Residual salt model for daily application in winter service management

- **Göran Blomqvist,**
- Researcher, PhD
- VTI, Sweden
- goran.blomqvist@vti.se

Project team: Michel Eram, Skúli Thordarson, Kai Rune Lysbakken, Mats Gustafsson

0. CONTENT

1. The reasons for building a residual salt model
2. The field site in Bygholm, Horsens
3. Data used
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6. Future outlook

1. Why a residual salt model?

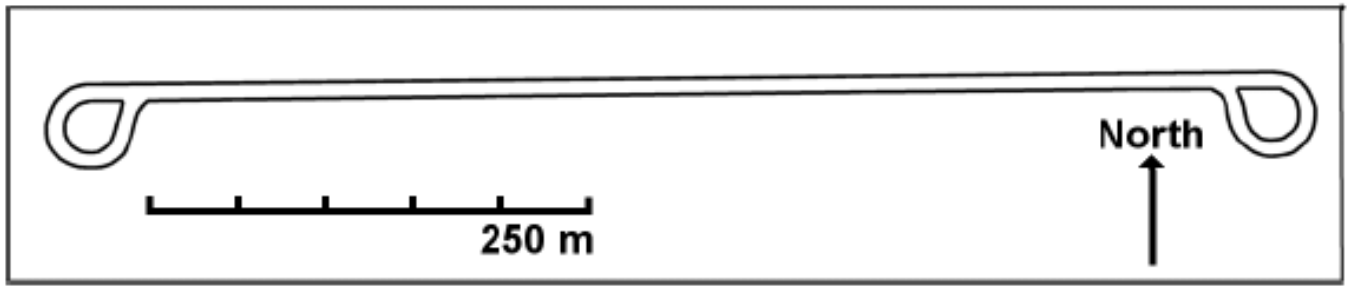
Goal:

To develop a model that will be able to predict the development of residual salt on the road after spreading, taking traffic, road and weather parameters into consideration.

The model will be available in a range of different complexity levels, from simple printed nomogram graphs to comprehensive algorithms for implementation in existing decision support systems.

It will help reaching a more precise and sound use of salt application rate, without compromising traffic safety and road network accessibility

2. THE FIELD SITE BYGHOLM



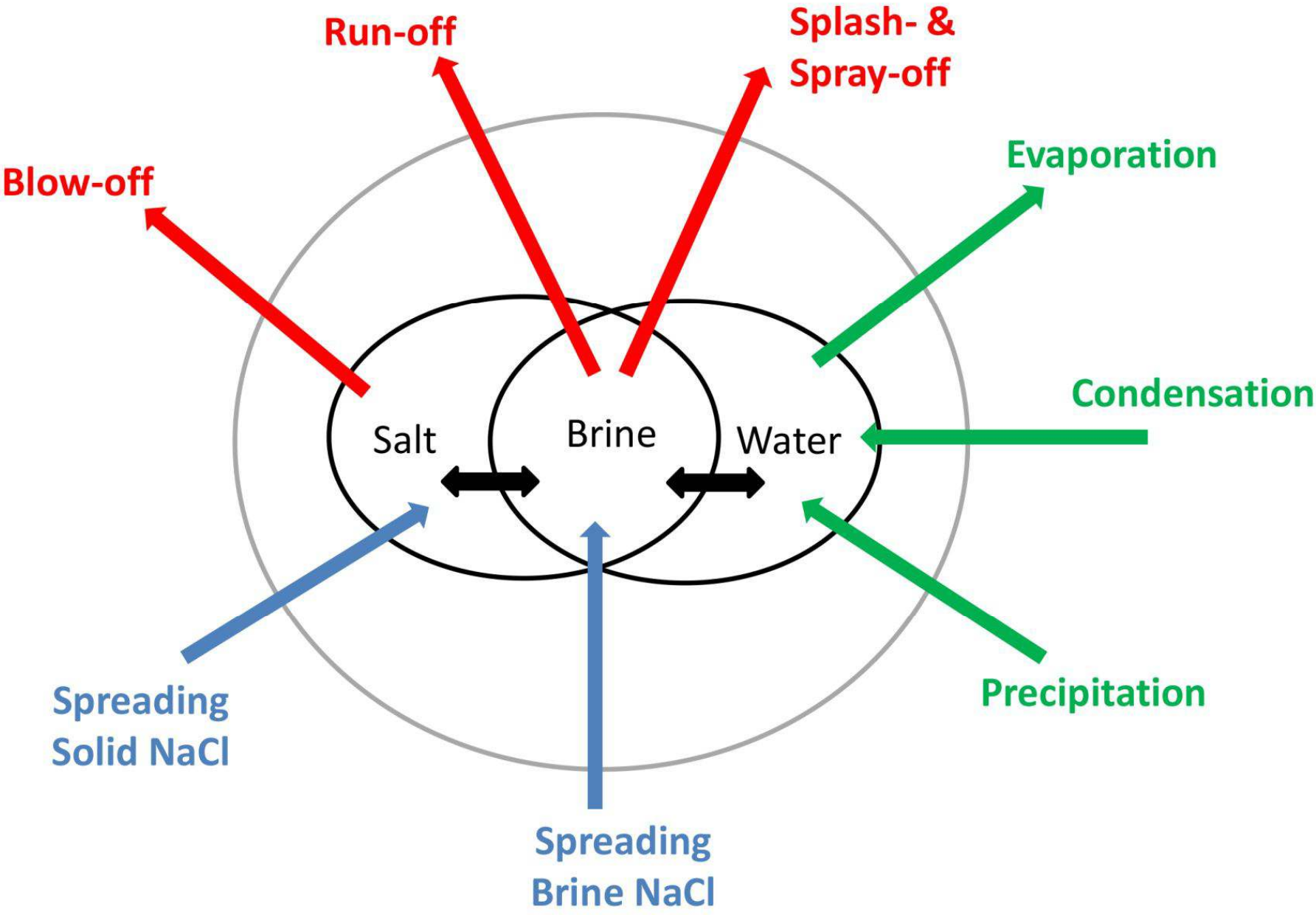
The field site consist of a ca 600 m long, 10 m wide test track with an RWIS-system (VAISALA Rosa) installed in the center position including four salt sensors (wheel tracks and in-between wheel tracks).

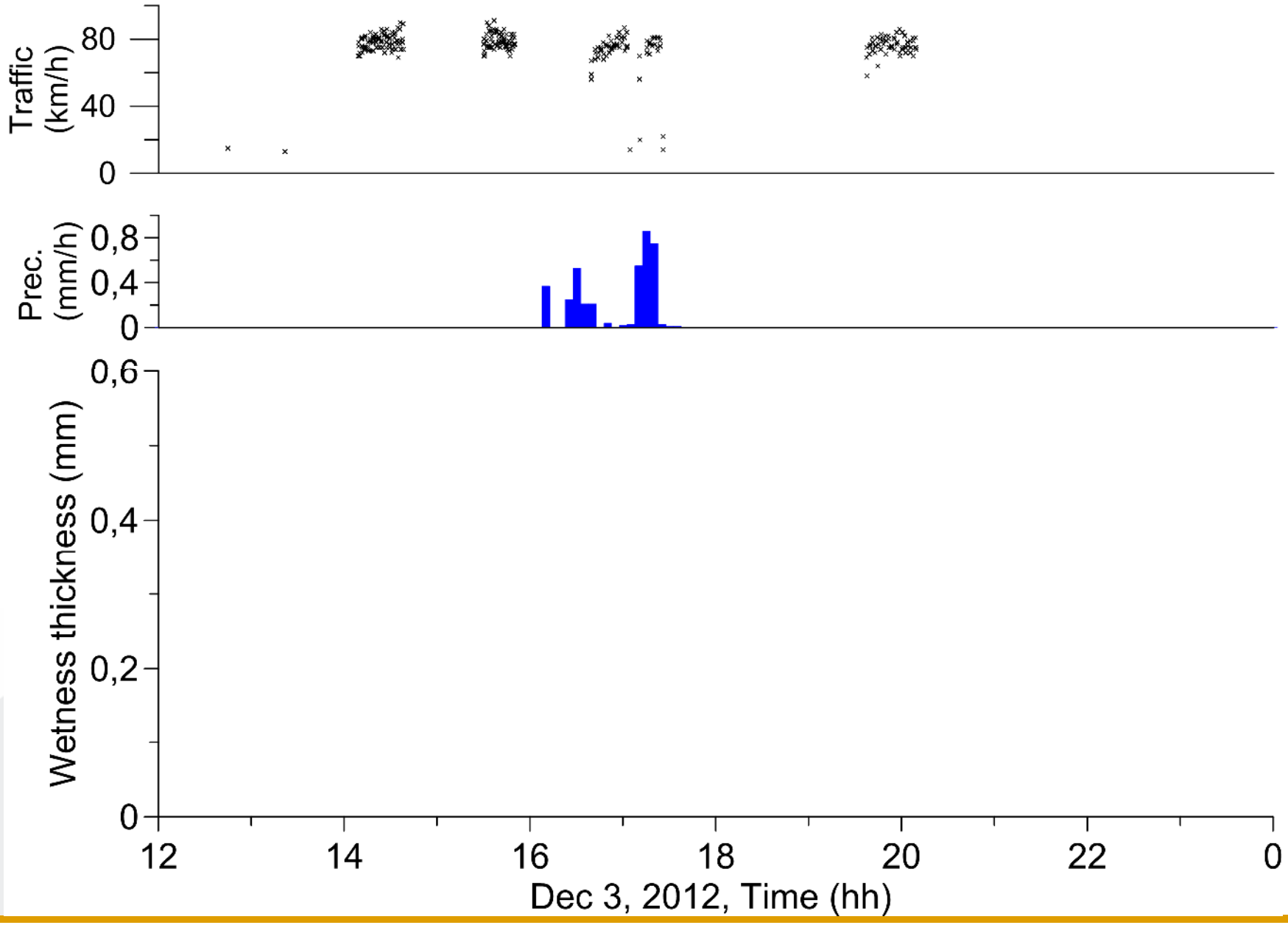
3. Automatic RWIS-sensors VAISALA Rosa

1. Precipitation: Vaisala PWD12
2. Air Temperature: Vaisala HMP155
3. Air humidity: Vaisala HMP155
4. Wetness and salt amount: Vaisala DRS511
5. Road surface state (wetness): Vaisala DSC111

3. Manual measurements

1. SOBO 20 (dissolved salt amount up to 45 g/m2)
2. VTI-Wet dust sampler (salt amount)
3. Refractometer (salt concentration)
4. Wettex kitchen cloth (wetness, g/m2, including salt)
5. Petri dishes (splash and spray deposition)


Run-off
Splash- &
Spray-off
Blow-off
Evaporation
Condensation
Salt
Brine
Water
Spreading
Solid NaCl
Precipitation
Spreading
Brine NaCl


Traffic (km/h)
80
40
0
Prec. (mm/h)
0,8
0,4
0
Wetness thickness (mm)
0,6
0,4
0,2
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12
14
16
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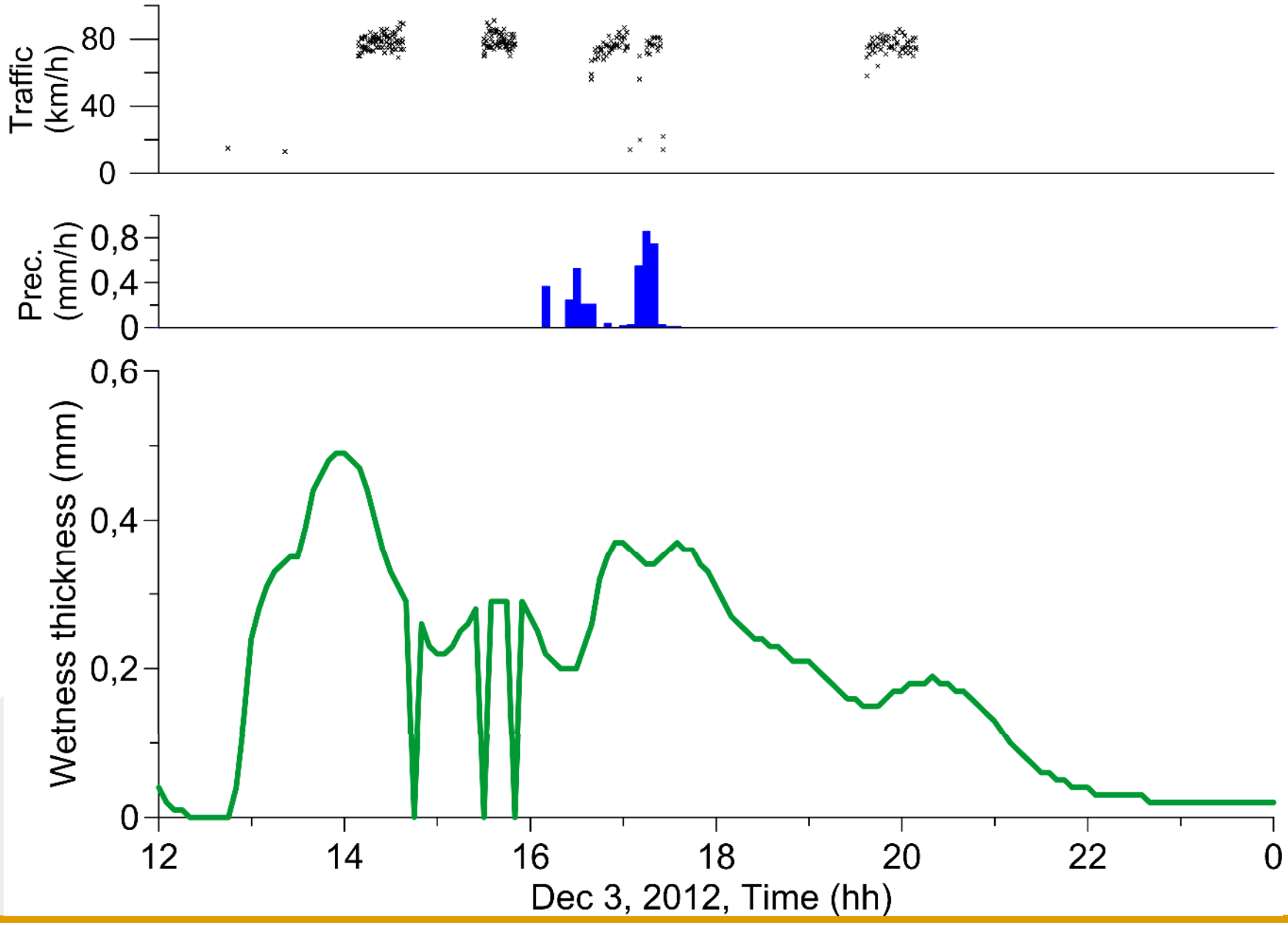
Dec 3, 2012, Time (hh)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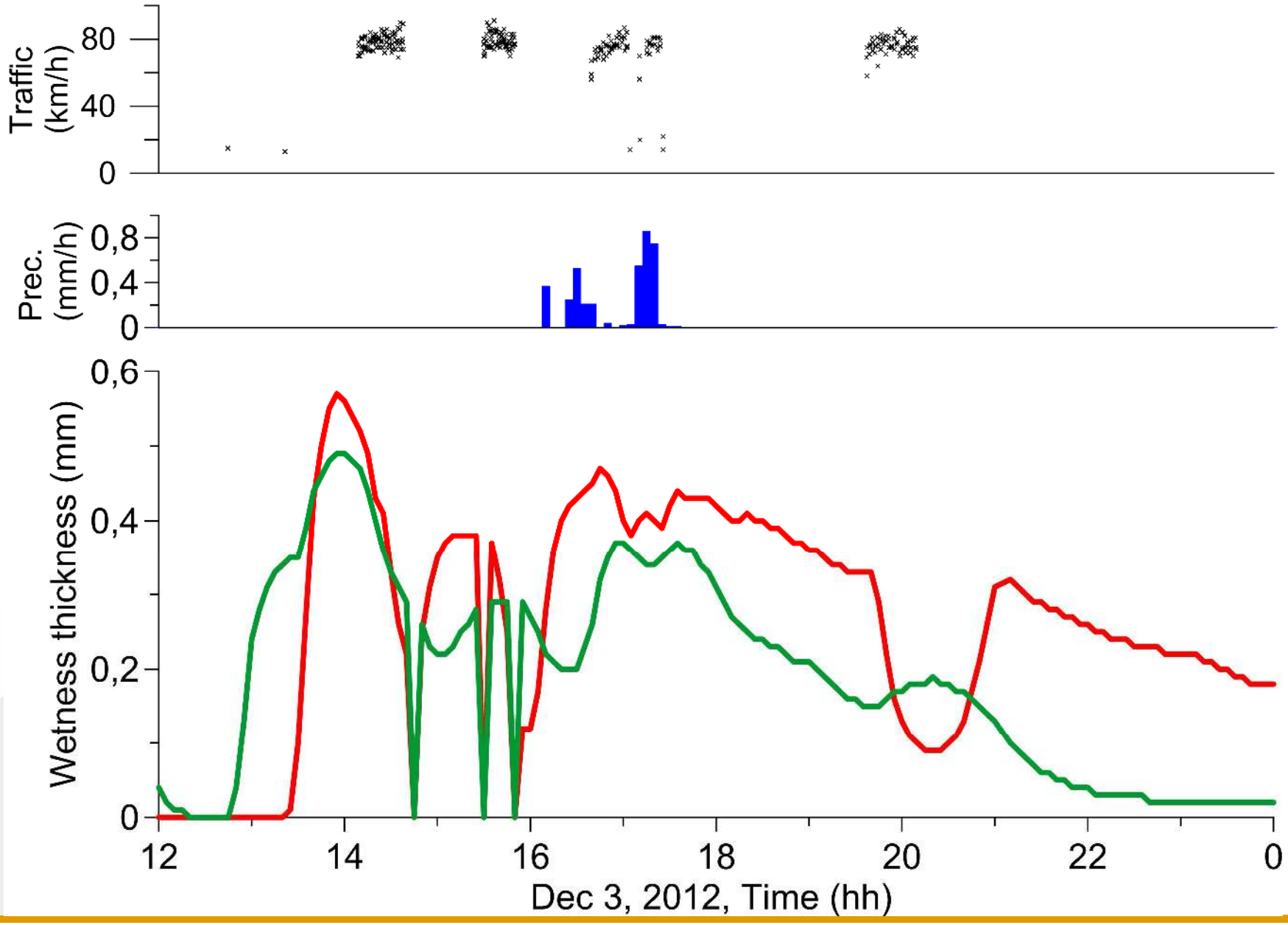
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1. Run-off model:

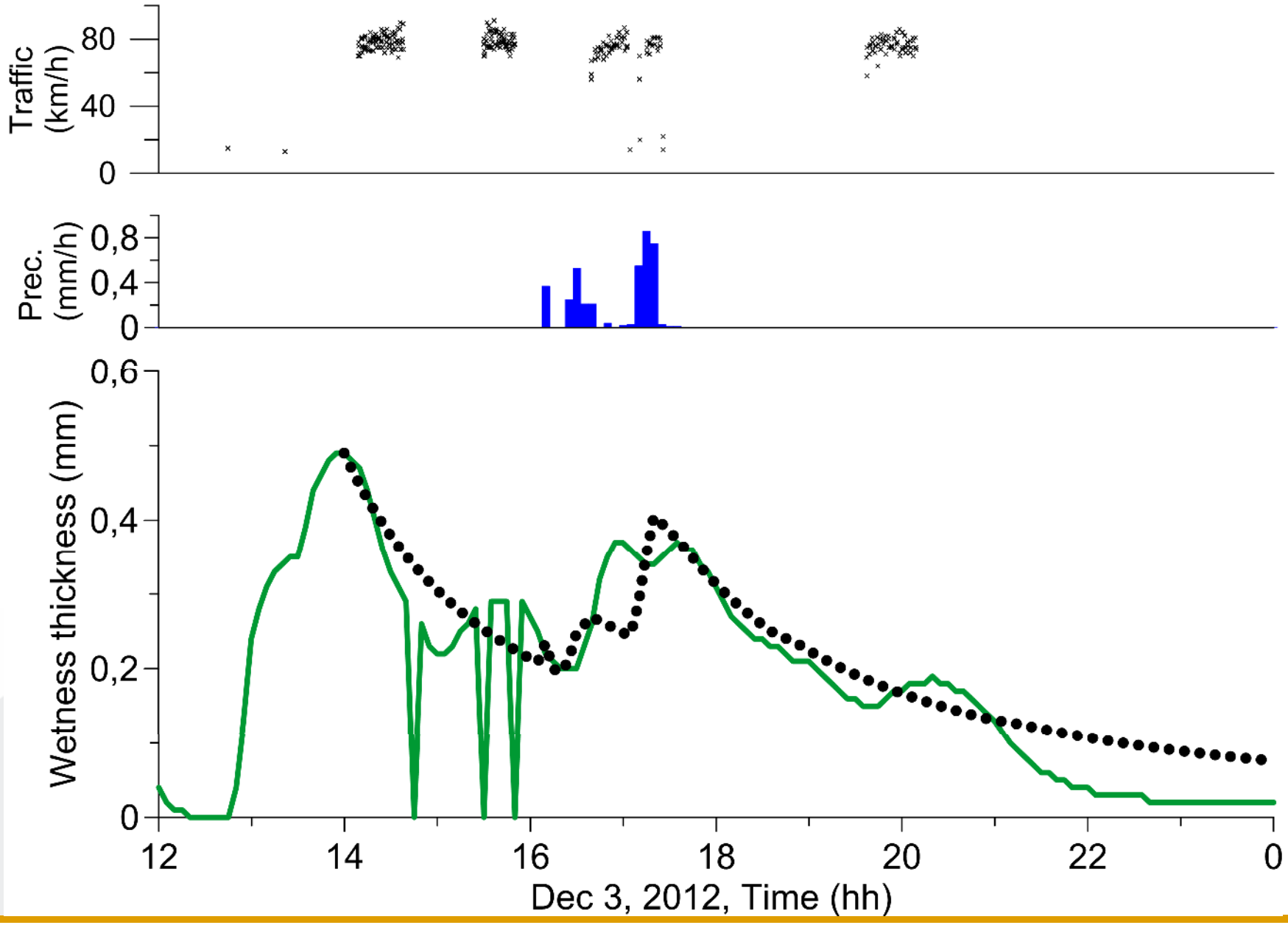
The run-off is modelled by an overland flow sub-model from Stanford Watershed Model IV (1989, 1966)

The model calculates a steady-state wetness based on:

- precipitation intensity

- length (half the road)

- crossfall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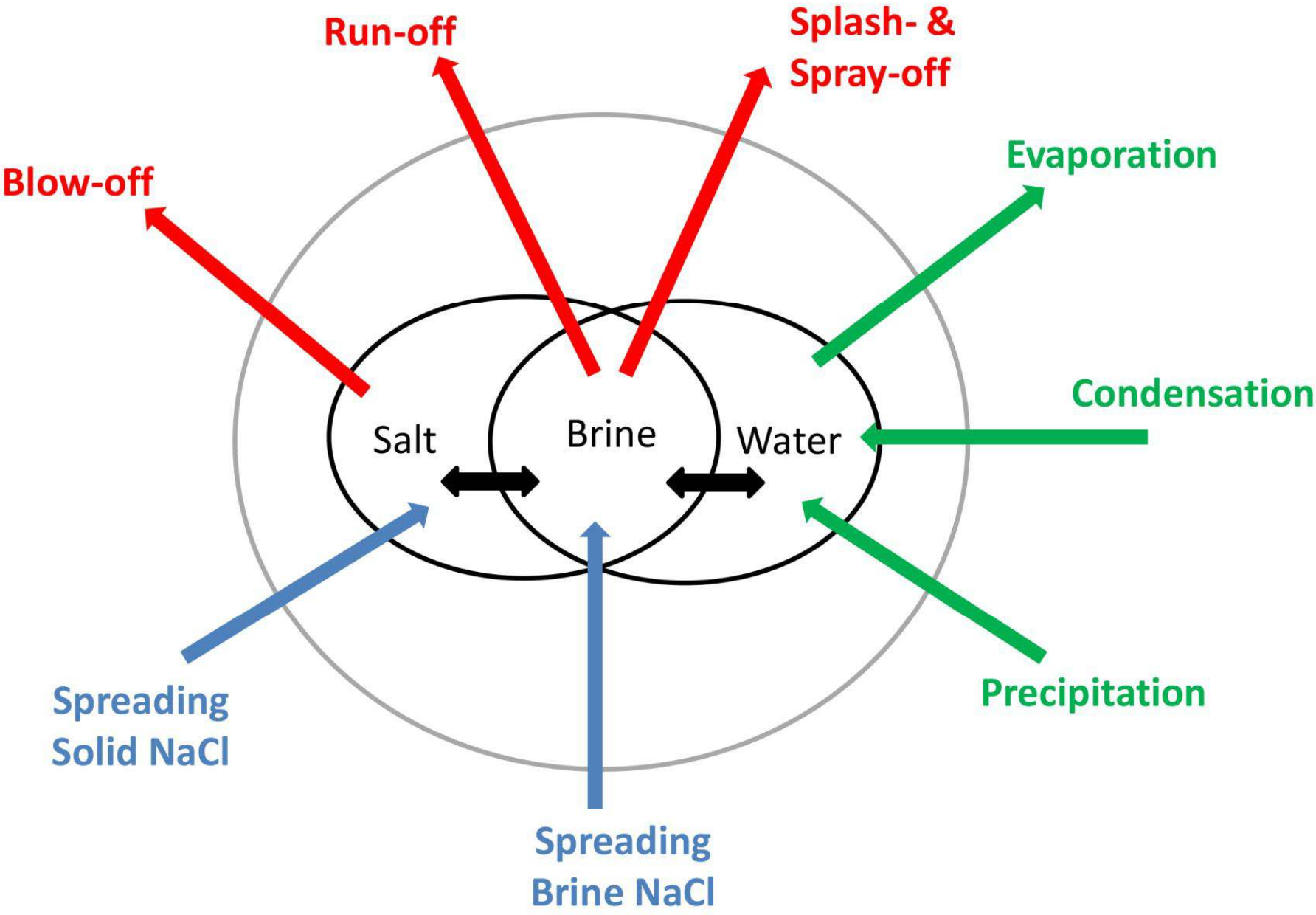
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Salt
Brine
Water
Spreading
Solid NaCl
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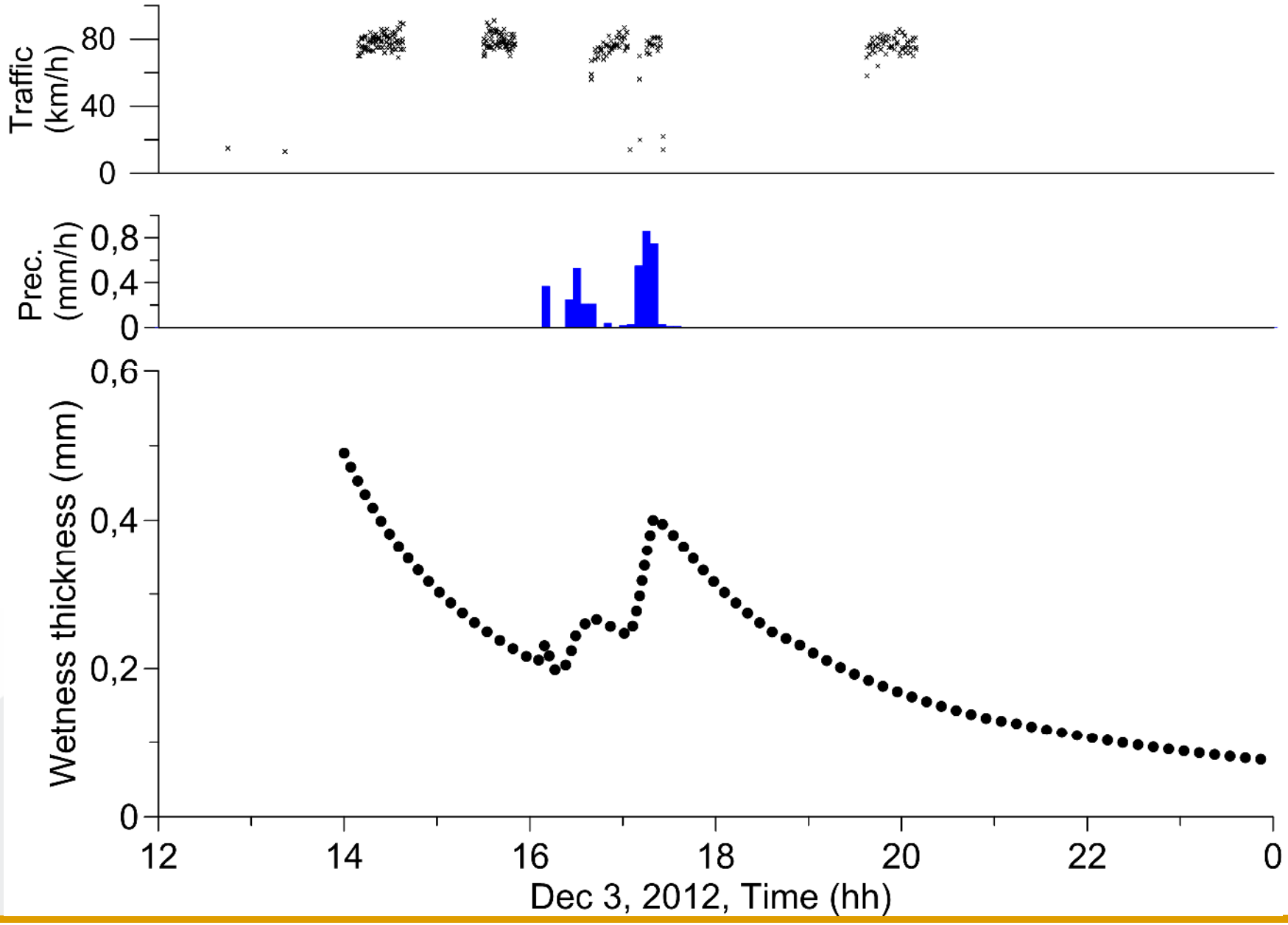
1. Splash and Spray model:

The splash and spray model is based on empirically found relationships between:

- road surface wetness
- road perpendicular wind component
- traffic
- road side depositions (petri dishes)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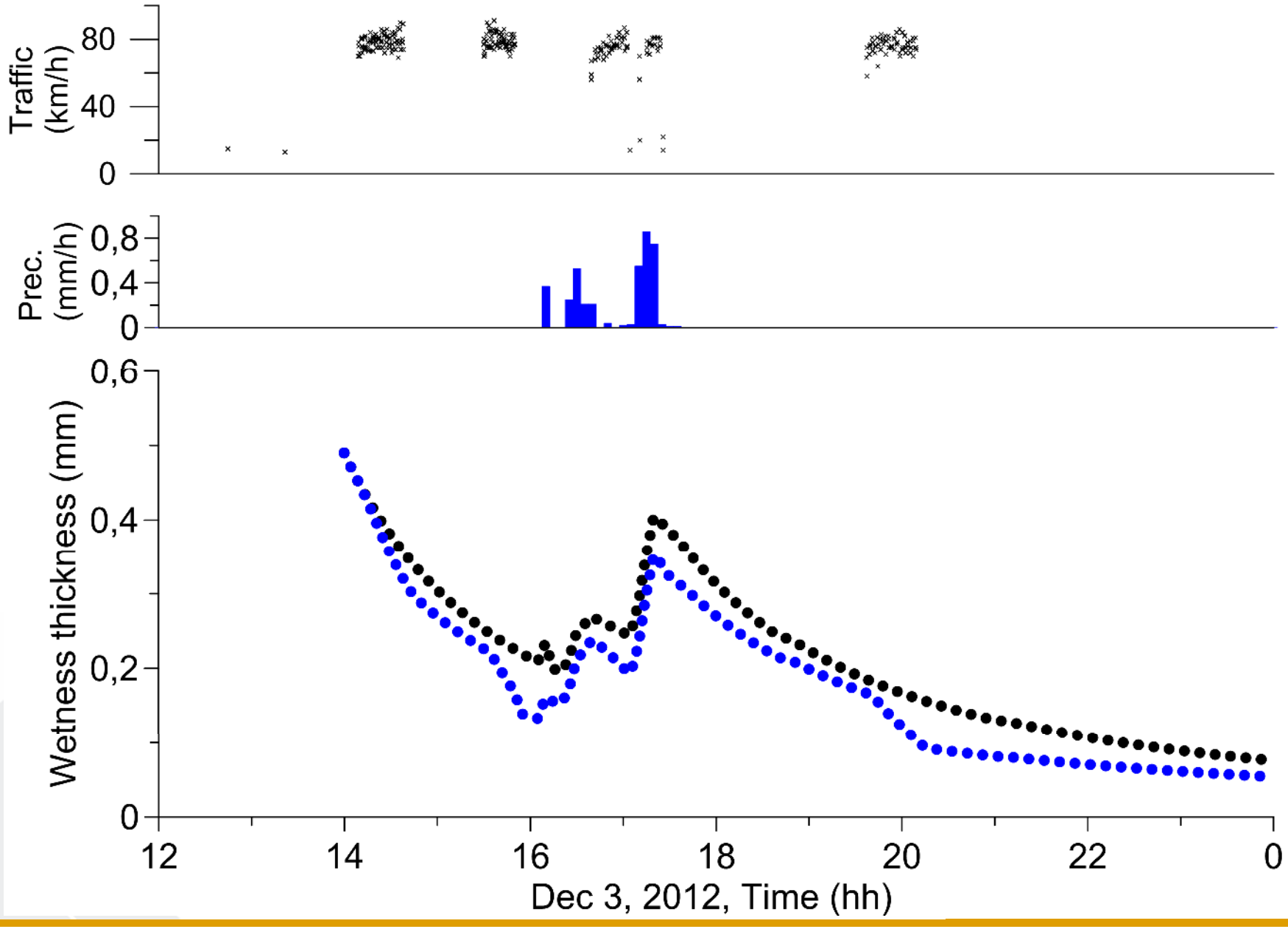
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What's next…

This prototype model predicts the water loss from the road surface due to run-off and traffic induced splash and spray

Heavy traffic, evaporation and atmospheric condensation will be added in the next phase.

Loss of recrystallized salt from a dry road surface will be included as well as loss of undissolved salt particles by turbulence blow-off.

Establishing run-off properties for different pavements in lab.

We welcome contacts and discussions

Visit us at the poster session and in the VTI-Sweden booth (A-30) in the exhibition hall

More information can be found at www.nordfou.org/mors