measure and device checking is done every month, by foot or skiing.

## **2 FIRST RESULTS**

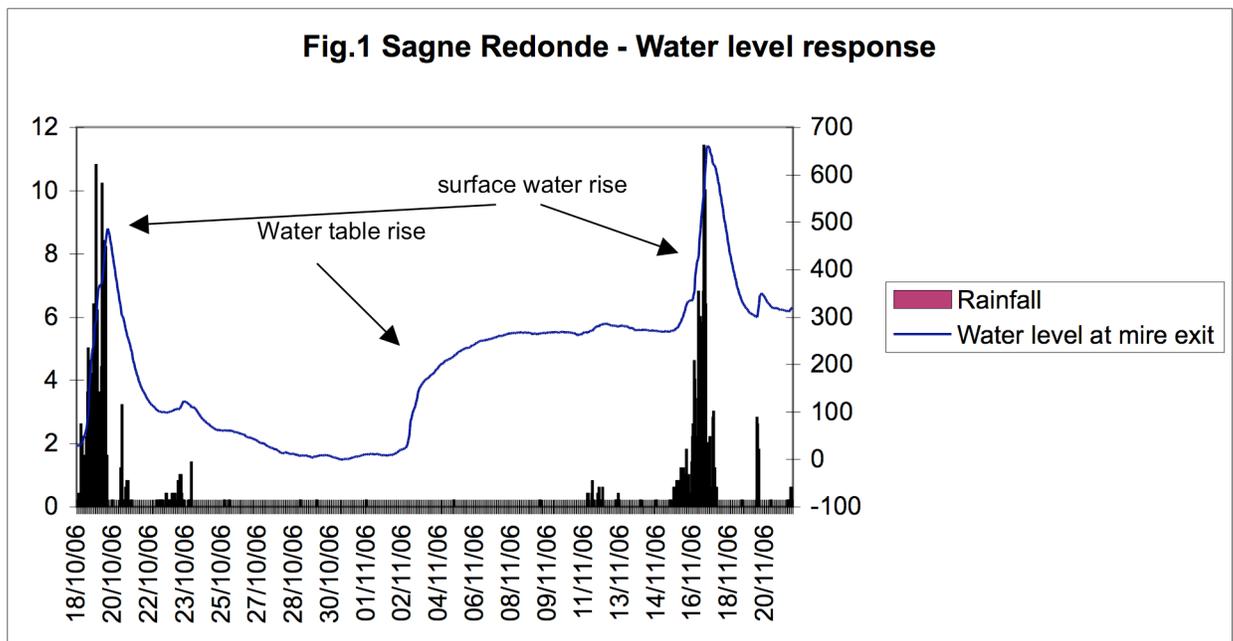
The two stations are operating since 2005. Some problems, especially with Montselgues raingauge, functioning well when tested and lazy as soon as we went back to office, explain why we have still discontinued data. Things are improving now. We used, to complete them, the measures done by a sheperd, irregular (not every day) but reliable, checked by EDF and ourselves.

As we thought, rain amount in Sagne Redonde is very similar to Issanlas one, indicating an oceanic rain distribution with mediterranean influence (« cevenol events »). In Montselgues, rain amount is about 25% lower than Loubaresse, with truly cevenol distribution, a dry summer and a very wet autumn.

Temperature in Sagne Redonde is particularly low. In fact, it is a true frost hollow, where minimum temperatures can be lower by more than 7°C than the plateau ones. Annual temperature mean is about 1°C lower than Issanlas. This seems to be the lowest site of the Ardeche plateau.

Mean temperatures in Montselgues are generally higher by 0,5 to 1°C than Loubaresse. This seems to be the warmest site of the Ardeche plateau. It is also the southeast one.

Records give also important indications on water circulation. The graph 1 shows the influence of rain sequences on water level at the exit of the mire of Sagne Redonde. Two type of variations are perceptible, one, short, up and down, indicates a rapid filling and evacuation of water, another, longer, up, without rain, indicates probably the impact of the storage in the water table which supplies water to the mire. It means that water level in the mire cannot be understood without studying the watershed. In Montselgues, poor storage in rocks make the water level more unstable.



### 3 MANAGING CLIMATIC GUIDELINES

First results are of value for manager, but, as usual, give some answers and put new questions.

#### 3.1 Water availability

In Sagne Redonde, good rain distribution, positive water budget and water storage in the watershed keeps a high water level throughout the year, even during recent dry periods (2003 and 2005). Constant flow water allows, if decision is taken for biodiversity choices, the manager to make the level rise easily.

In Montselgues, despite high precipitations, circa 1500 mm/yr, irregularity of rainfall as well as hydrogeomorphologic features make the water level in mires unstable. This is the reason why local farmers have always established little dams to keep water on the plateau, for irrigation or cattle. The mire manager has to include this type of water control to keep the mires growing.

### 3.2 Temperature impact

Here are the questions, for we are at a border between oceanic and mediterranean domains, with the influence of altitude.

Despite deep frost, it has been noticed in Sagne Redonde that some fauna features are more thermophile than in other sites of the plateau. The question is : are there some other influences, such as large pools or are there some warmer microclimate inside of vegetation, for instance in the reeds ? Anyway, the low temperatures make the growing season very short.

In Montselgues, a very wide open plateau, things are even more complicated. Some plant communities features show pyrenean ones similarities. For mosses, it seems that oceanic influences are essential. In fact, each taxonomic group adds an element to the complexity. If climate is not the main factor, the manager has to take care of very local space management, for instance water level control, vegetation growth, local shelters.

### CONCLUSION

Local measurements are very necessary for mire hydrology studies and management. This experience shows that it is possible to achieve that at a reasonable cost. Results indicate that mires local climate and response to climatic events can be very different in a homogeneous region. So, we intend to settle two other stations in two mires, where we think that rain is underestimated and water level control works are planned.

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