

Optima (road weather information dedicated to road sections) – significant developments to optimize road treatments

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0. CONTENT

1. Introduction

2. Reminders about Optima

3. Two new parameters for a better description of snow events

4. Road surface conditions forecasting in Meteo-France

5. Conclusion

1. INTRODUCTION

- OPTIMA (Road weather information dedicated to road sections) :
 - a global approach of data fusion ;
 - specific road weather algorithms implementation;

=> to obtain the best road weather information, according to the state of art, at 5 km resolution, on the french road network.

- Significant developments have been made since its first operational use.

0. CONTENT

1. Introduction

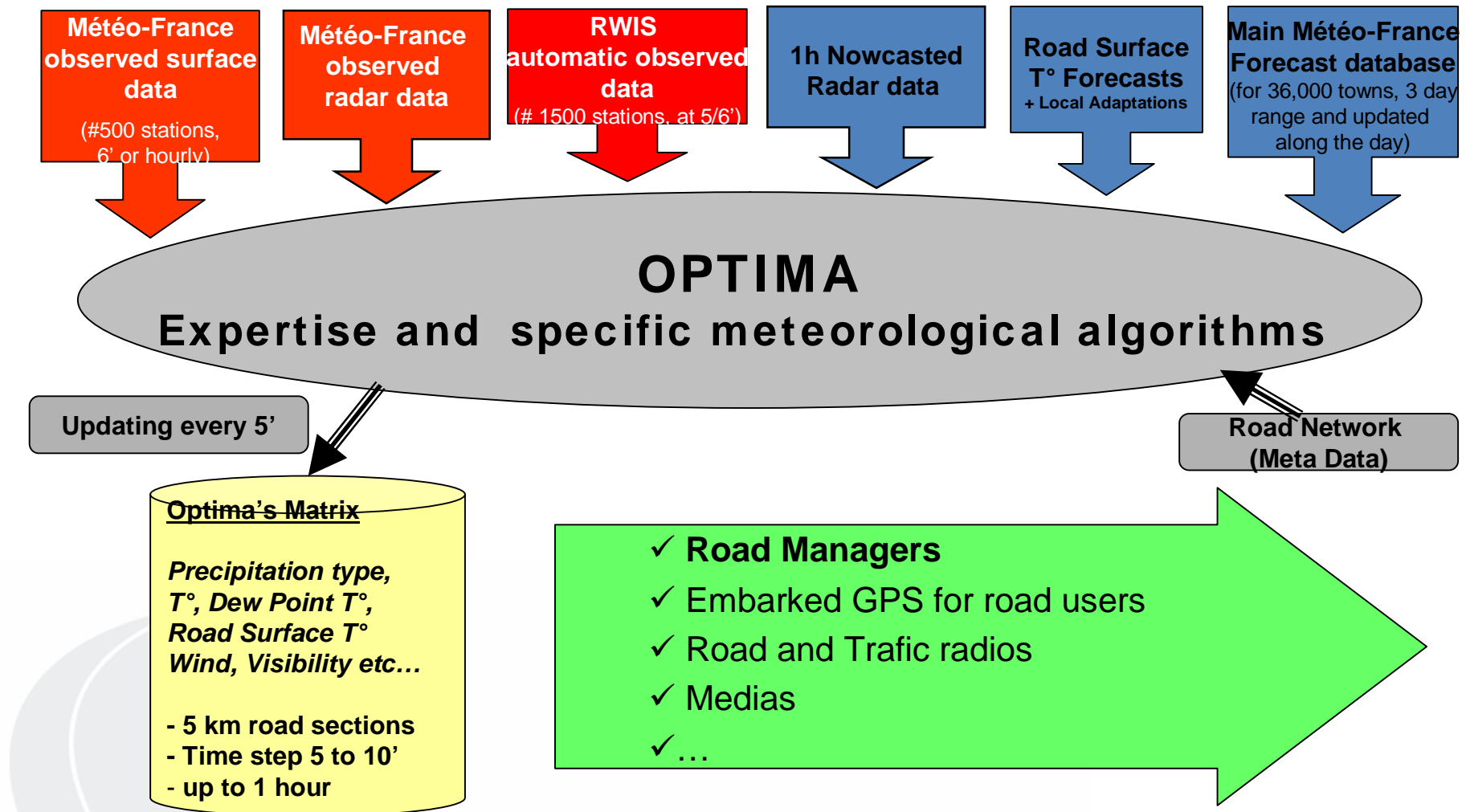
2. Reminders about Optima

3. Two new parameters for a better description of snow events

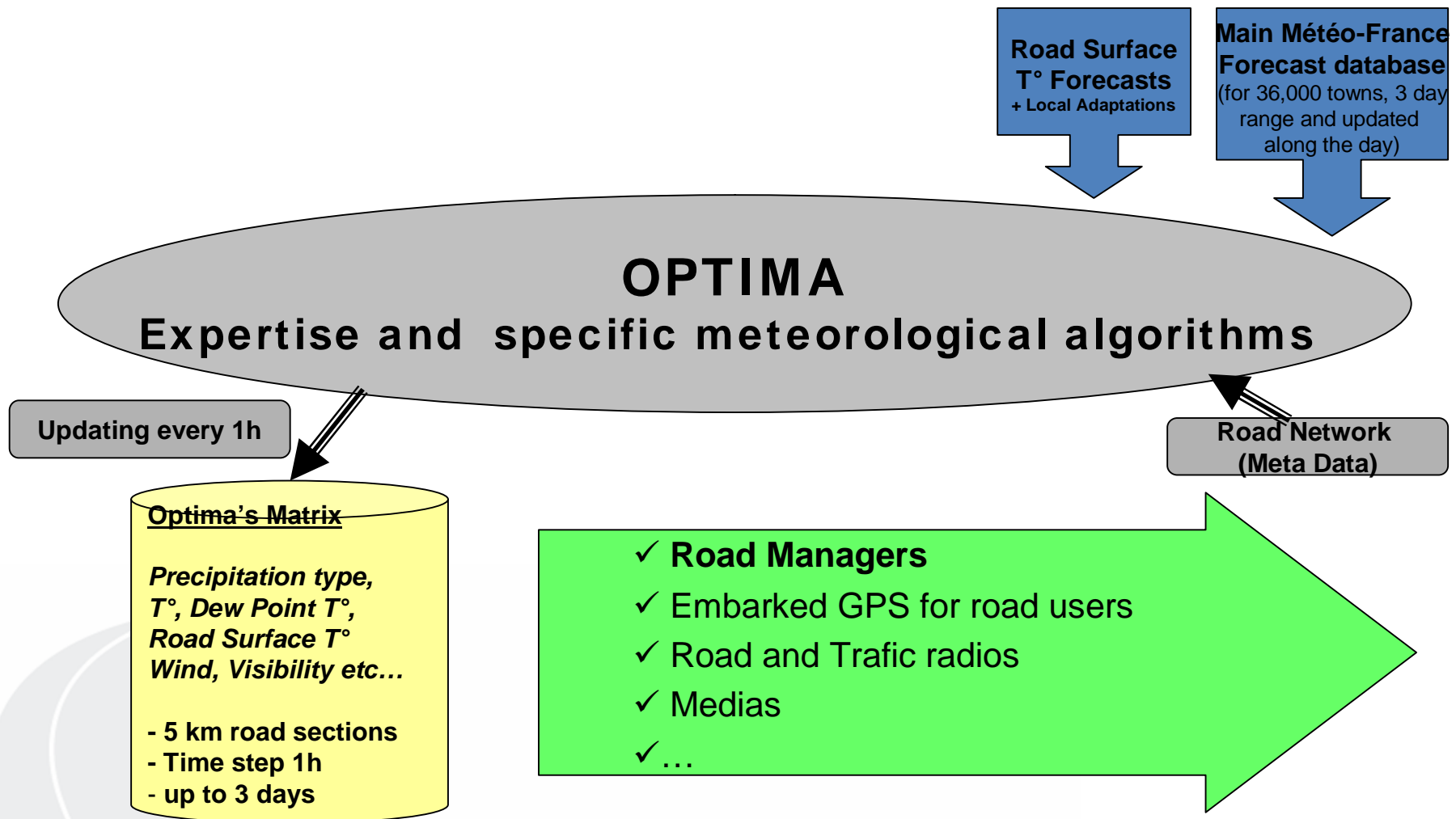
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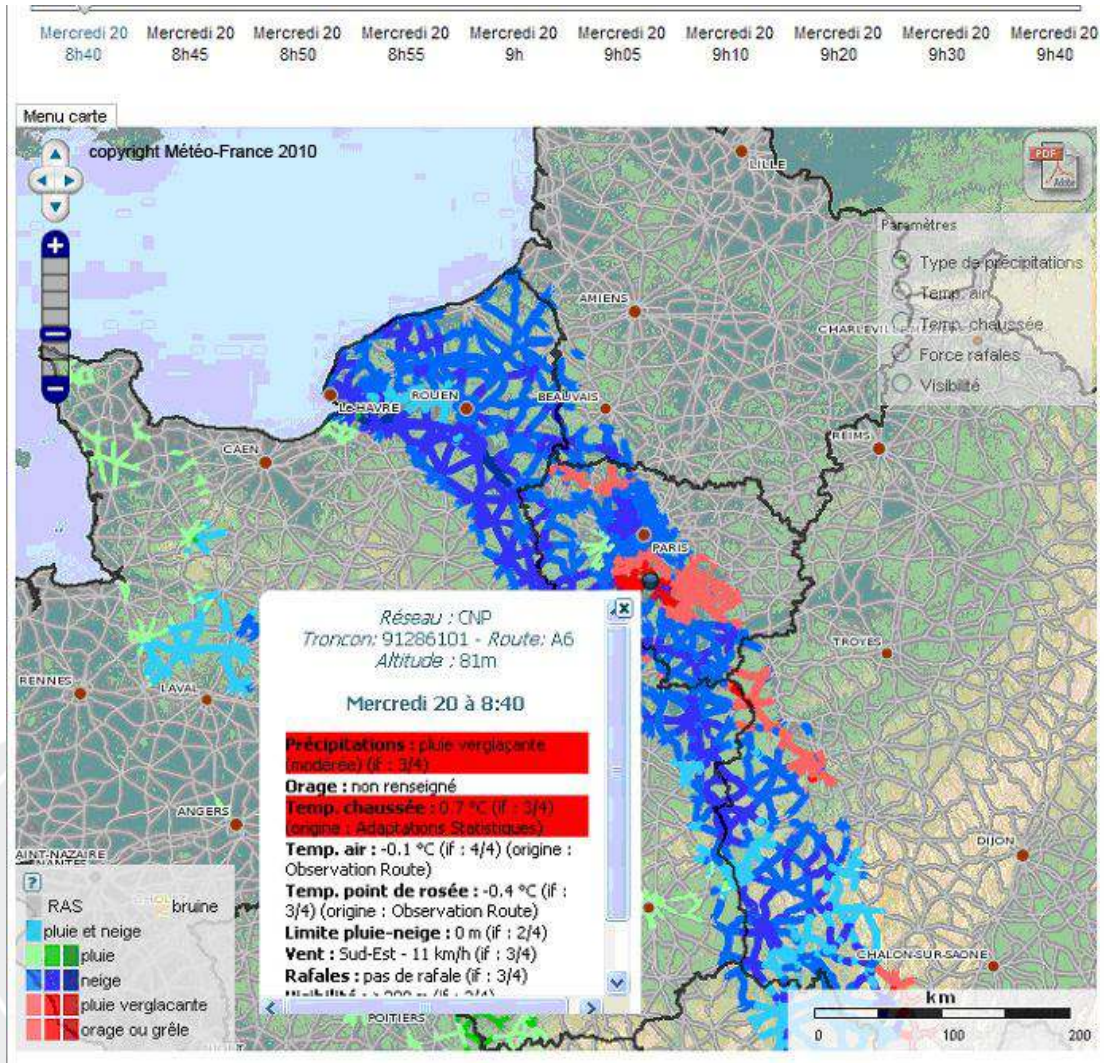
2. Reminders about Optima : OPTIM A Nowcasting's synthetic diagram



2. Reminders about Optima : OPTIM A Forecast up to 3 days



2. Reminders about Optima : Optima's nowcasting map



The color of the road sections depends on the type of precipitations :

- Red : freezing rain
- Blue : snow
- Blue sky : sleet
- Green : rain

2. Reminders about Optima : The forecasted parameters in Optima

- **Precipitations** : Rain, Frozen Rain, Snow, sleet, Hail, Drizzle.
- **The intensity of the precipitations**
- **Air and dew point Temperature**
- **Road Surface Temperature**
- **Snow Quality**
- **Snow potential**
- **Altitude Limit Rain/Snow**
- **Wind and squalls**
- **Visibility**
- **Thunderstorm**

In Optima nowcasting, at any parameter is associated a reliability index according to the quality and the number of input sources.

0. CONTENT

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3. Two new parameters for a better description of snow events (1)

1. Snow quality

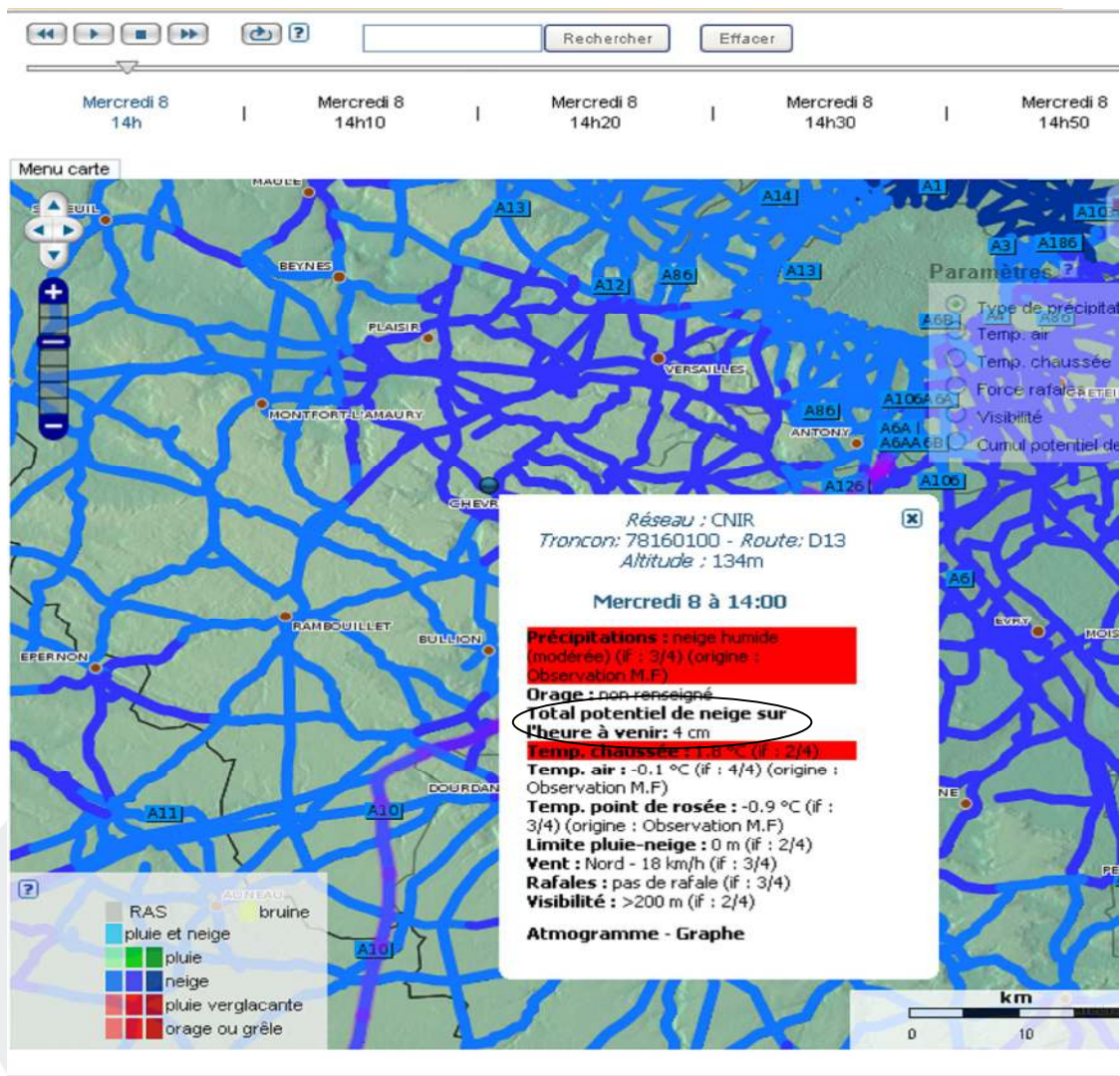
- Snow quality is closely related to the type of treatment the road managers will have to choose.
- We defined 5 different qualities of snow depending on air temperature forecasts
 - Powder snow : T_{air} is -5°C or less
 - Dry snow : T_{air} in $]-5^{\circ}\text{C} ; -2^{\circ}\text{C}]$
 - Moist snow : T_{air} in $]-2^{\circ}\text{C} ; 0^{\circ}\text{C}]$
 - Moist to wet snow : T_{air} in $]0^{\circ}\text{C} ; +1^{\circ}\text{C}]$
 - Wet snow : T_{air} strictly more than $+1^{\circ}\text{C}$

3. Two new parameters for a better description of snow events (2)

2. Snow potential

- It represents the potential snow height on the road without accounting for melting, metamorphism or mechanical effects
- Depends on the snow density (snow quality) and the forecasted amount of precipitations
- The critical threshold of 4 cm per hour for a snow fall has been exceeded during the 2010 December 8th snow event

Forecasted snow potential for the hour to come December 8th, 2010



Example of 4cm/hour snow potential the 8th december 2010 at 14h00 in the South West of Paris

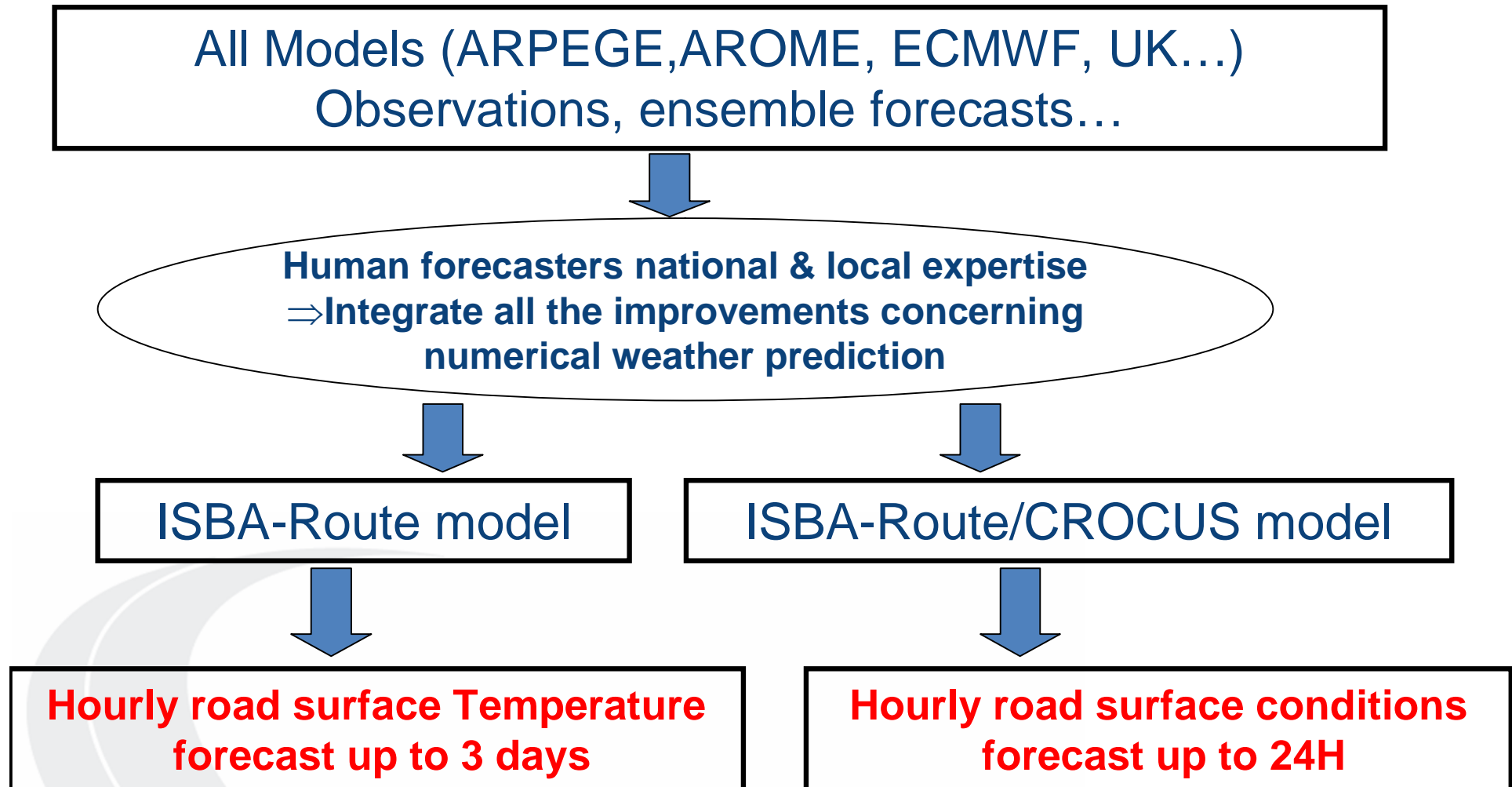
Note : from 5 cm/hour, the roads and highways maintenance become rapidly difficult



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4. Road surface conditions forecasting in Meteo-France : Evolution of the production : PrevExp-ISBA-Route (PEIR) and PEIR/ CROCUS models



4. Road surface temperatures forecasting in M eteo-France : the PrevExp-Isba-Route model PEIR

Compared to the previous surface temperature forecast's system AIR :

- Improvement of root mean square error (from 2.3 for AIR to 1.65°C for the new PEIR system)
- A mean error of 0.1°C
- Large bias reduction (from 1.5 to 0.1°C) => improvement of the forecast of « Negative road surface temperature » events
- No significant decrease of scores for the 2nd and 3rd night

4. Road surface temperatures forecasting in M eteo-France : local road surface temperature forecasts

Local measurements from RWIS to improve road surface temperature forecast scores

⇒ **Correction of initial road temperature profiles with** real time integration of RWIS measurements in Météo-France database

- *Main results :*

⇒ Reduction of the Root Mean Square Errors for the full RWIS sample

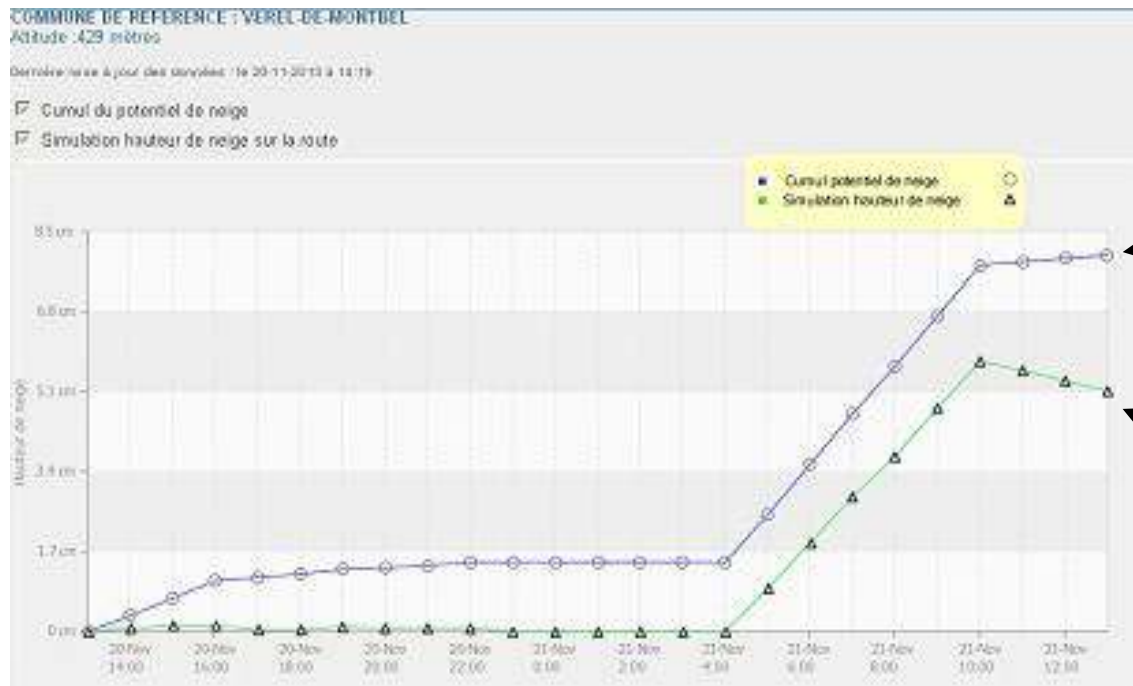
➤ - **0.6°** for the 6h-forecast range

➤ - **0.25°** for the 30h forecast range

⇒ Lower reduction of the RMS errors with only road surface temperature measurement but can reach - **0.4°** for the 30 h forecast range for RWIS with deep measurements

4. Road surface conditions forecasting in M eteo-France : PEIR/ Crocus model (1)

Accurate description of the behaviour of the snow deposited on the road :
height, density, liquid water content, grain type, snow/road configuration



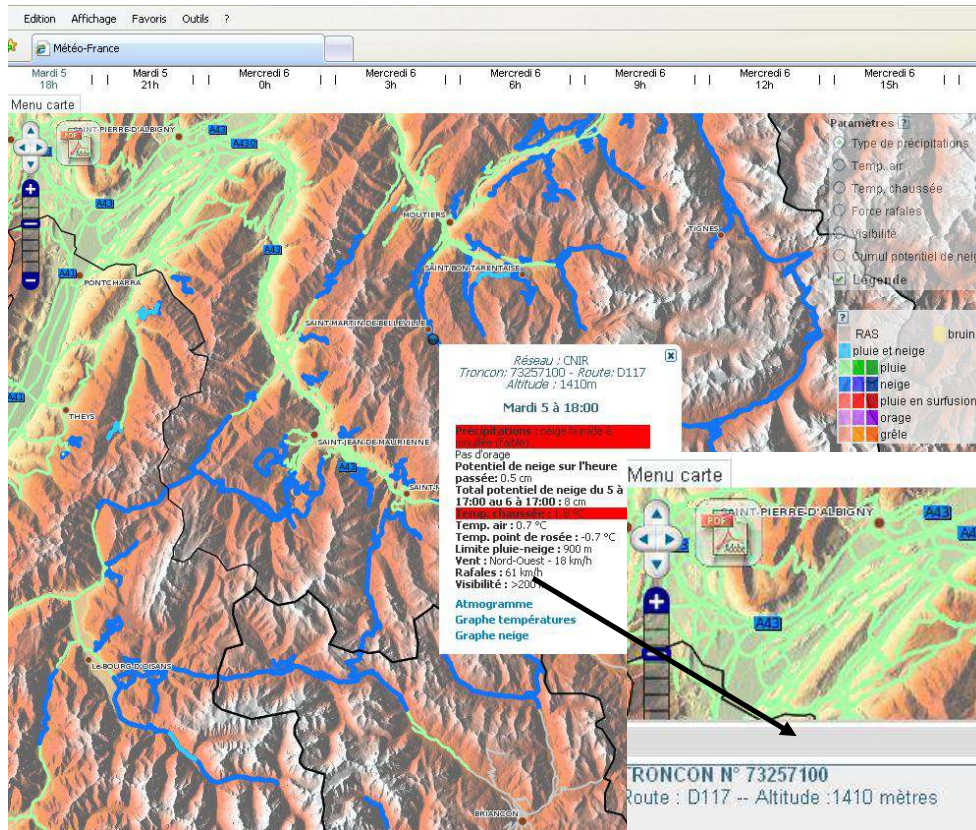
Snow potential without accounting for melting, metamorphism or mechanical effects

Snow height on the road with no traffic and no de-icing but accounting for melting, metamorphism or mechanical effects

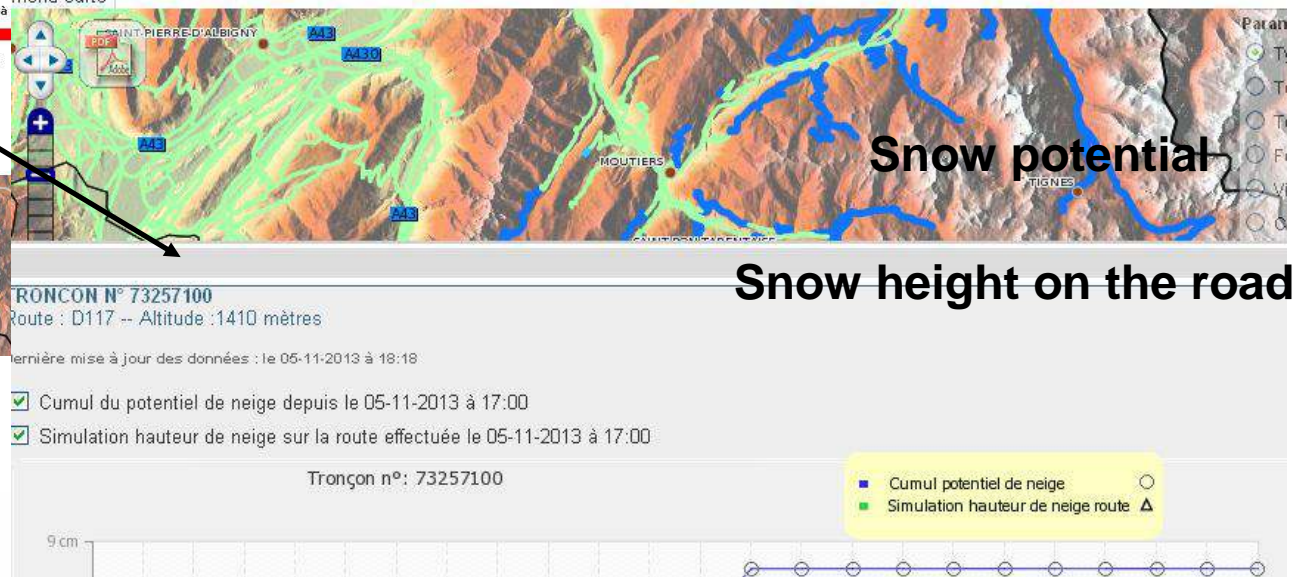
- First part of the event : the snow doesn't stick on the road or with a negligible snow height (lower than 0.3cm) ;
- Second part (from 4 am to the end), the snow stick on the road since the beginning of the snowfall. Snow height rises approximately 5cm, before melting.

4. Road surface conditions forecasting in M eteo-France : PEIR/ Crocus model (2)

The information in Optima :



Example of November 5, 2013 in St-Martin de Belleville (Savoie), 4 p.m. run



Snow potential

Snow height on the road

0. CONTENT

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5. Conclusion

Compare to the snow potential that informs us about the snow event (beginning, duration, magnitude), the snow height on the road gives further essential information :

- Will the snow stick on the road ? If yes, when?
- How long will the snow stick on the road?

Prospects :

- Improving the model PEIR/Crocus by introducing the parameterizations of real conditions as traffic and road de-icing
- Forecasts for specific locations as bridges and shadow areas
- Forecast of the conditions for tire grip on the road

Thank you

