ANYWHERE

Self-protection tools
Snow impacts on roads
in Mediterranean areas

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Motivation

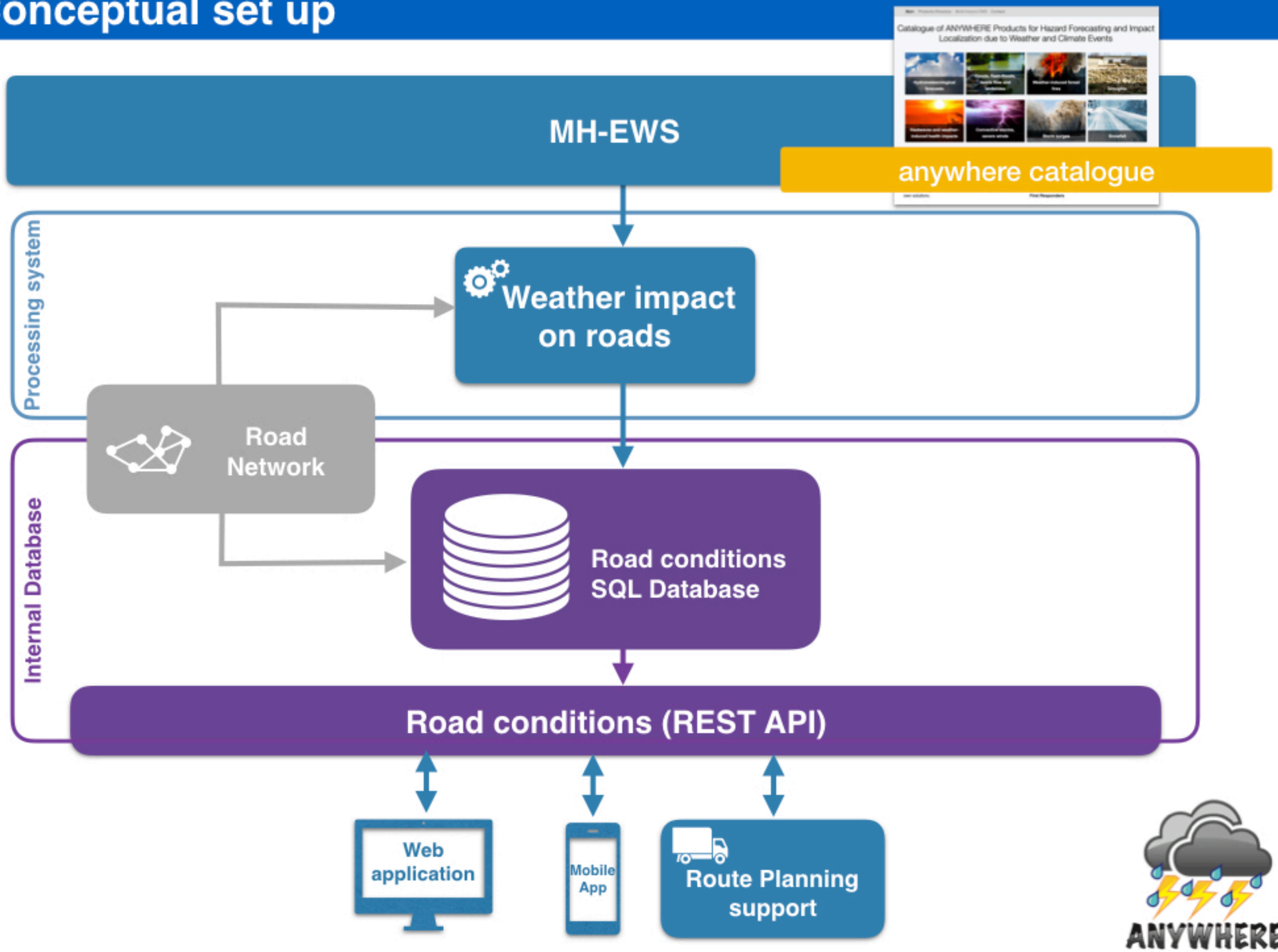
- During high-impact weather events the roads can be affected and their capacities collapsed in critical points.

- In particular, perishable food distribution in Southern Europe is affected by heavy snow events (delays, loss of fresh goods…)

Roadway Impacts	Traffic Flow Impacts	Operational Impacts
• Visibility distance • Pavement friction • Lane obstruction	• Traffic speed • Accident risk • Travel time delay • Roadway capacity	• Vehicle traction • Driver capabilities • Road treatment strategy • Traffic signal timing • Speed limit control • Evacuation decision

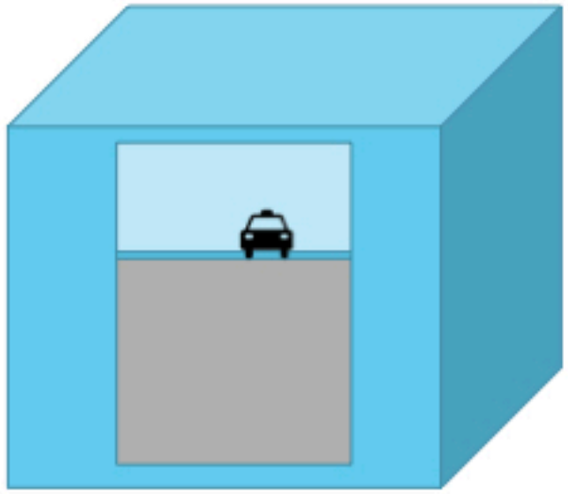
Support the decision-making of food distribution companies by anticipating the expected road and traffic conditions?

Conceptual set up

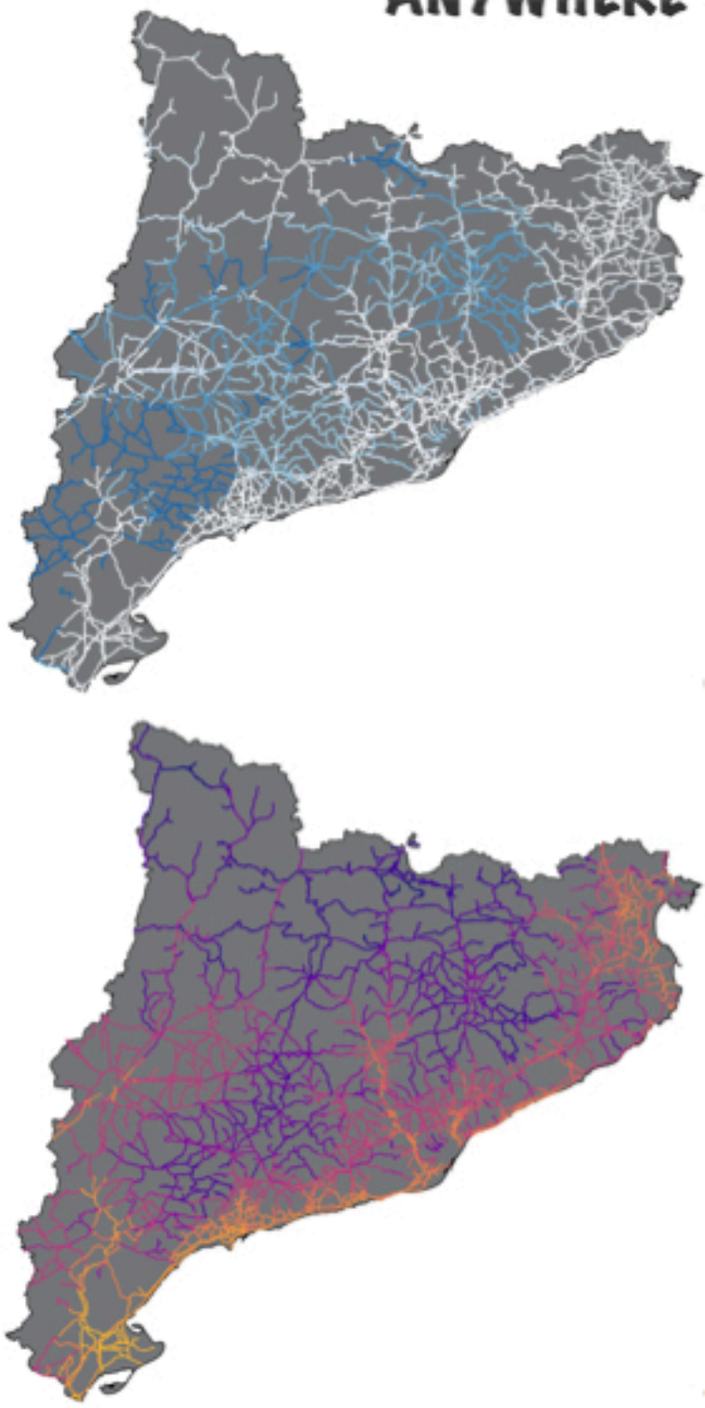


Snow Impact on roads

Meteorological variables

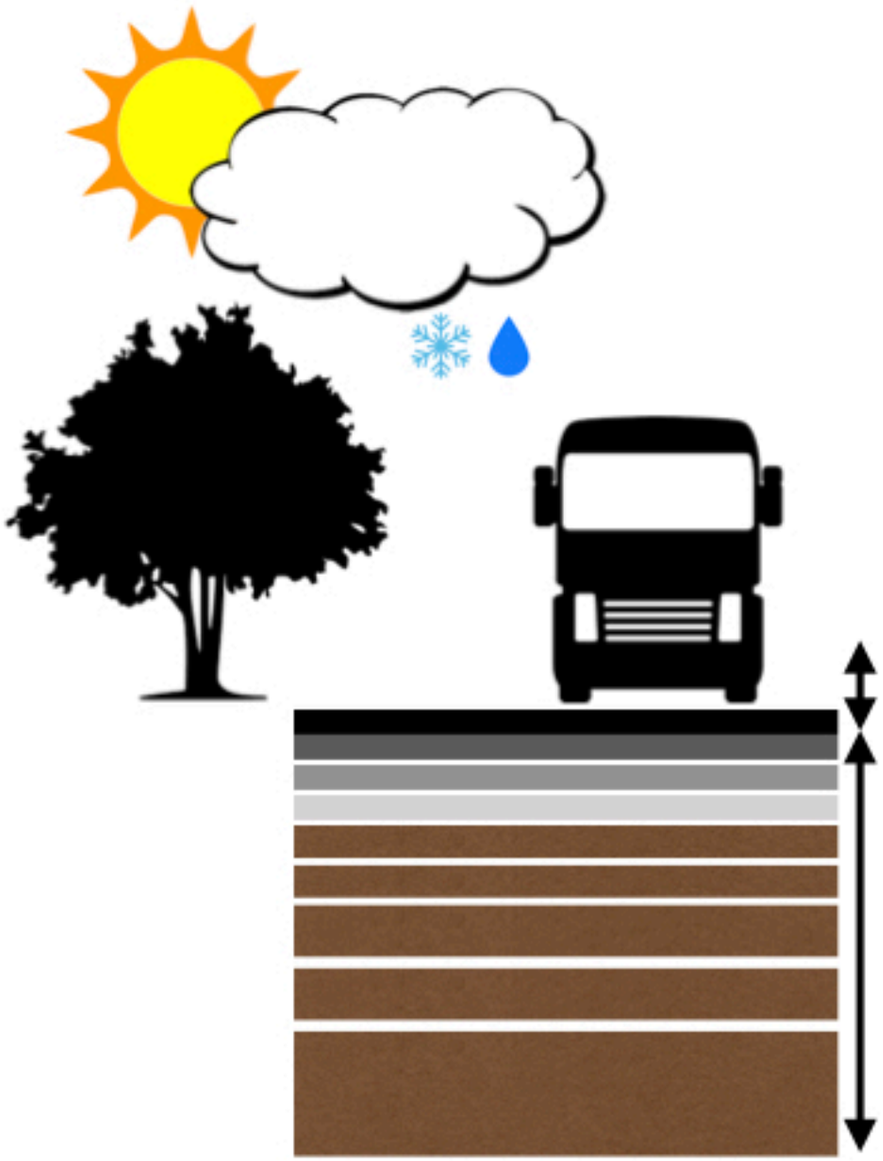


Road conditions model



Road condition model

1-D energy balance (vertical heat transfer)



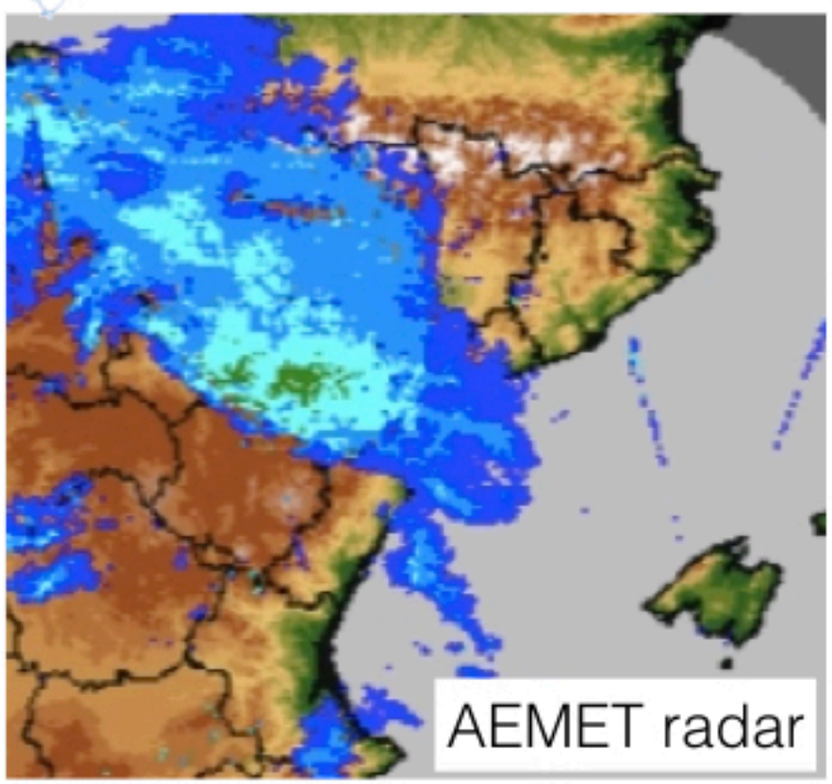
precipitation
radiation (LW & SW)
wind
temperature & humidity

water and snow accumulation
surface heat exchange

ground heat transfer

Catalonia snow storm - 28 February 2018

road network



Roads C-17 and C-25

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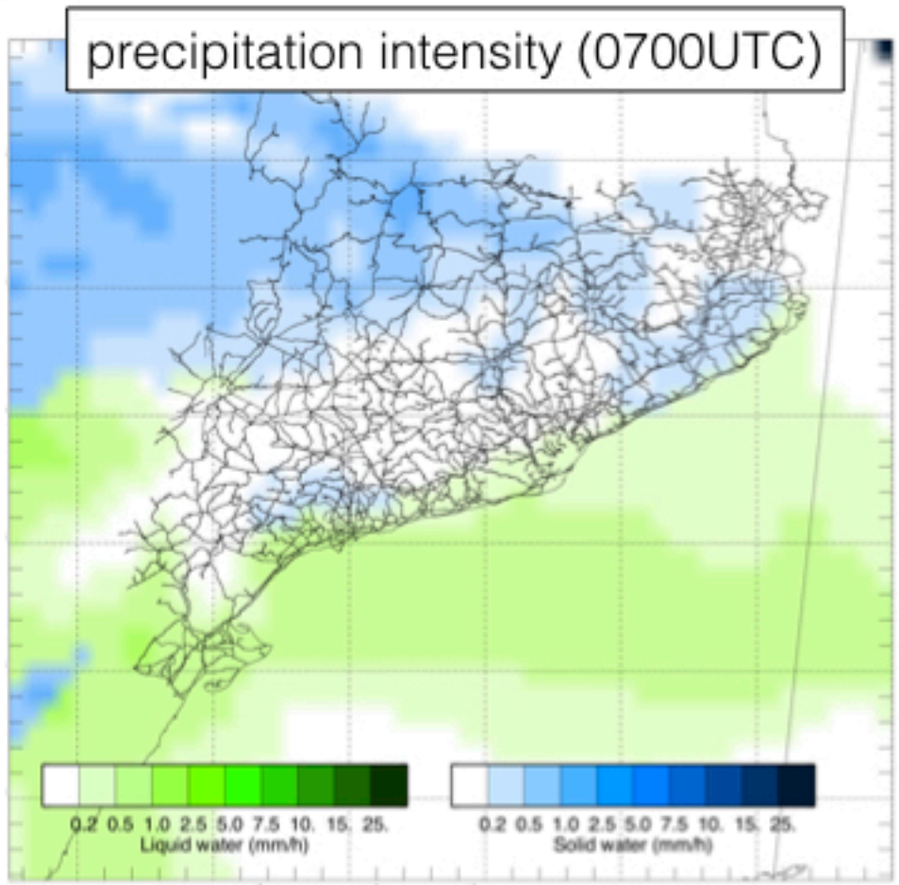
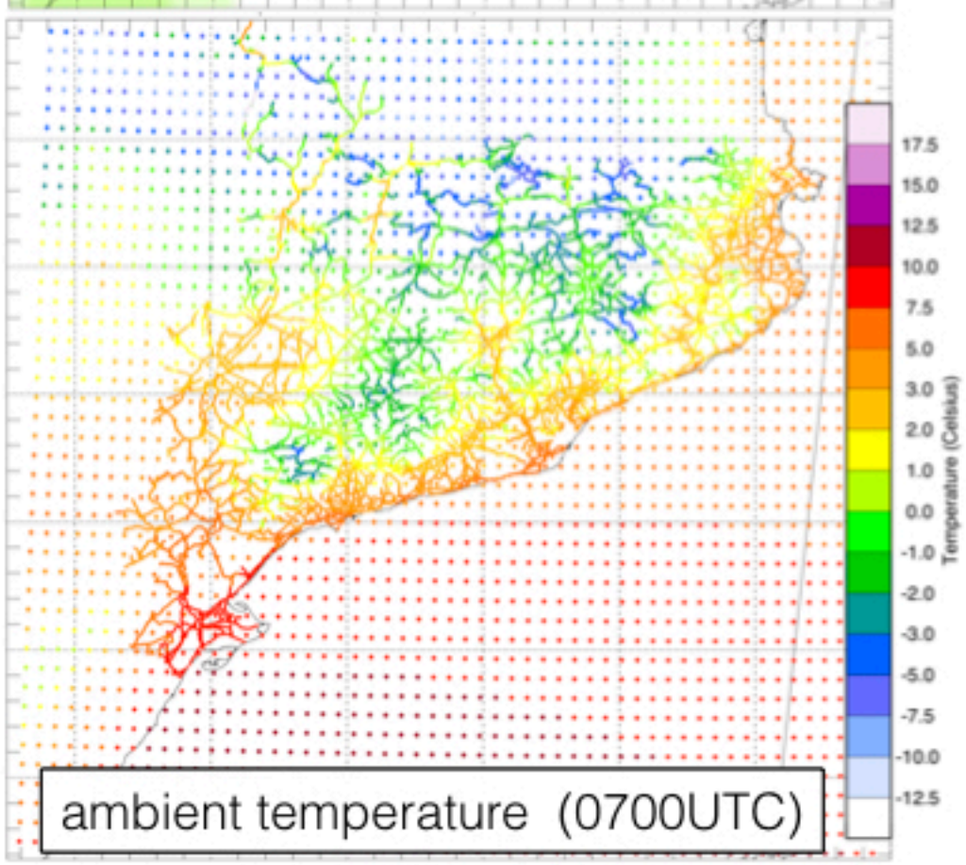
Weather Impact on Roads Process





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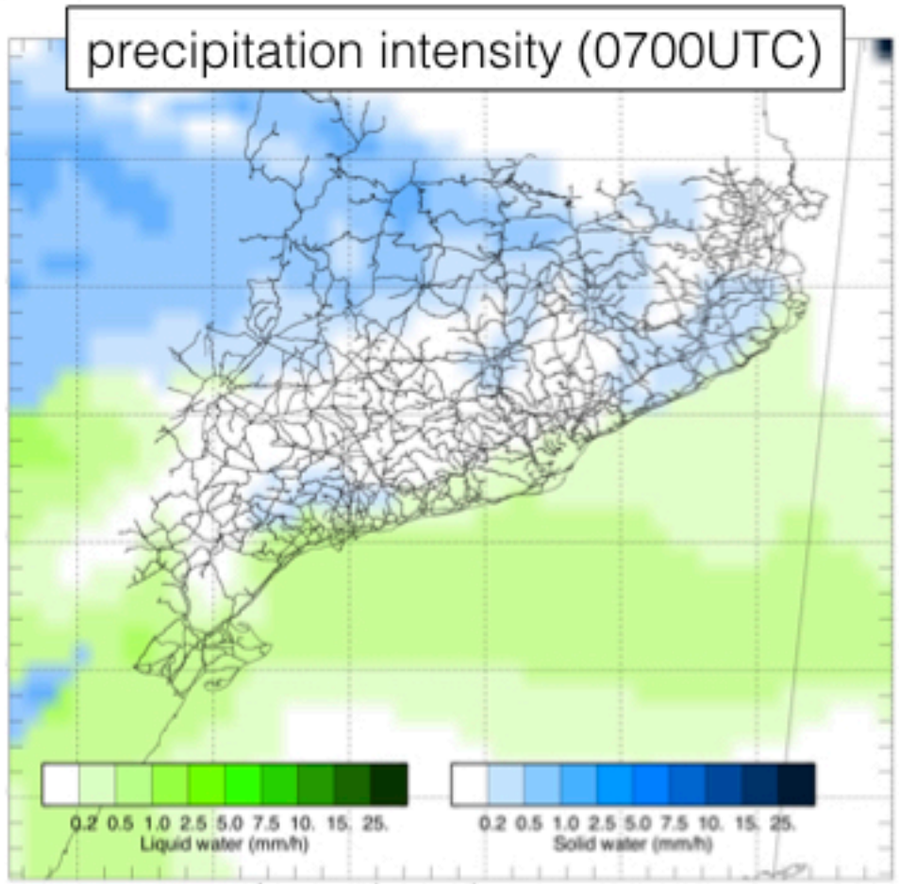
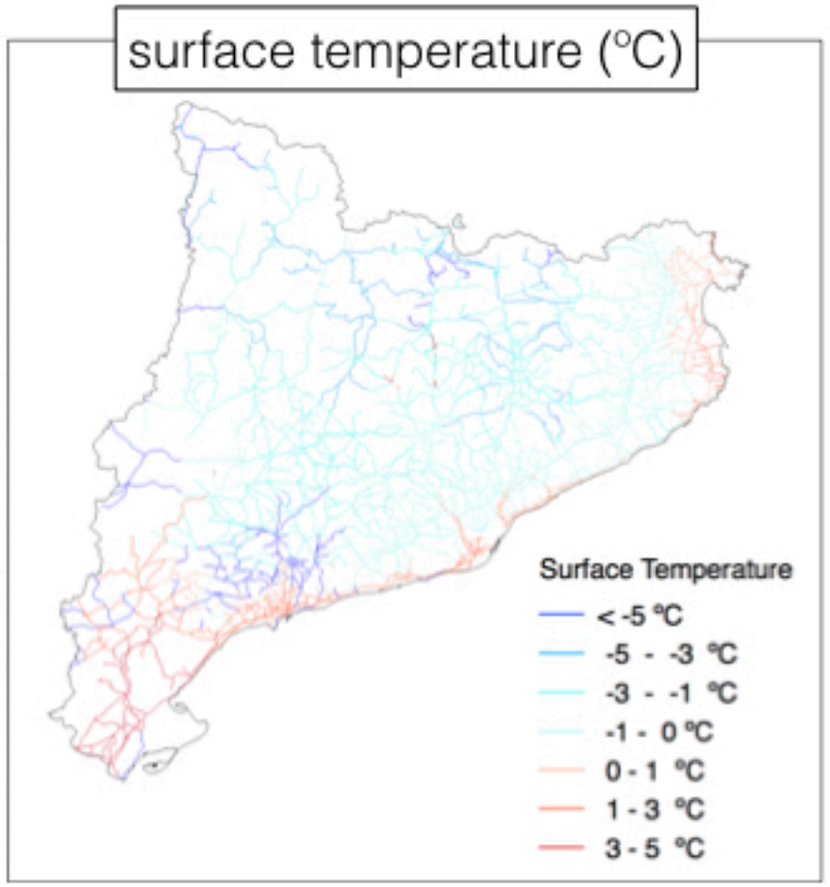
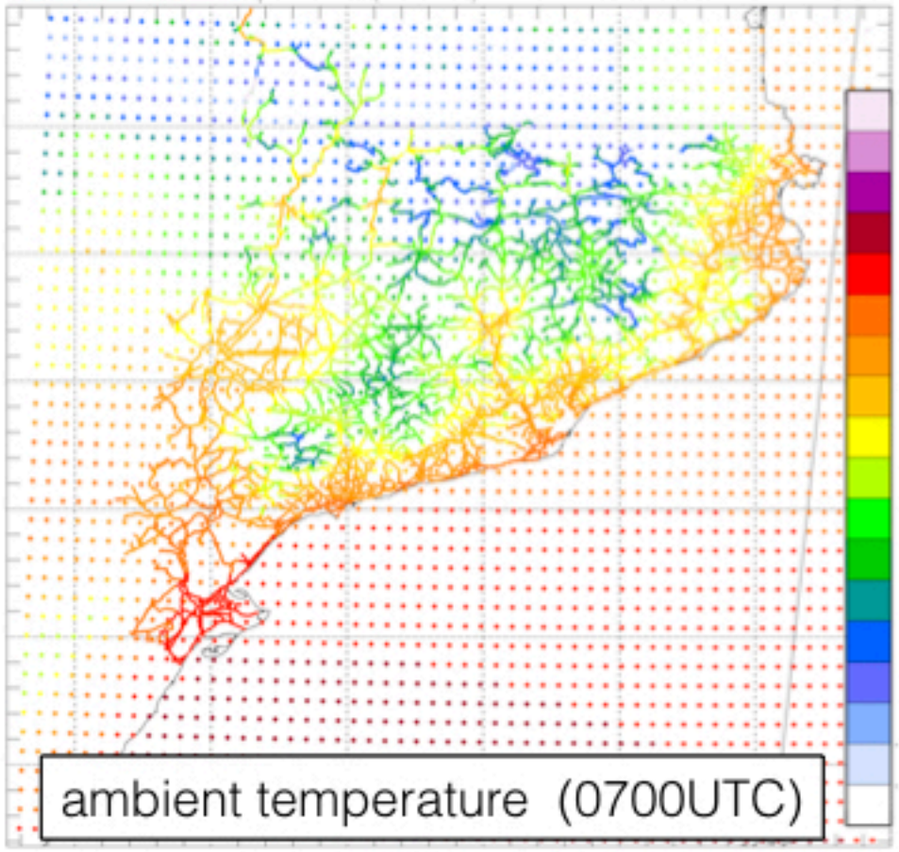
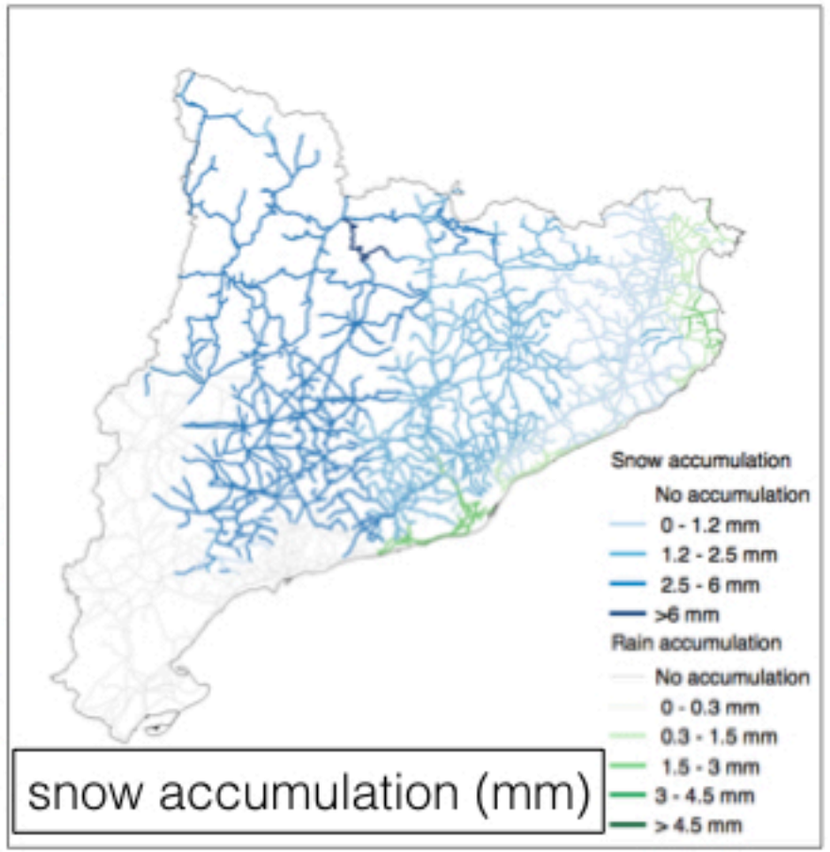
Weather Impact on Roads Process









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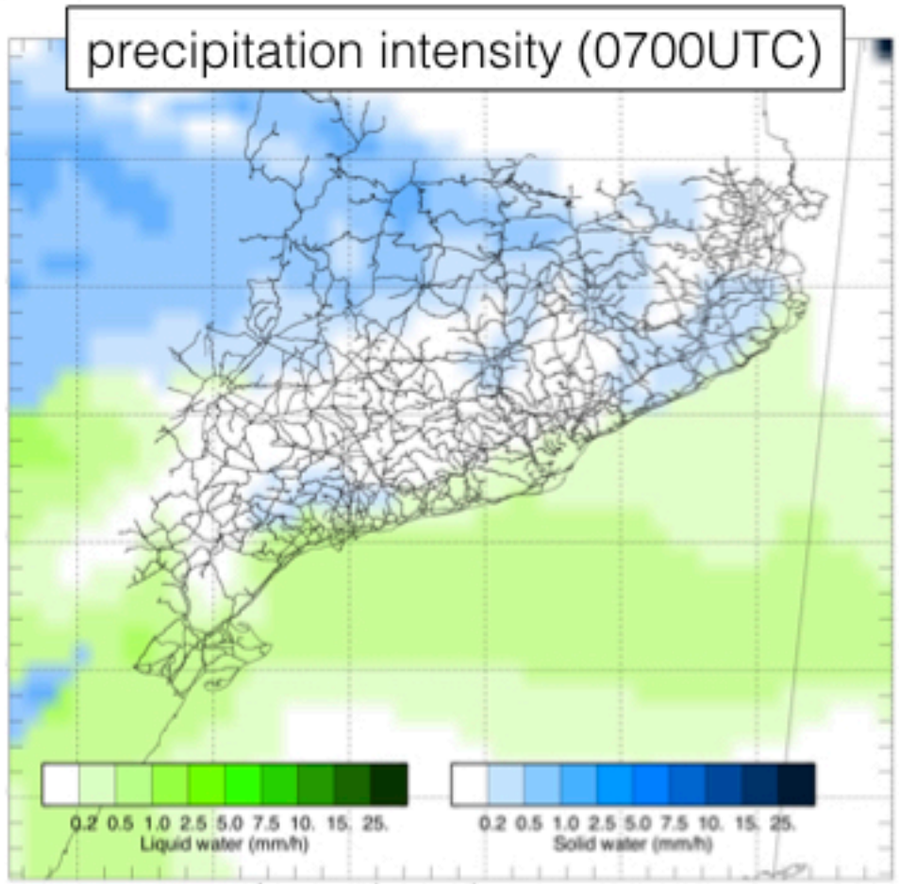
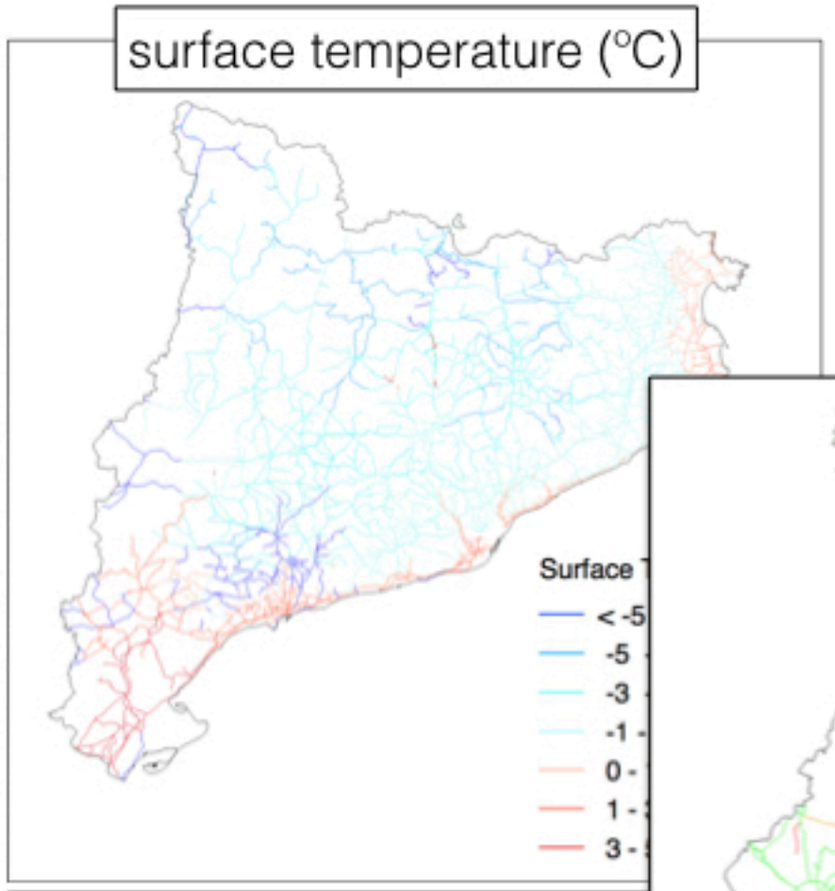
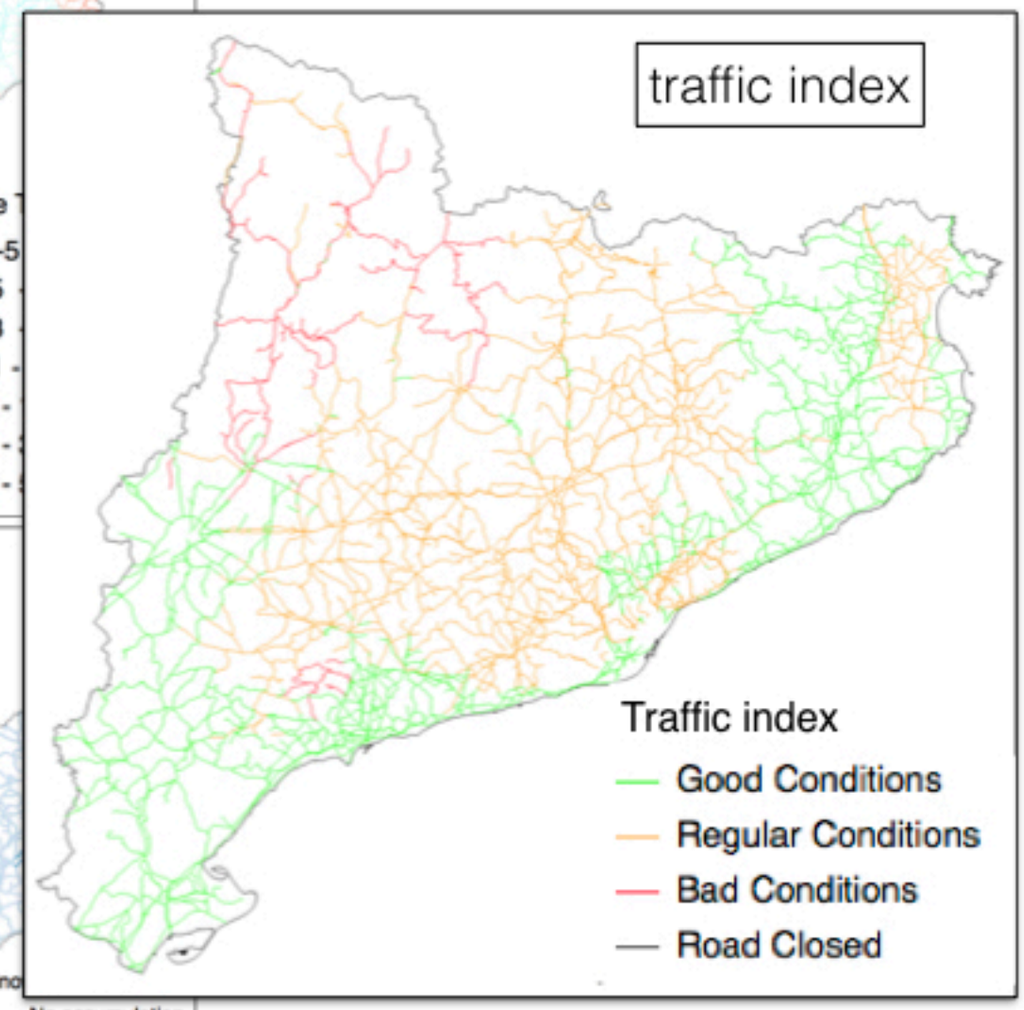
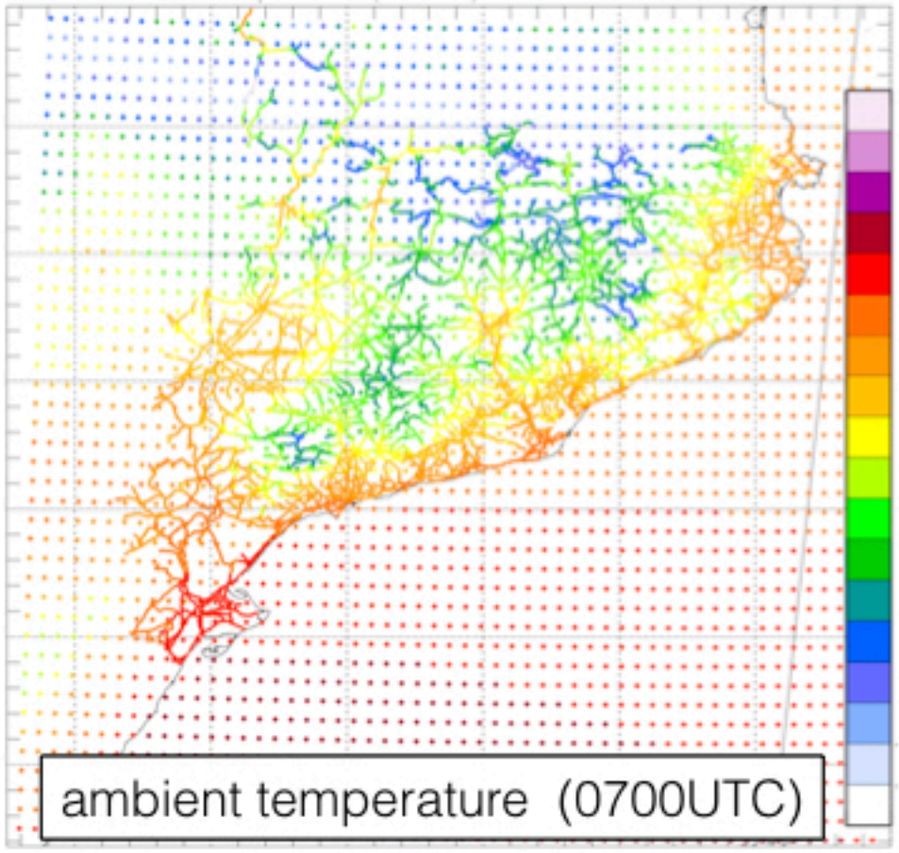
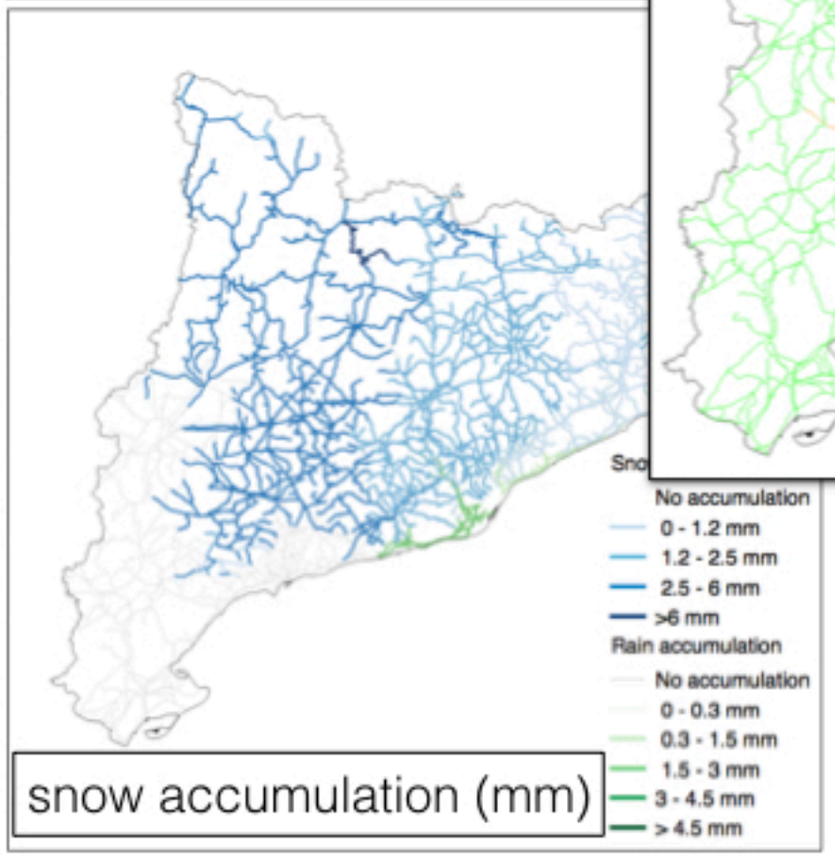
Snow impacts on Roads











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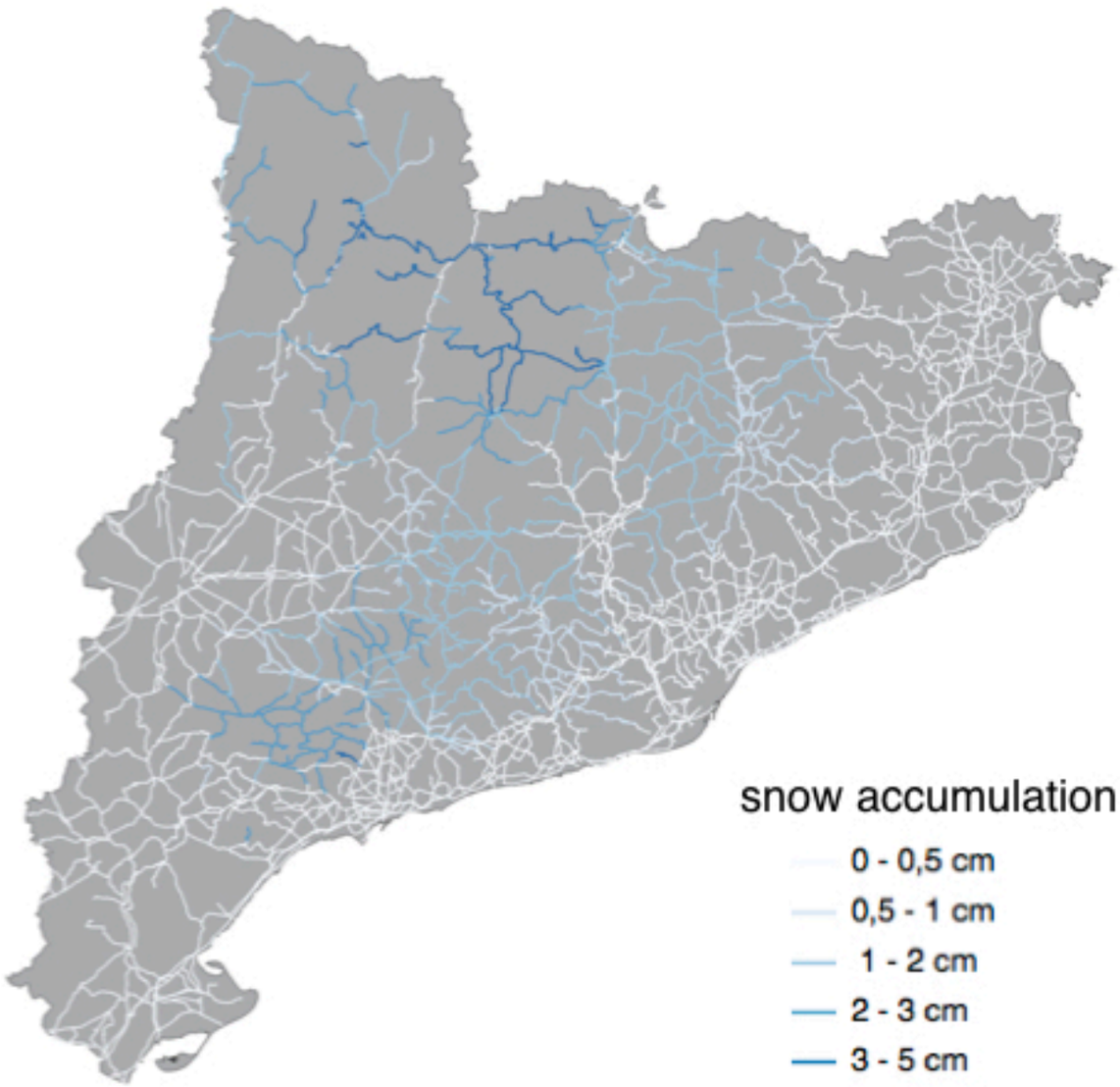
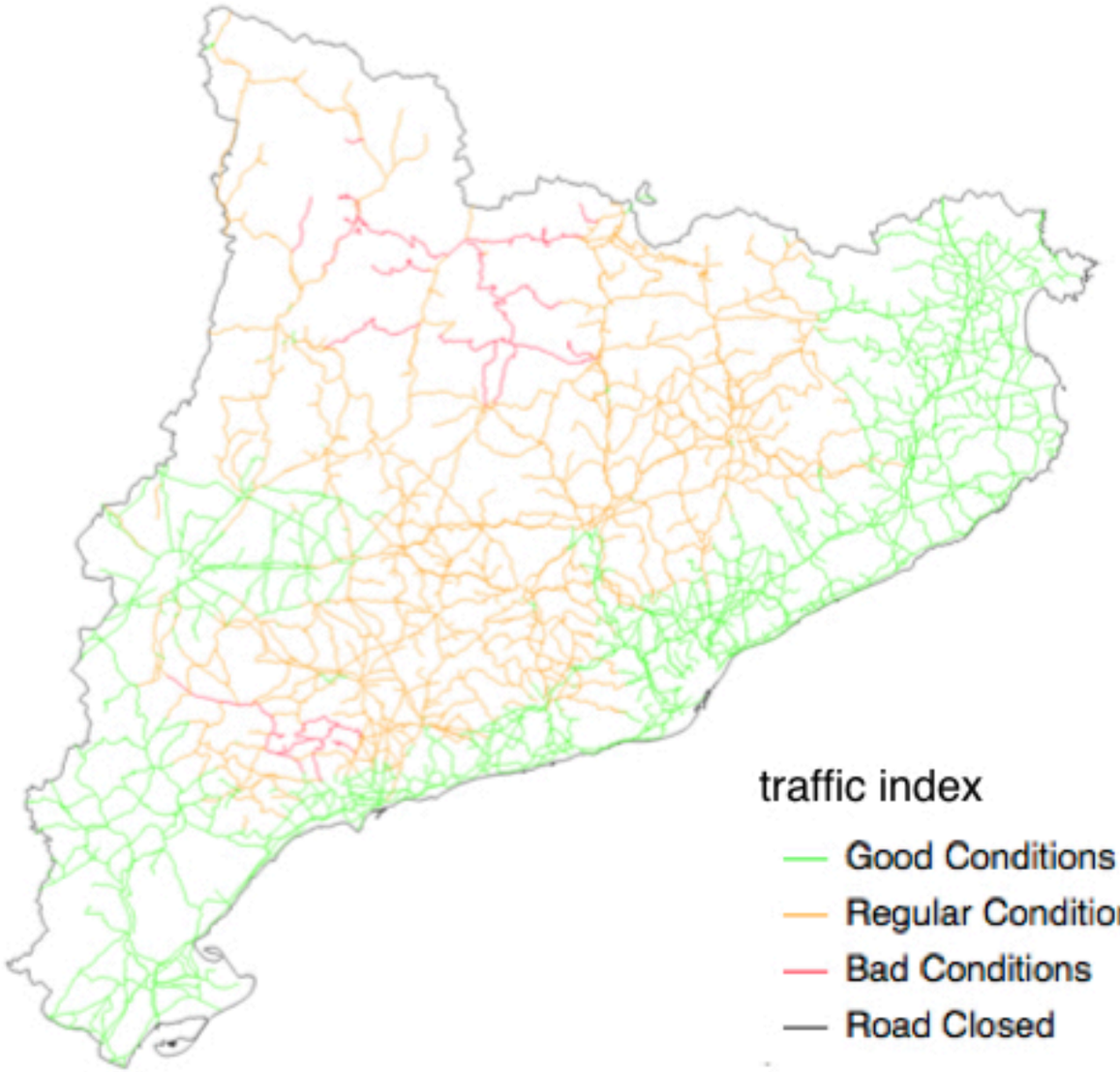
Snow impacts on Roads

28 Feb 2018 0200 UTC



snow accumulation

- 0 - 0,5 cm
- 0,5 - 1 cm
- 1 - 2 cm
- 2 - 3 cm
- 3 - 5 cm
- > 5 cm



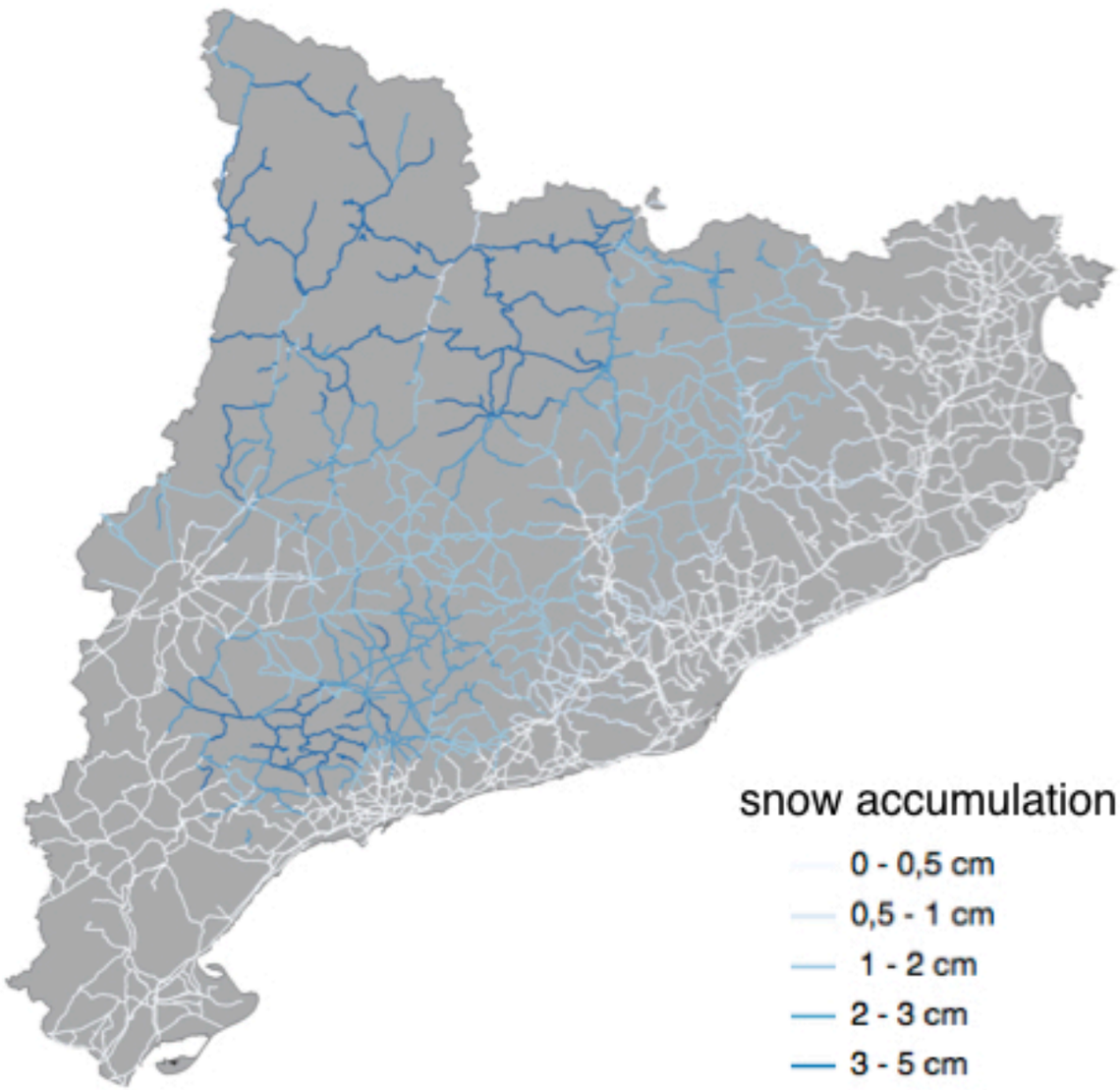
traffic index

- Good Conditions
- Regular Conditions
- Bad Conditions
- Road Closed

ANYWHERE

Snow impacts on Roads

28 Feb 2018 0600 UTC



snow accumulation

- 0 - 0,5 cm
- 0,5 - 1 cm
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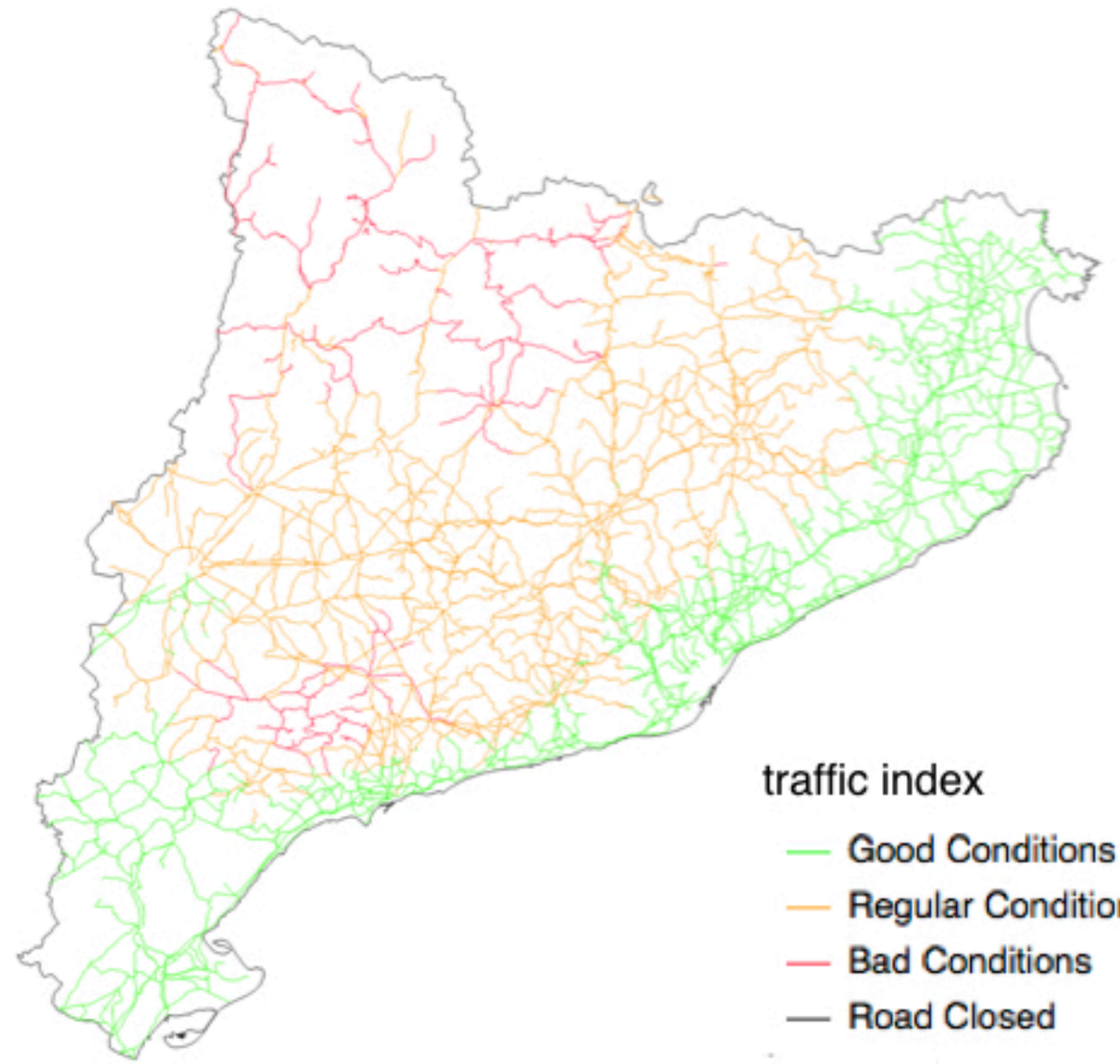
- 2 - 3 cm
- 3 - 5 cm
- > 5 cm



traffic index

- Good Conditions
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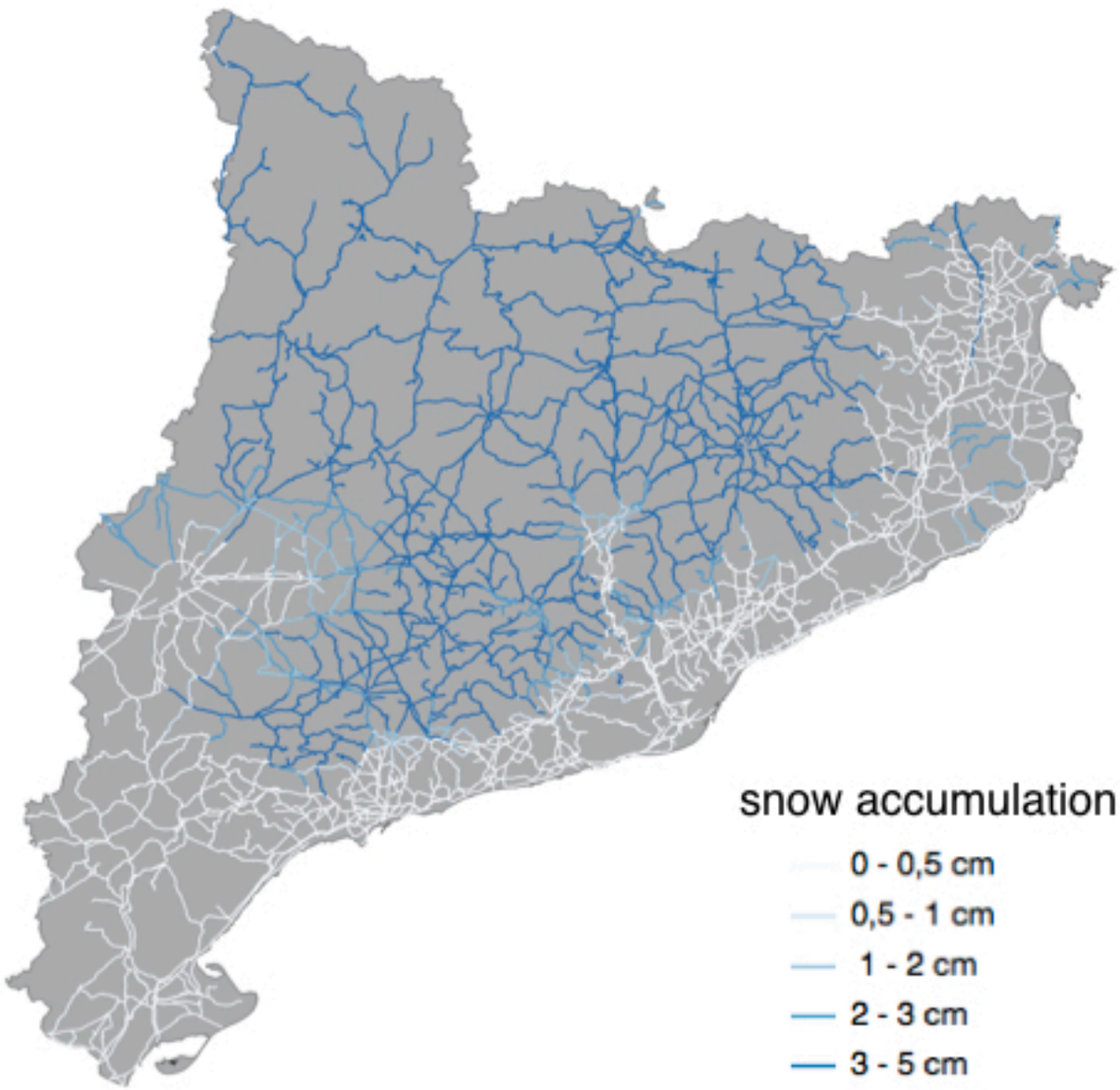
ANYWHERE

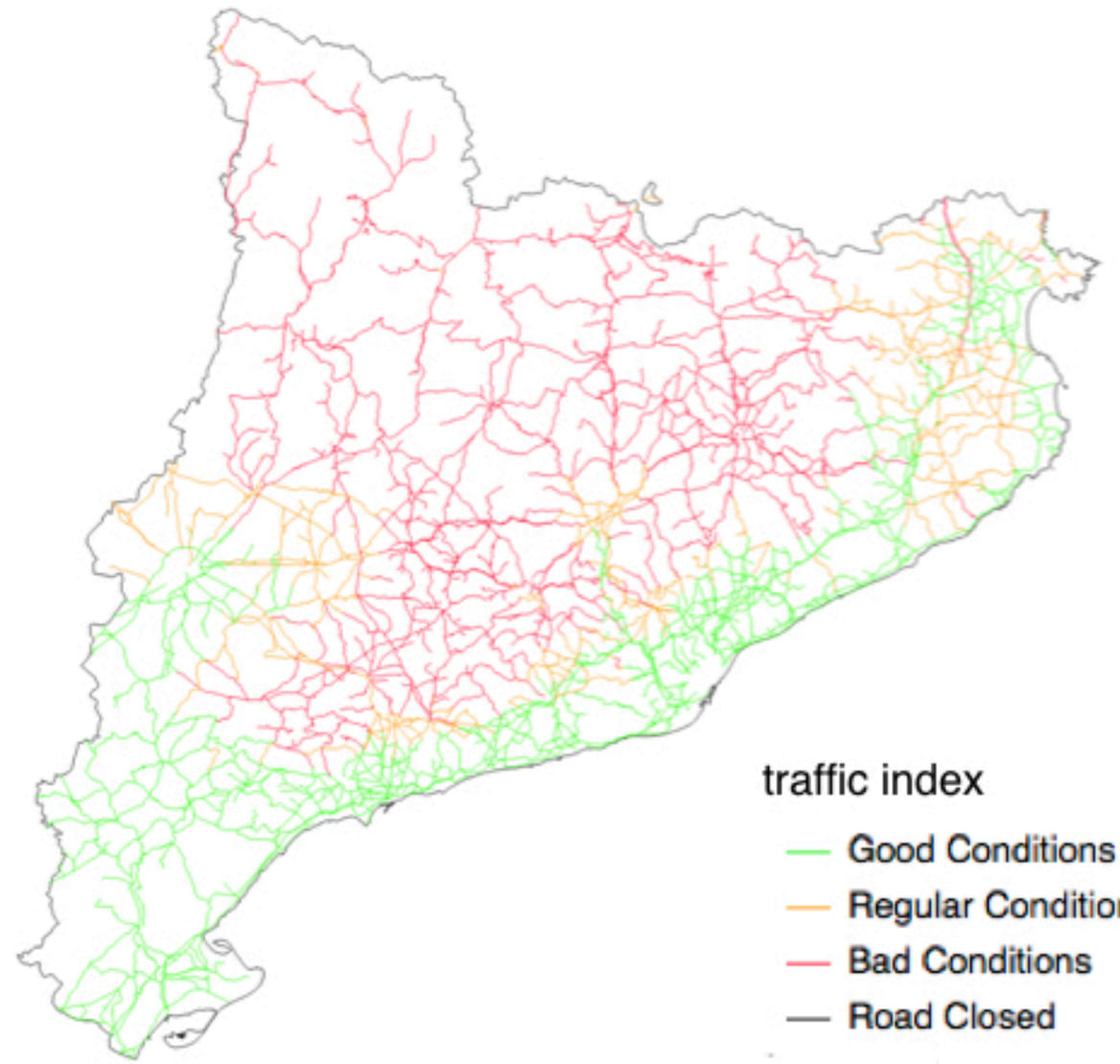
Snow impacts on Roads

28 Feb 2018 1000 UTC



snow accumulation

- 0 - 0,5 cm
- 0,5 - 1 cm
- 1 - 2 cm
- 2 - 3 cm
- 3 - 5 cm
- > 5 cm



traffic index

- Good Conditions
- Regular Conditions
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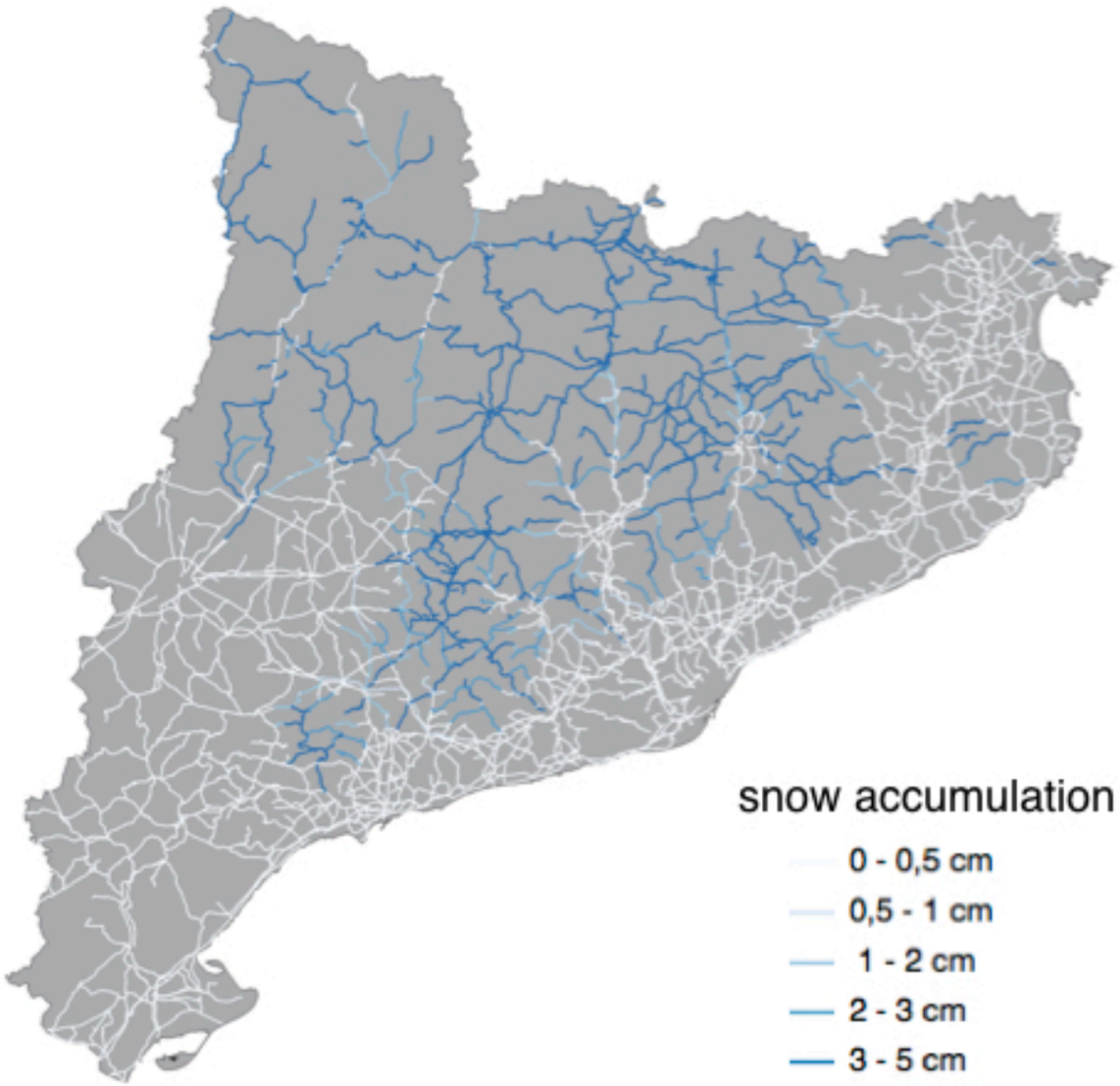
ANYWHERE

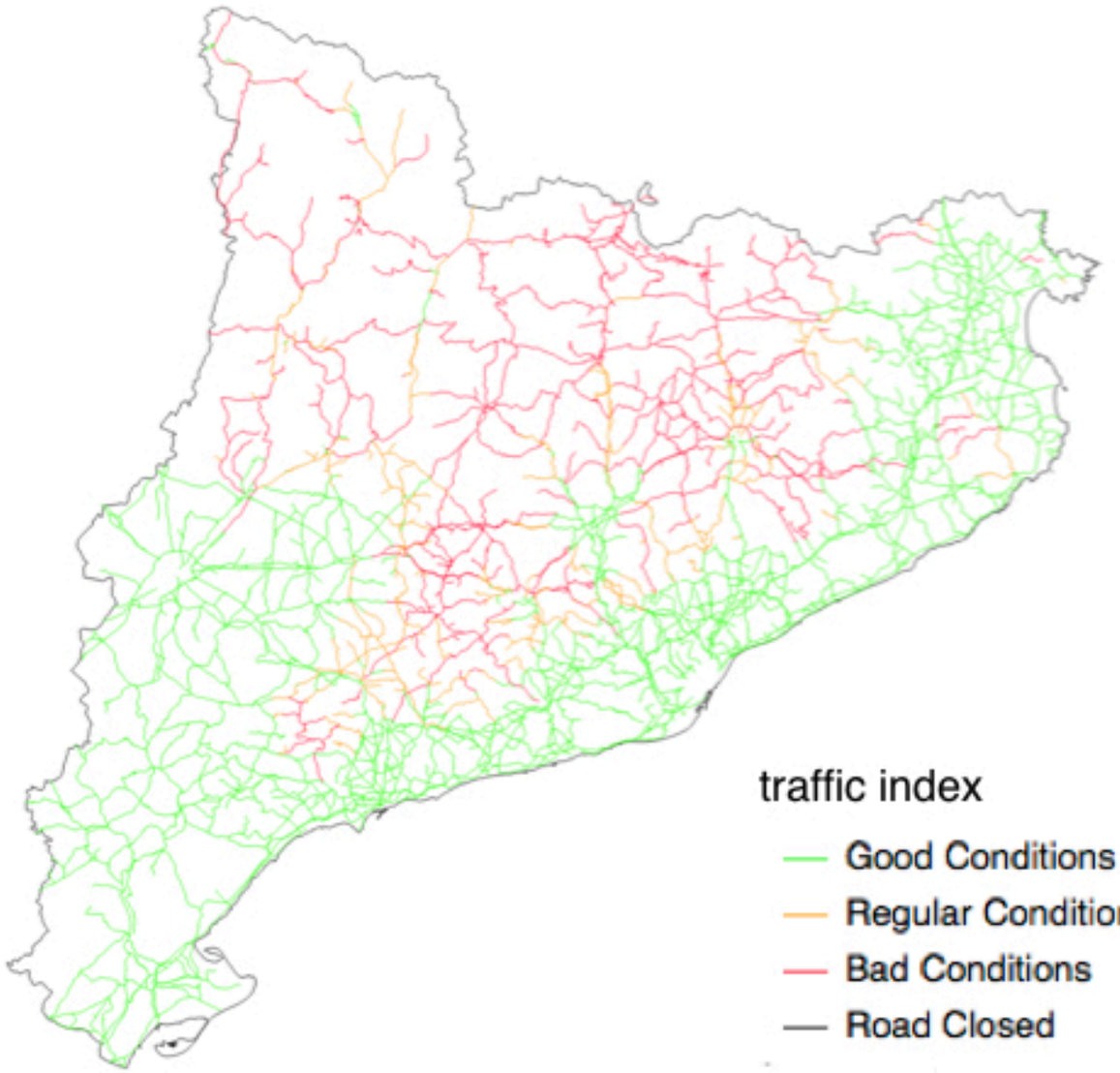
Snow impacts on Roads

28 Feb 2018 1400 UTC



snow accumulation

- 0 - 0,5 cm
- 0,5 - 1 cm
- 1 - 2 cm
- 2 - 3 cm
- 3 - 5 cm
- > 5 cm



traffic index

- Good Conditions
- Regular Conditions
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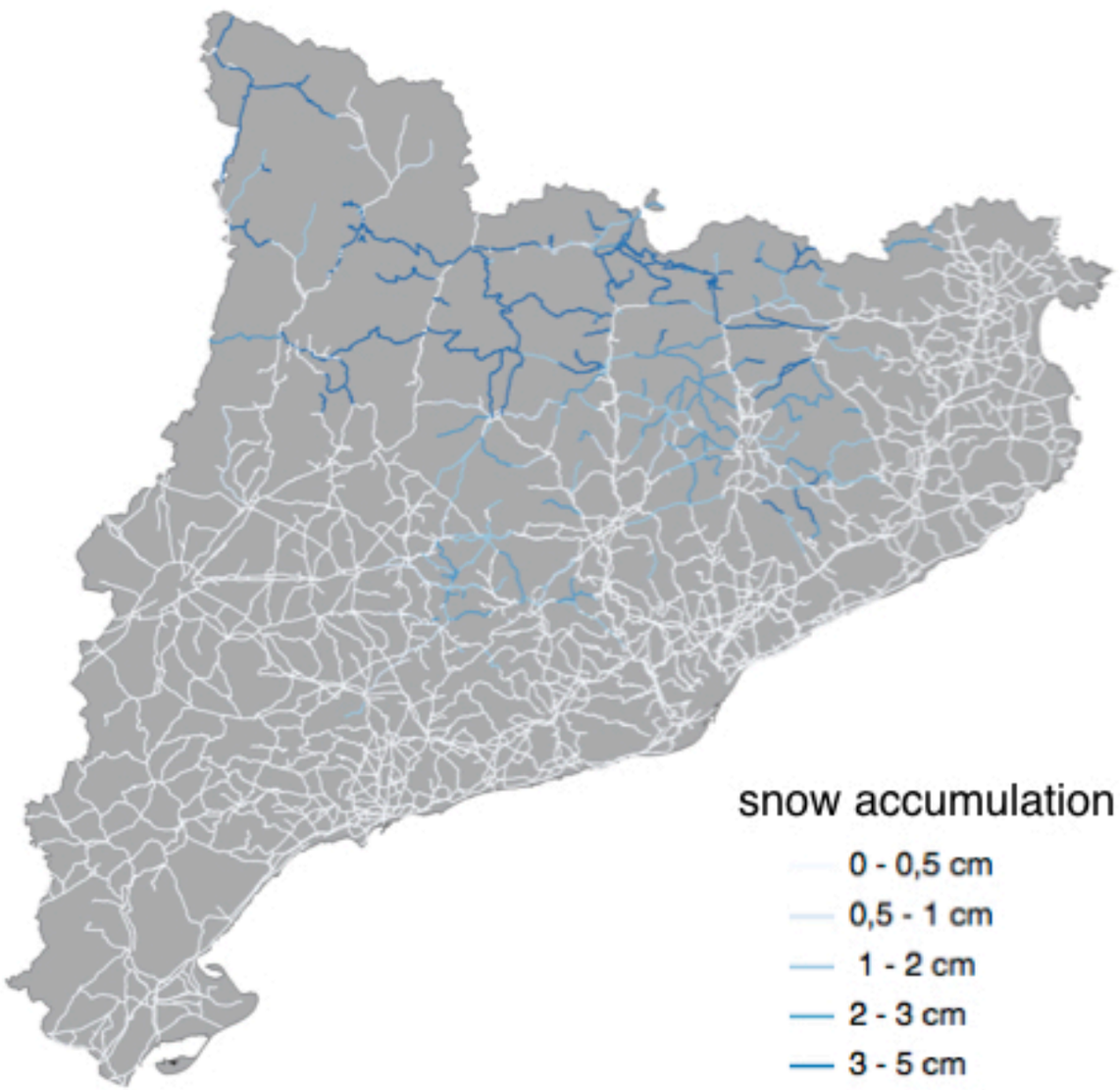
- Road Closed

ANYWHERE

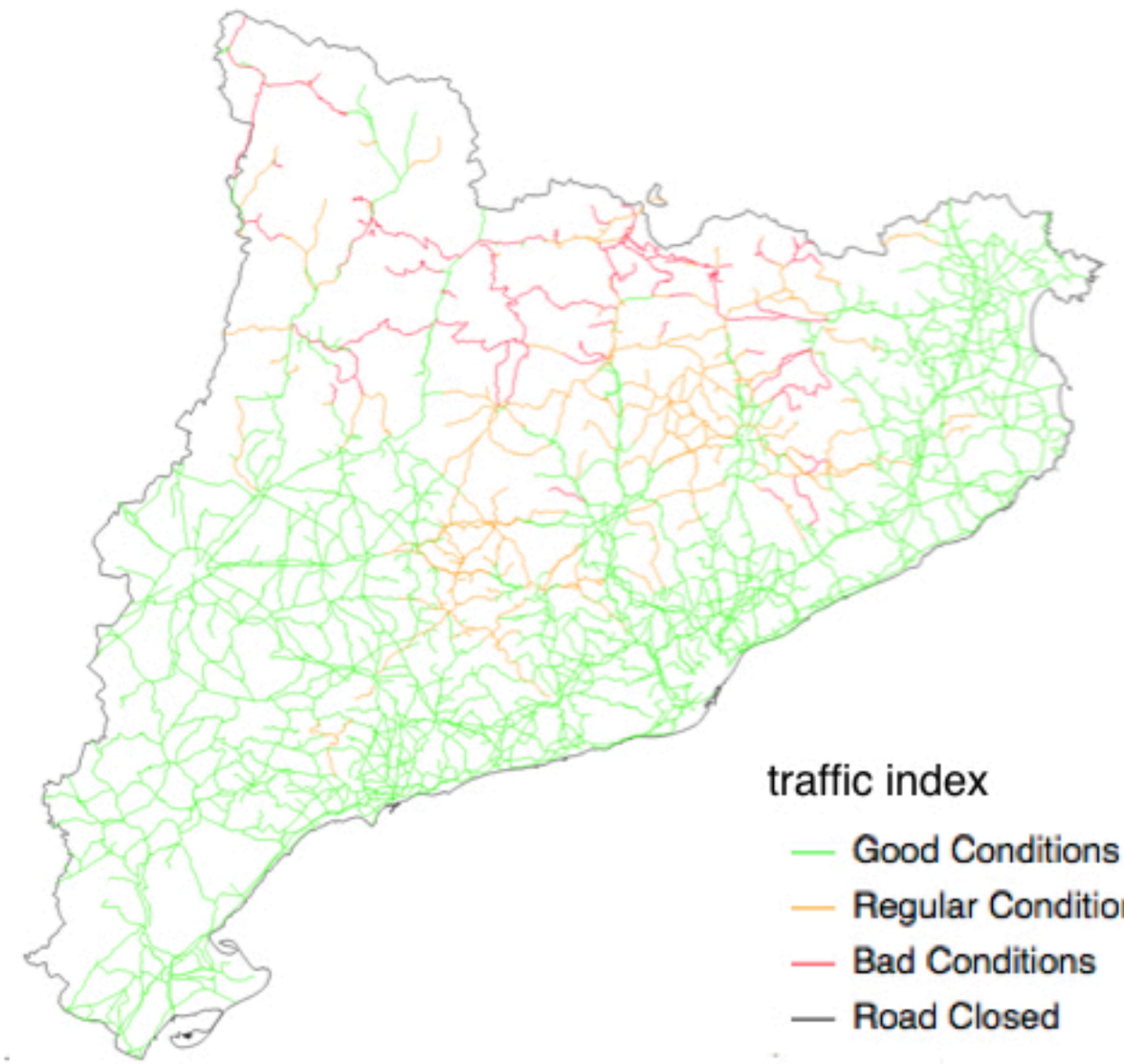
Snow impacts on Roads

28 Feb 2018 1800 UTC



snow accumulation

- 0 - 0,5 cm
- 0,5 - 1 cm
- 1 - 2 cm
- 2 - 3 cm
- 3 - 5 cm
- > 5 cm



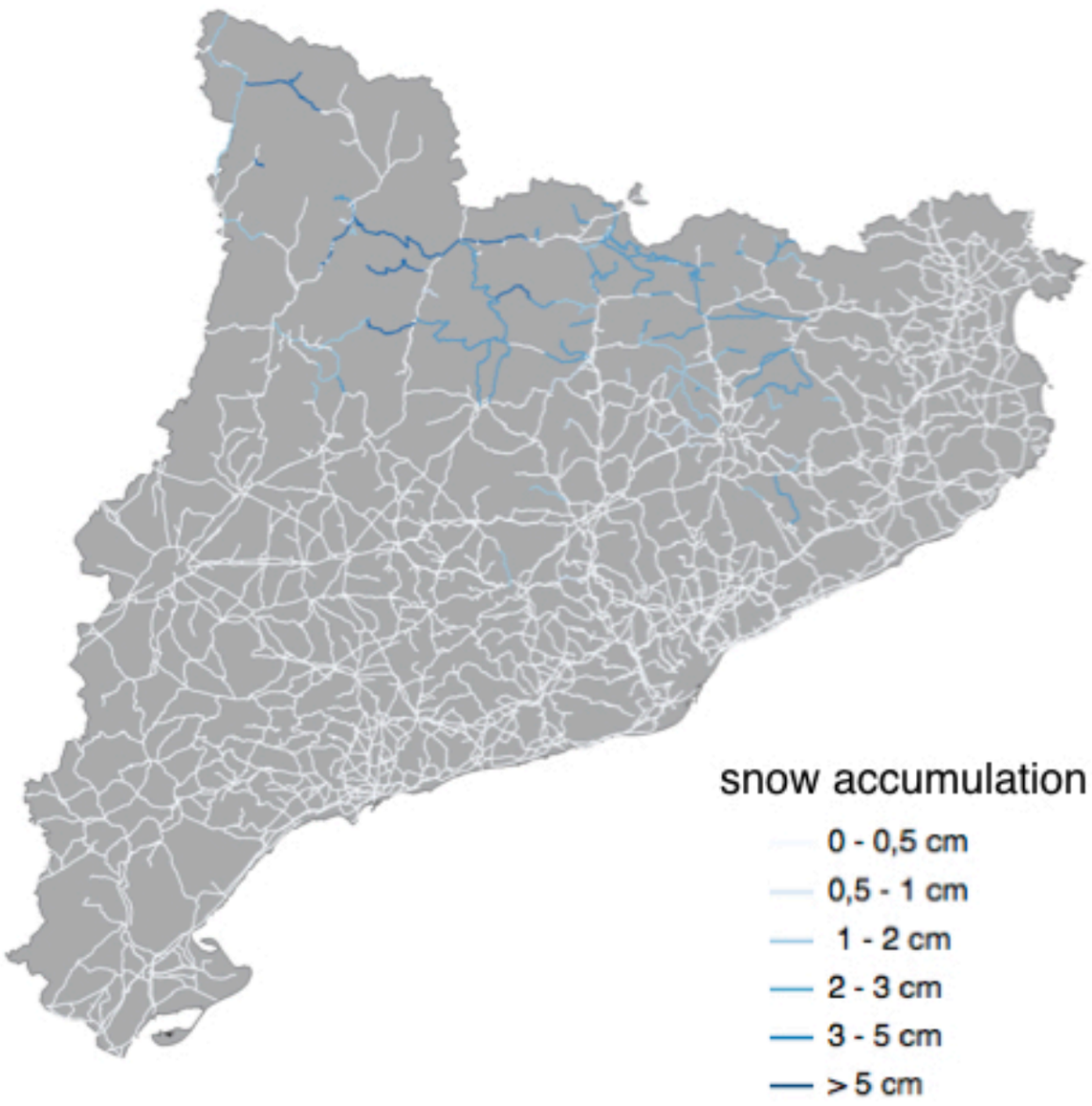
traffic index

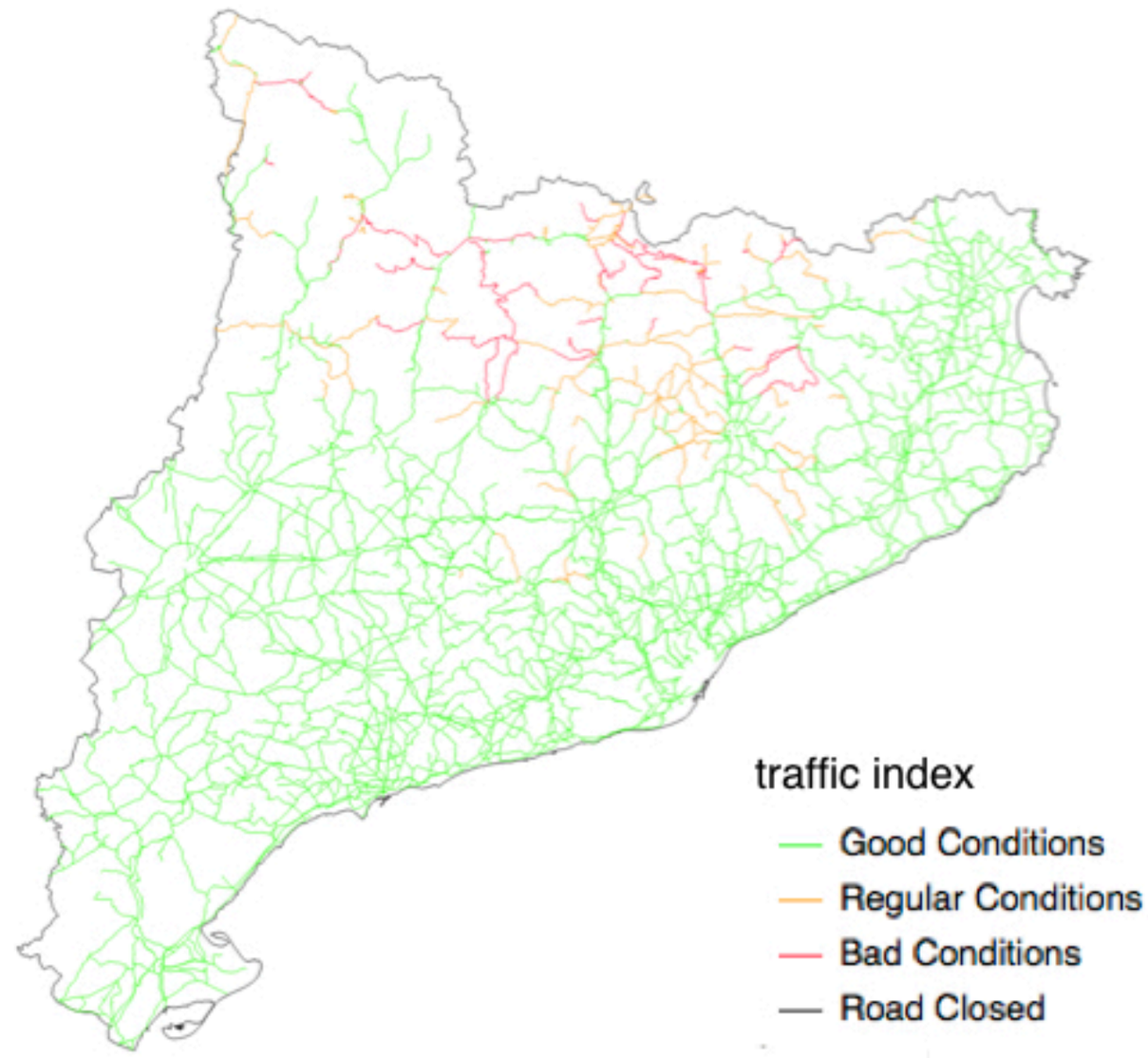
- Good Conditions
- Regular Conditions
- Bad Conditions
- Road Closed

ANYWHERE

Snow impacts on Roads

28 Feb 2018 2200 UTC





ANYWHERE

Àrea de Mobilitat
Govern d'Andorra
2019-01-23 07:00 UTC
ANDORRA
LA VELLA
Escaldes-Engordany
Santa Coloma
Arinsal
La Massana
Encamp
Canillo
Bordes d'Envalira
Pas de la Casa
El Serrat
Tirvia
Llivorsi
Ronl
Sort
Puigcerdà
Ossèja
Bellver
La Seu d'Urgell
FRANCE
2019-01-23 07:00 UTC

ANYWHERE