

# Risk management of urban rain events in a coastal city



## The case of Marseille





North



Marseille :  
1 million inhabitants

+ Torrential rain

Shape of a basin  
of 250 km<sup>2</sup>



North



Beaches

Harbour

Beaches

Rain water network

500 km of storm drains

50 km of Rivers

Operated by SERAM

North

## Two main problems :

- Beach Pollution
- Flooding in the city





# Main Actions

- New developments
- Rainwater network maintenance
- Surface sealing regulation
- Public information
- Real time risk management

# Urban flooding

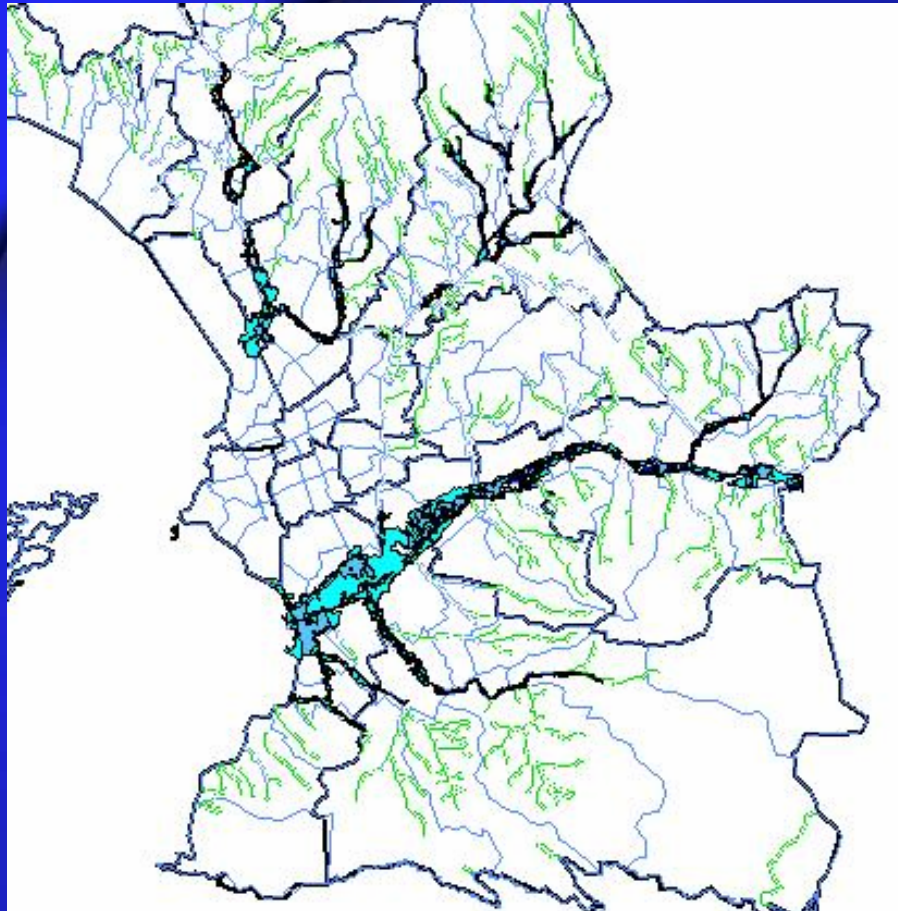


**Rivers overflows**

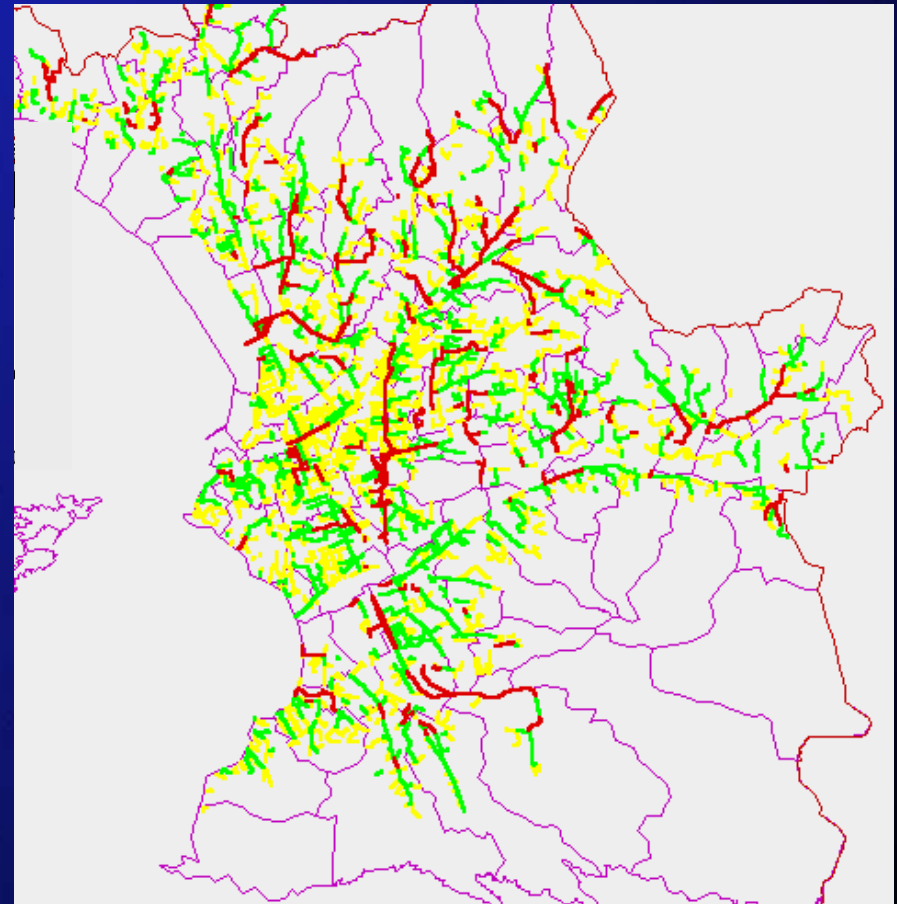
**Street runoff**



# Maps of flooding risk in Marseilles



**Rivers flooding areas**



**Dangerous street runoff**



## **Urban flash floods :**

**Time to act is very short,  
It is necessary to make a decision before  
it rains on the city**

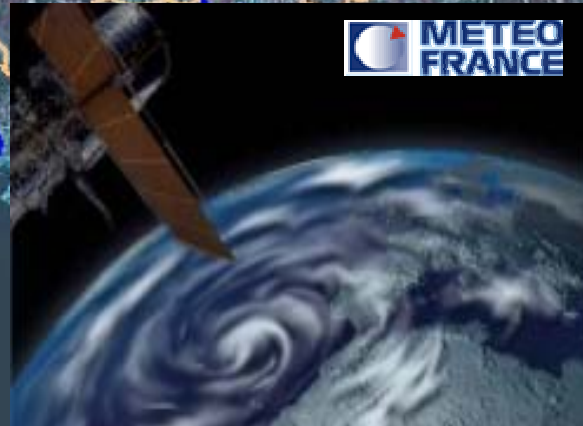
**We have to anticipate by assessing the  
« potential risk » of rainstorms coming  
towards the city**



# Rain control



**Lightning monitoring**



**Satellite images**



**Rain monitoring by radar**



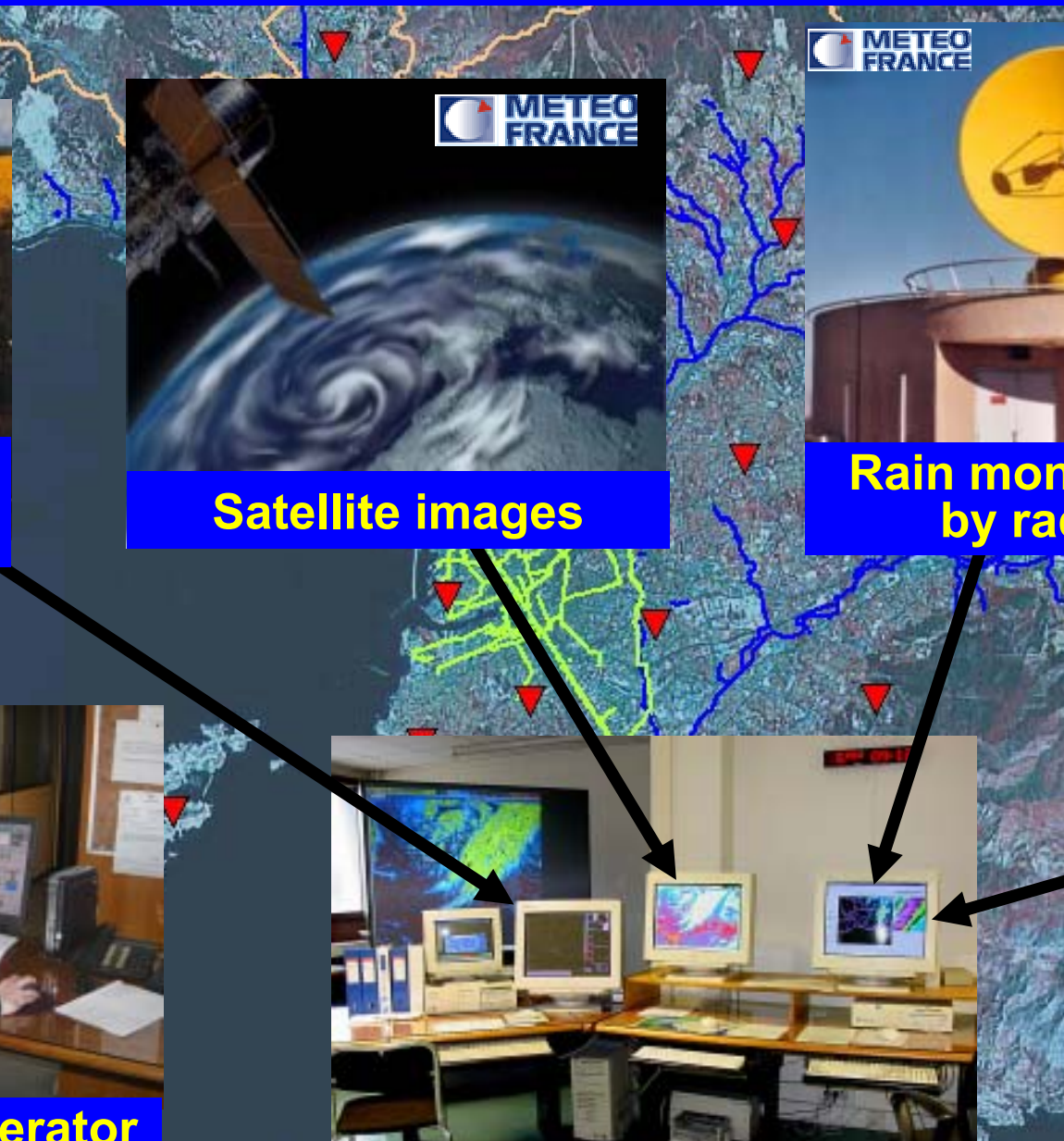
**24 Rain gauges**



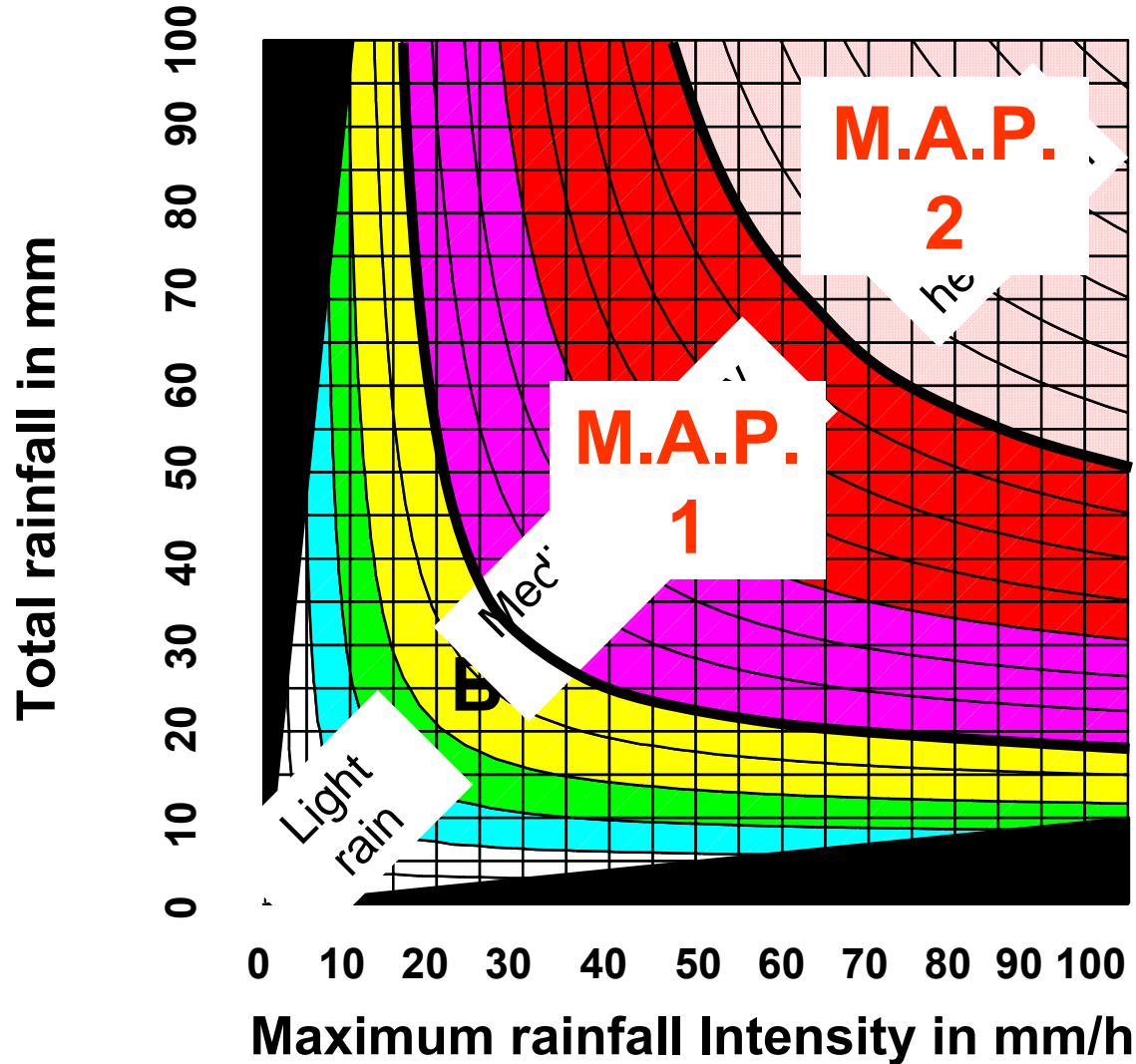
**24h SERAM Operator  
Sewer system supervising**

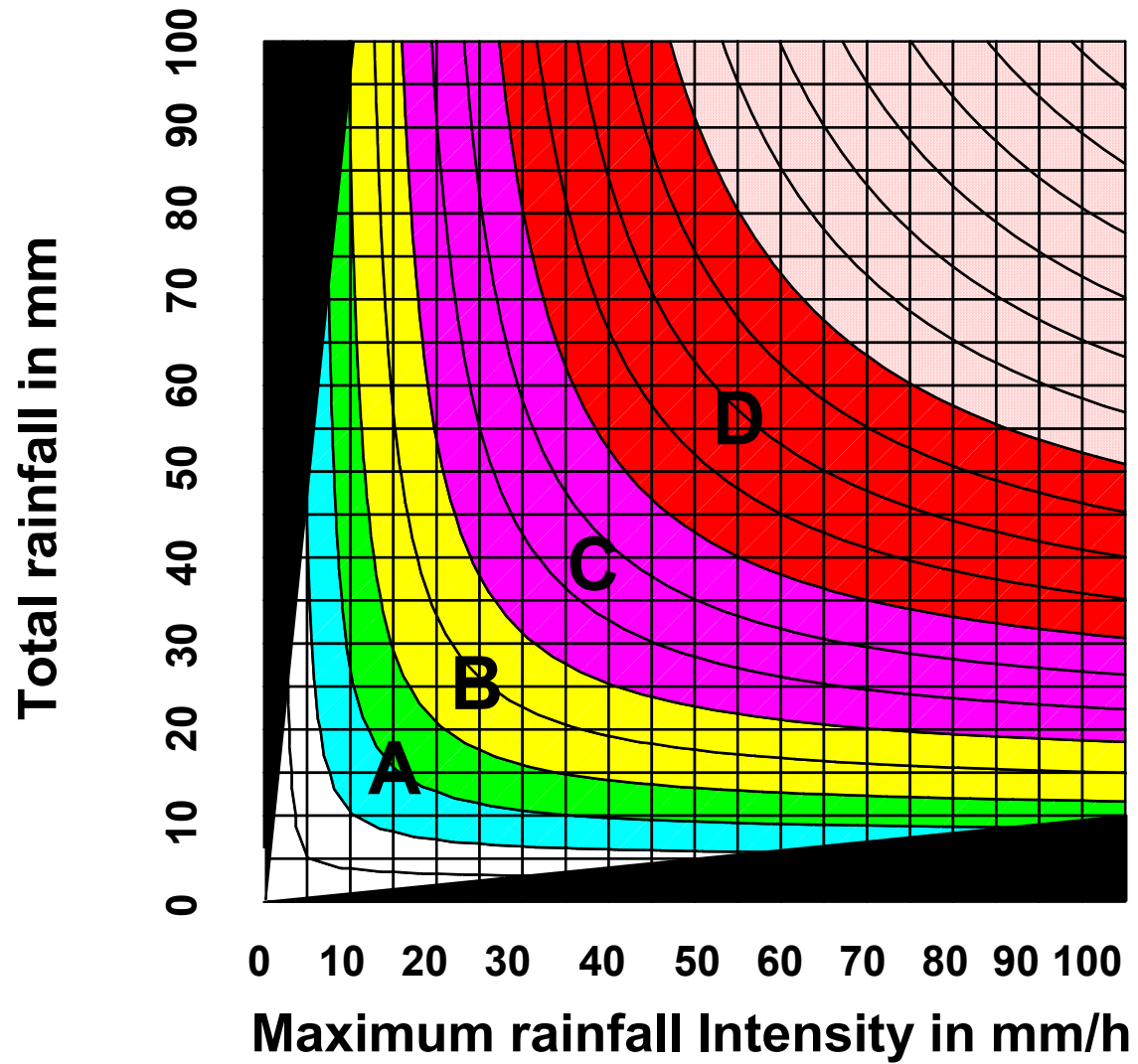


**Monitoring Center**



# Total Rainfall - Intensity - Danger







**Dry weather and Light rain  $\leq$  level A**

**Risk = Beach pollution**



**Objective : Waste water and first runoff goes to the treatment plant**

**Actions : Sewer network monitoring, rain monitoring**

**In case of discharge : Informing of municipal authorities**

**Bathing prohibition - Samples and analyses**



# Medium to Heavy rain : Levels B, C, D



**Risk = « flooding points »**



**Objective : To reduce flooding**

**Actions : Rain monitoring, Management of sewer discharges,**

**3 levels crisis management with SERAM staff in the field,**

**Informing municipal authorities**

**Raising of M.A.P. by the DEA with fire brigade and police**

**Heavy and Very Heavy rain : Level > D**

**Risk = Flows in the streets**



**Objective : Public safety**

**Actions : Rain monitoring, Informing municipal authorities**

**Raising of the M.A.P. by the DEA**

**with Fire Brigade, Police and SERAM,**

**Schools information, Public information by the security councillor**



**An example : September, 19<sup>th</sup> 2000**

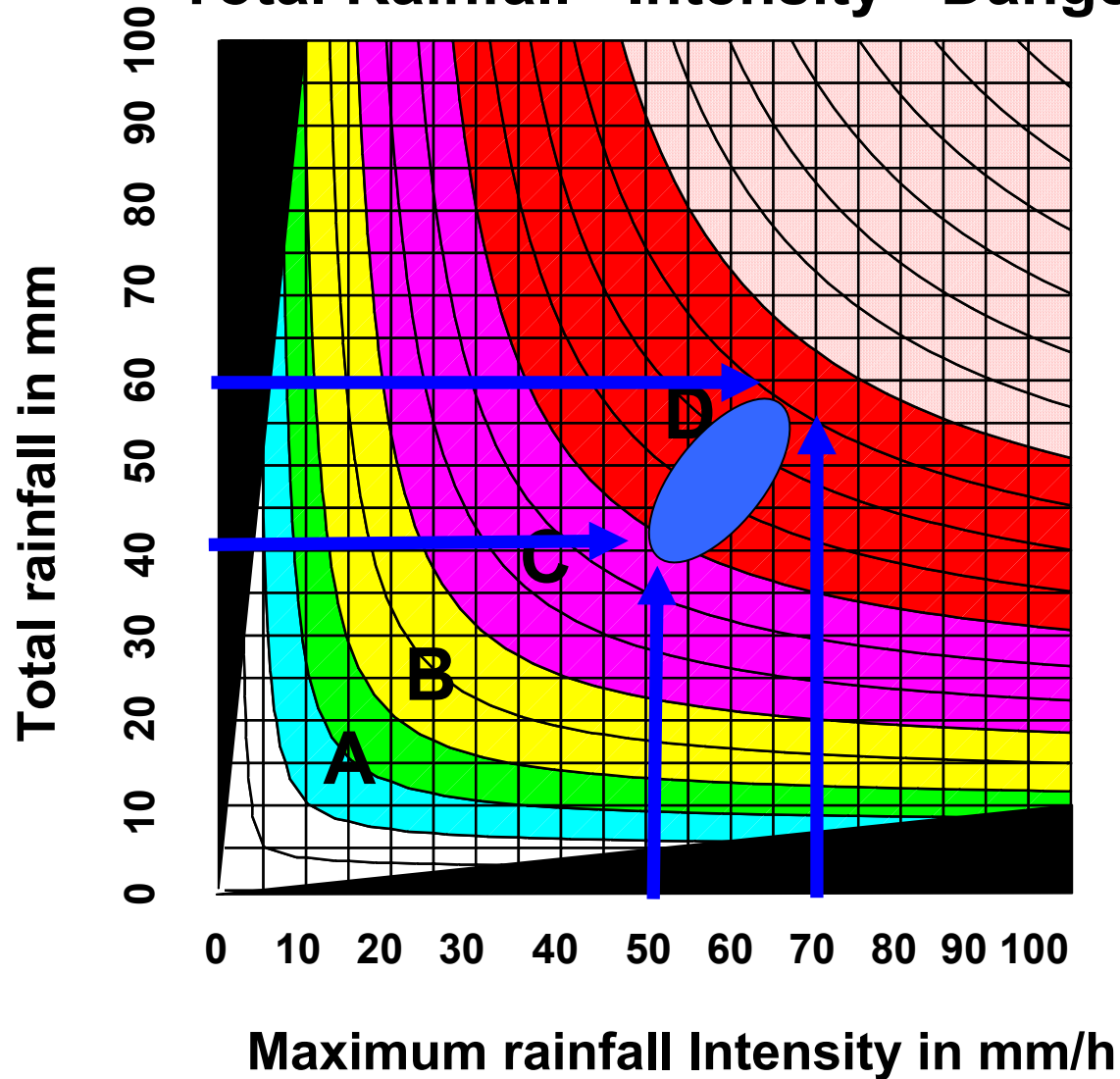
**9h00 Meteo-France Forecast :**

**Stormy weather for the afternoon**

**Total rainfall predicted : 40 à 60 mm**

**Intensity predicted : 50 à 70 mm/h**

# Total Rainfall - Intensity - Danger







**10h00**

**Raising of a risk level D**

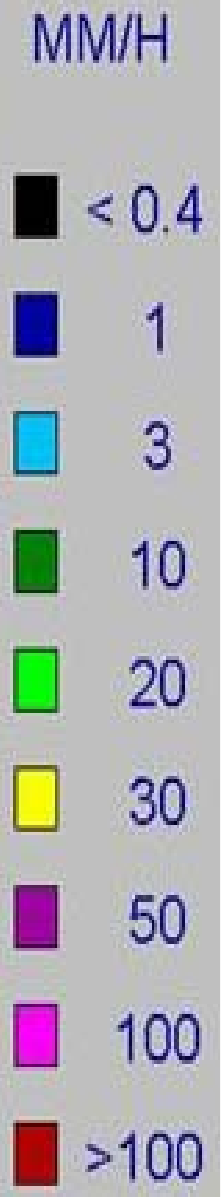
**Putting on call of 120 SERAM workers**

**Informing of local authorities,**

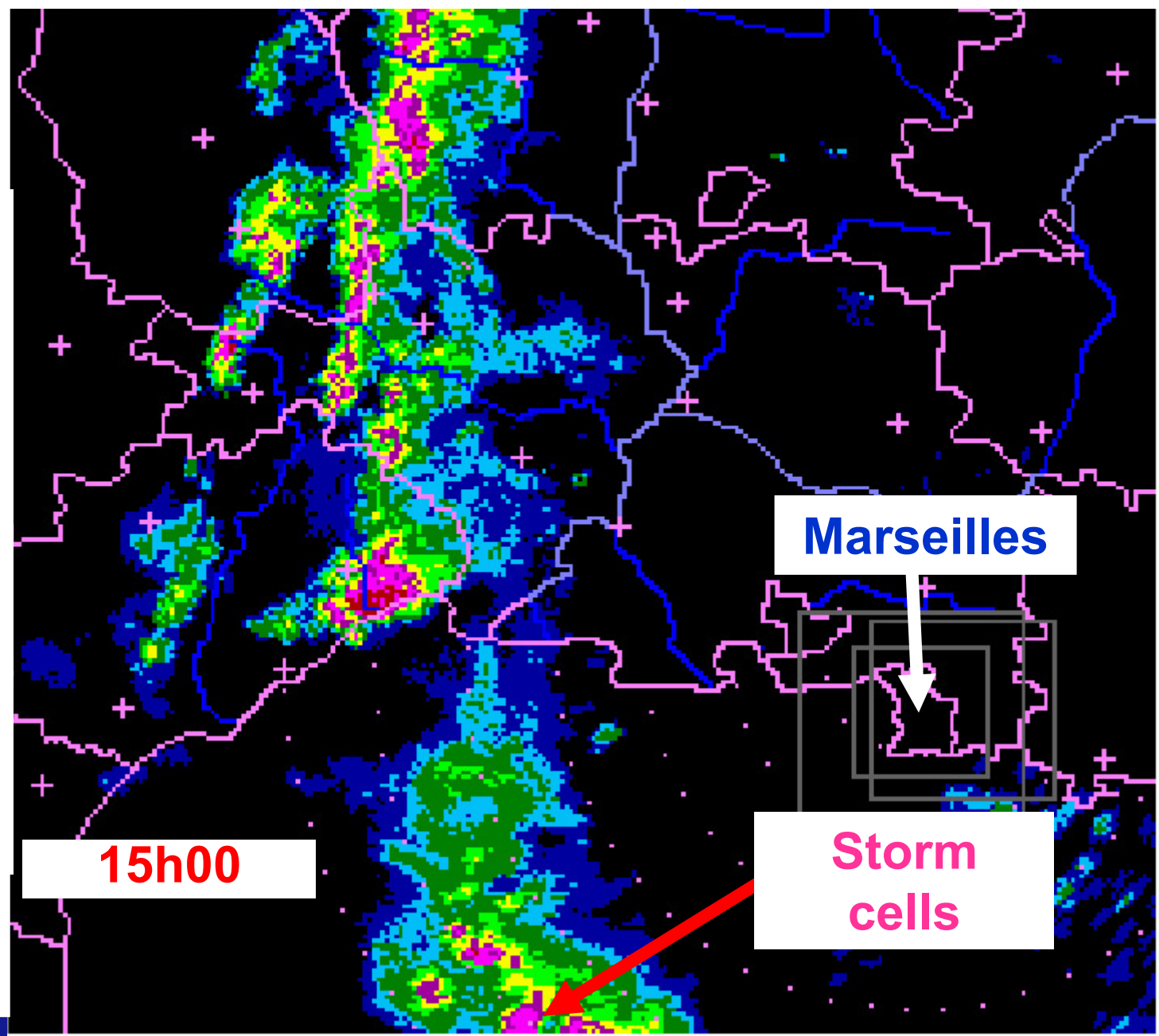
**Raising of Municipal Assistance Plan**

**Mobilisation of Fire brigade and Police,**

# Rain monitoring by Radar



↑  
**A**  
↓  
**B**  
**C**  
**D**



MM/H



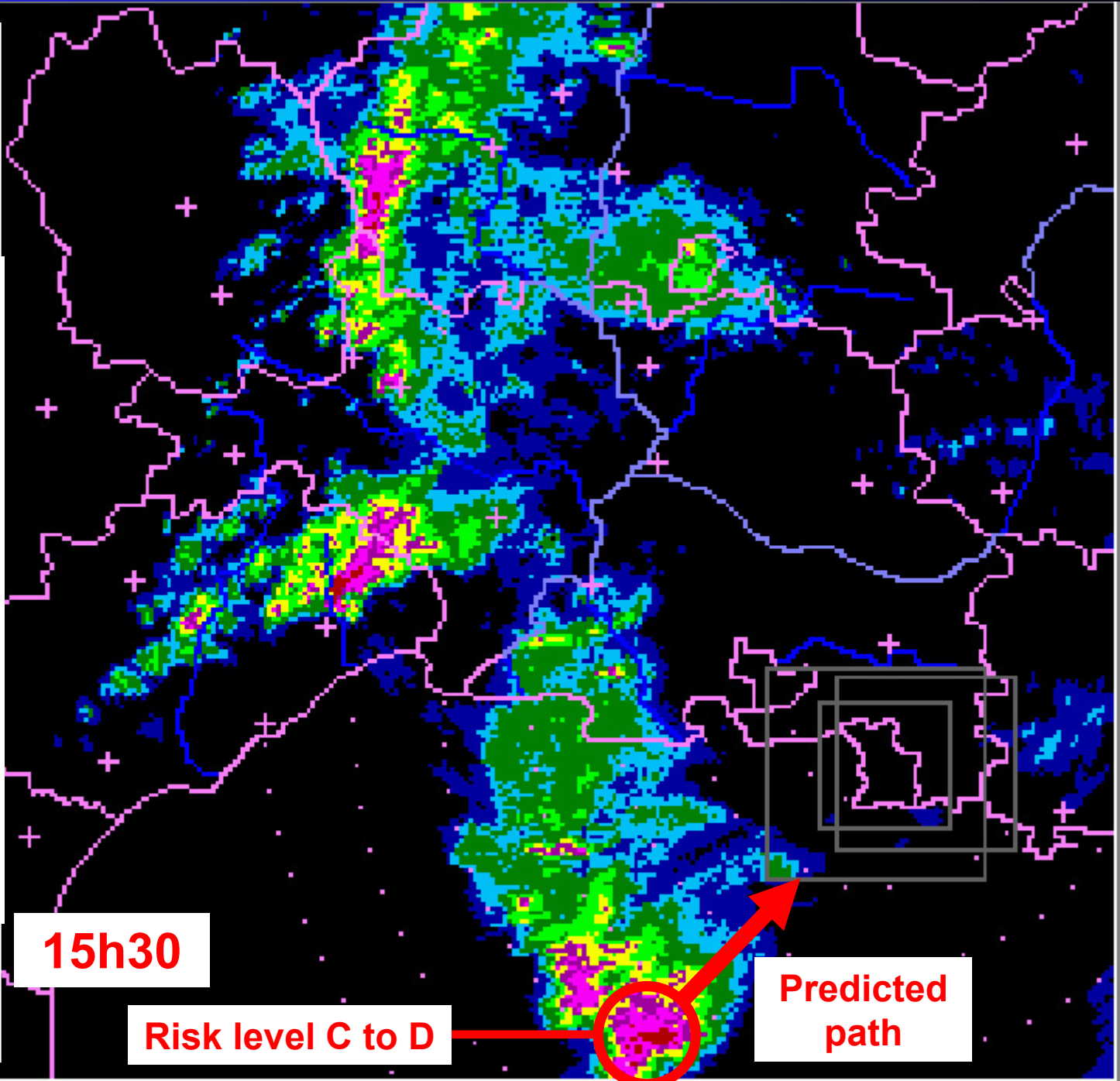
↑  
**A**

↓  
**B**

**B**

**C**

**D**



**15h30**

**Risk level C to D**

**Predicted path**



MM/H



↑  
**A**

↓

**B**

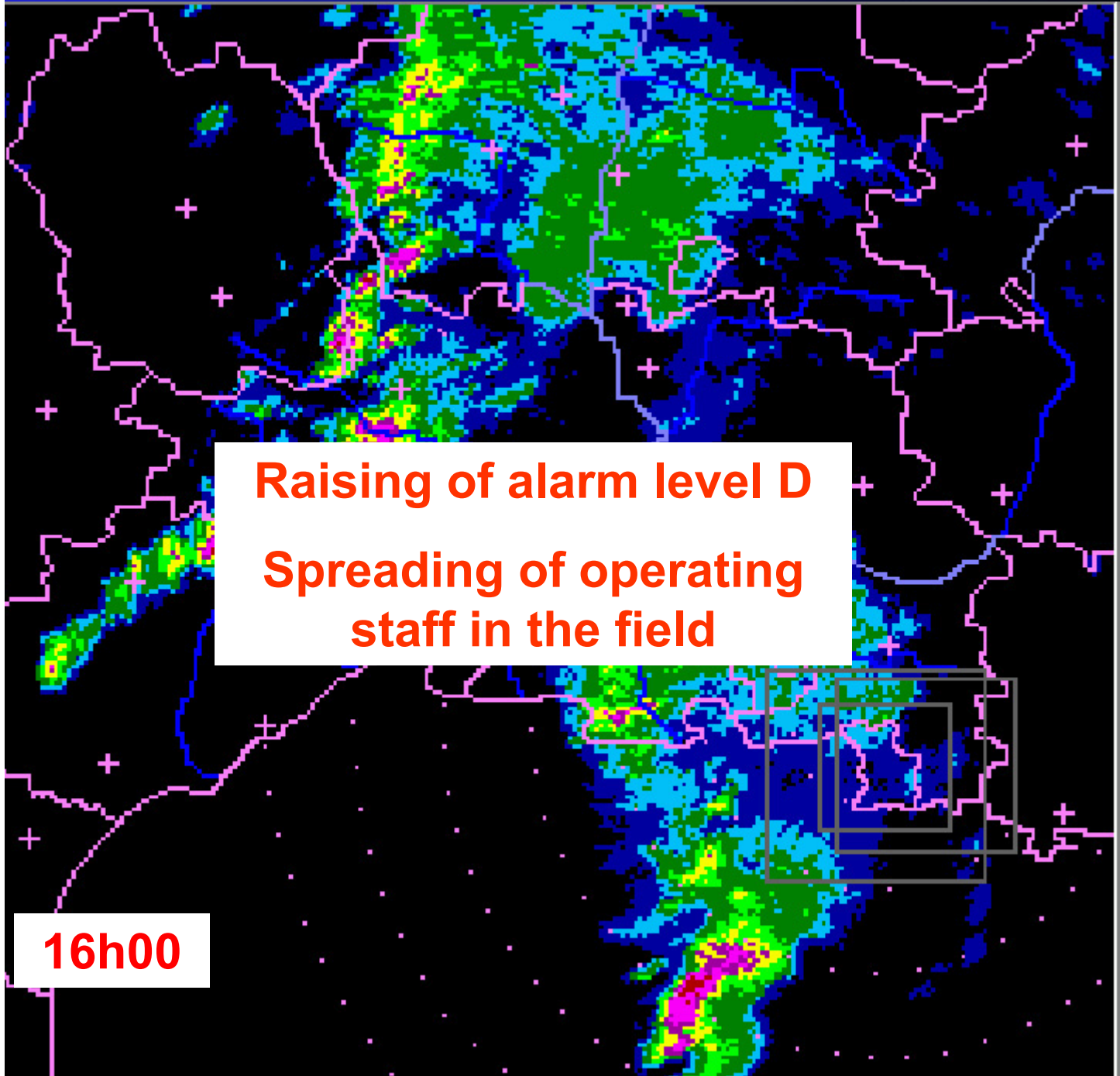
**C**

**D**

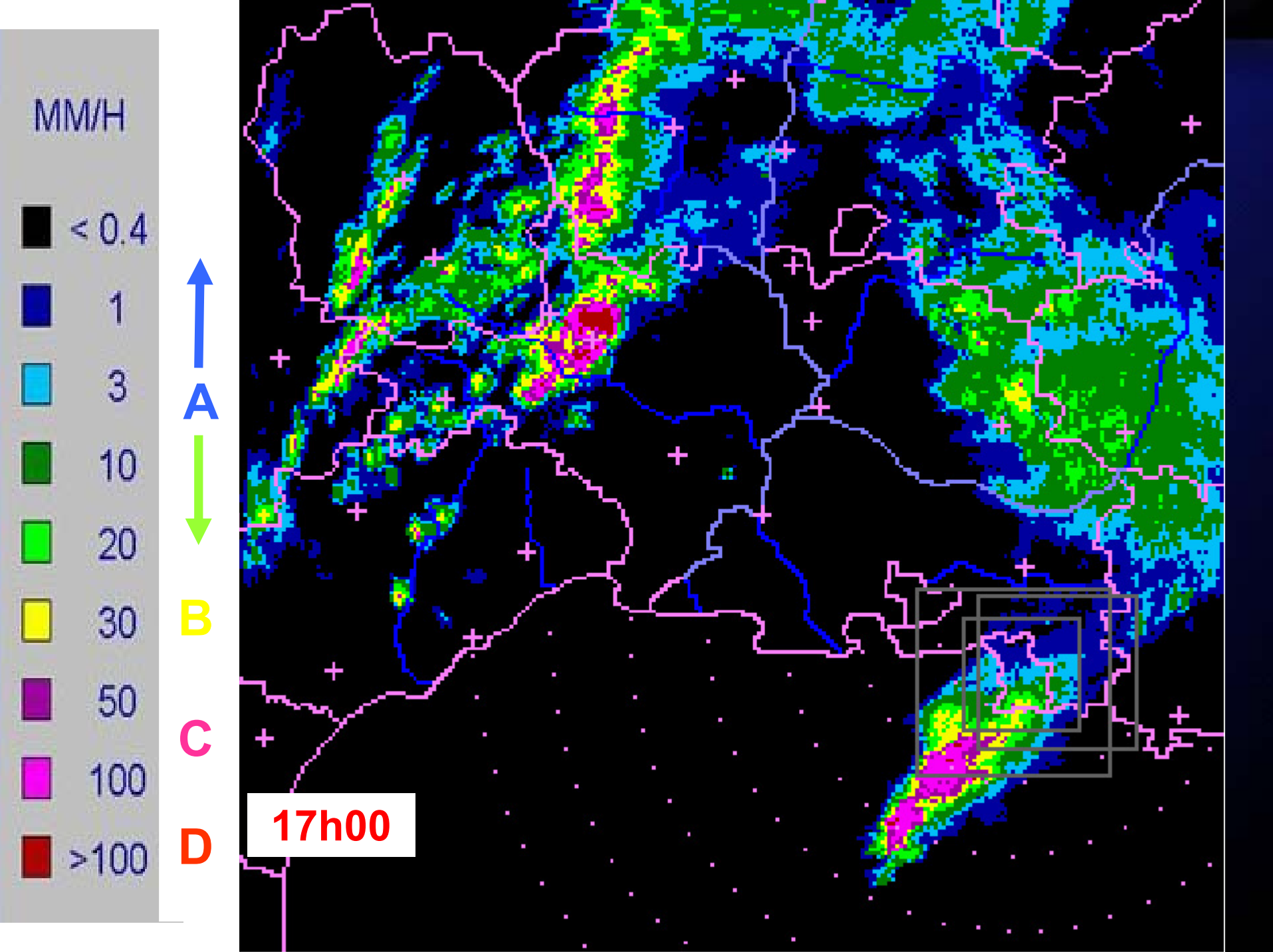
**Raising of alarm level D**

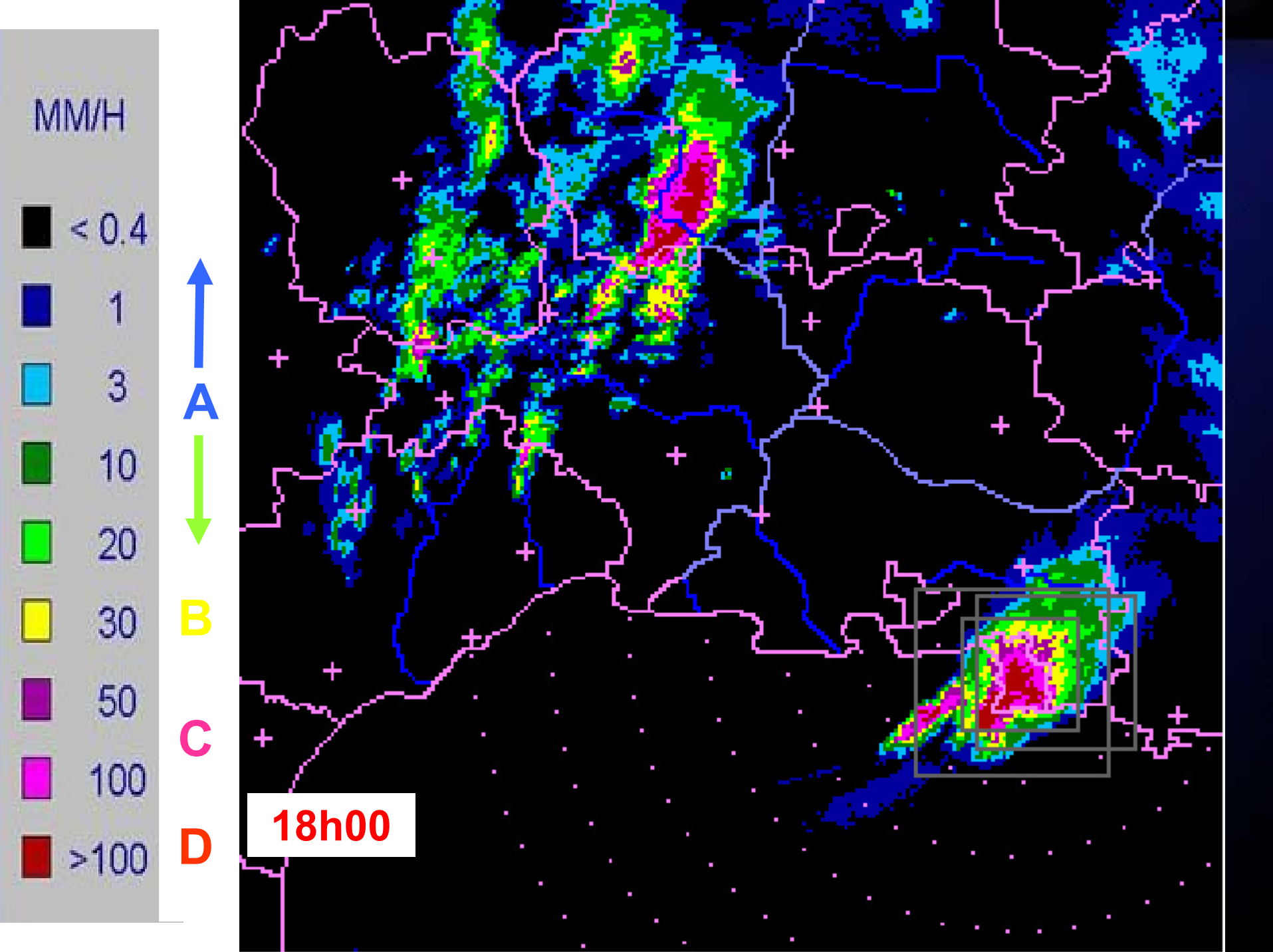
**Spreading of operating  
staff in the field**

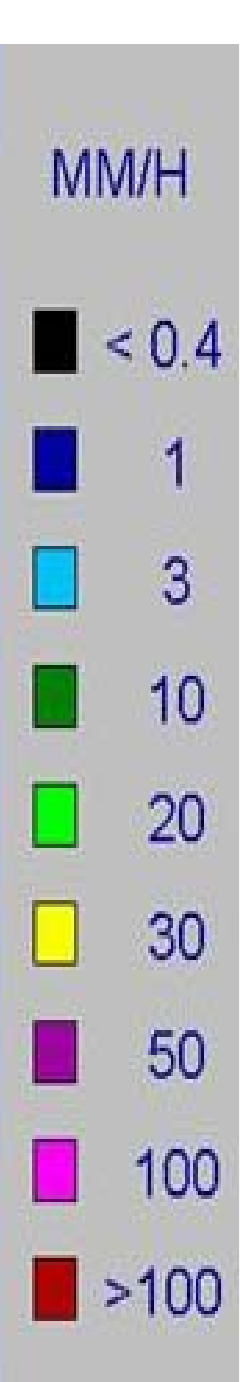
**16h00**



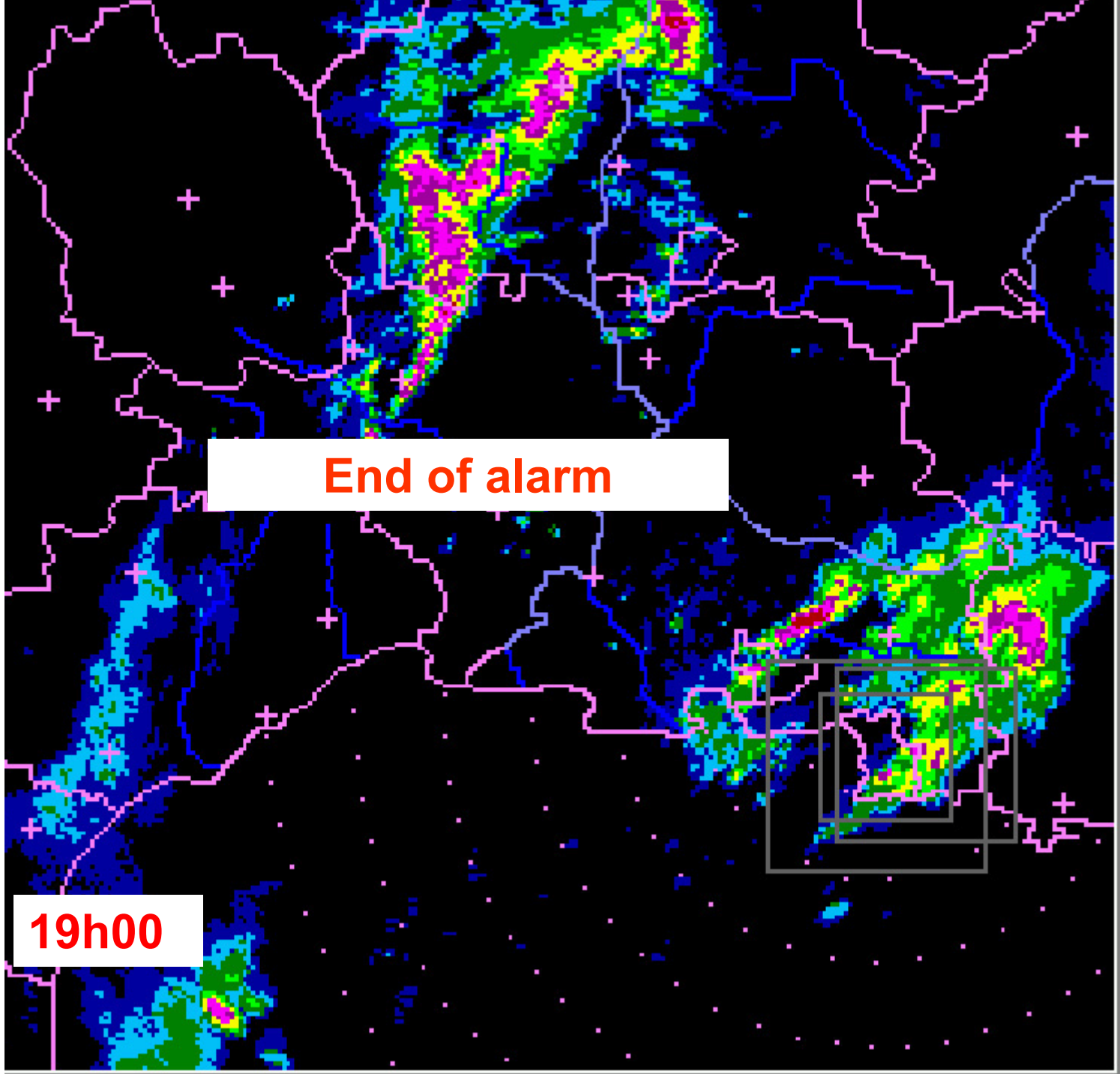








A ↑  
↓ B  
C  
D





## **A useful decision making system for Municipal Authorities**

- Allows anticipation of a crisis and organisation of an assistance plan**
- Allows the population to be informed when necessary**





## **Outcome concerning beach pollution risk :**

**Discharge reduction by remote control of gates**

**Bathing is forbidden if pollution is suspected**

**Bathing is allowed when the conditions are good**



## **Outcome concerning the flooding risk :**

**Flooding reduction by remote control of gates**

**Management of intervention teams**

**Security of children in the schools**

**Giving caution advices to the population**

**Closing of dangerous streets and underground spaces**

**Evacuation of dangerous zones**

**Helps the mayor in his rescue  
and assistance role**

**Develops a risk awareness approach**

**An example of Private / Public partnership**



**Thank you for your attention !**