

Moving bottlenecks to identify weak spots in a road network

Mary Panagopoulou

Albert Nijenhuis

Jaap van Toorenburg

Contents

1. Problem
2. Explain proposed method
3. Input data, Transpute's Viewer and Visualization
4. Two examples
5. Results
6. Possible real applications
7. Conclusions

Discussion

Problem description (1)

- Identify traffic bottlenecks
- Conventional methods :
 - 1) Expensive
 - 2) Need for congestion-data

Problem description (2)

How do we identify **weak spots** in roads that **hardly ever** get congested?




Why uncongested roads?

- Not congested roads → also interesting
- Bottlenecks of the future
- Hidden weak spots

Example: Evacuation of Walcheren



Proposed method

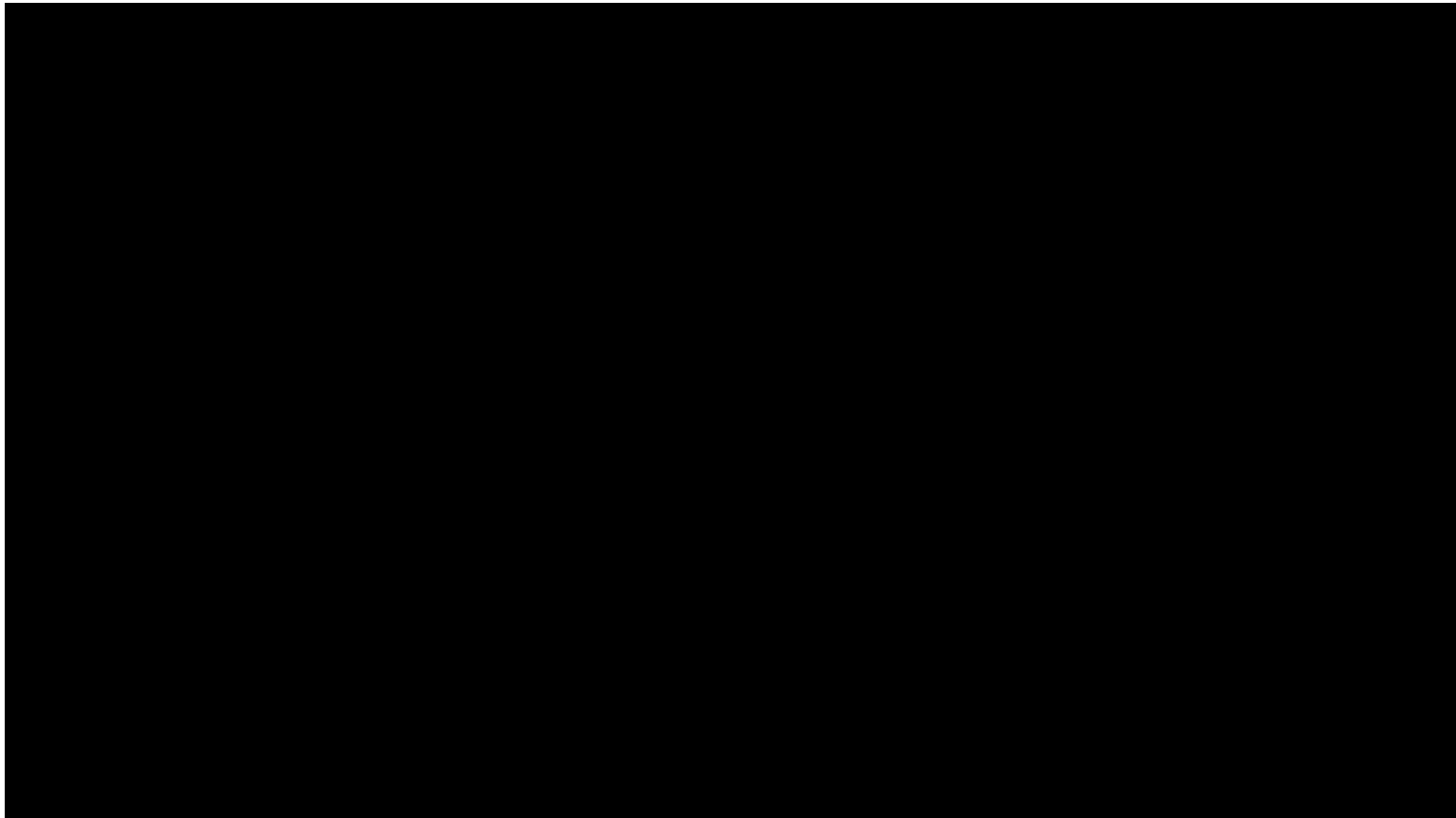
- Load the road, so that you create traffic congestion.
- By using moving bottlenecks.
- A moving bottleneck = slow moving vehicle (e.g. truck)
- No overtaking possibilities.
- Behind moving bottleneck  Heavy loaded road.
- Identify weak spots.

Input data (1)

- Actions on highways to protest
- Police action in 2015
- Congested & Uncongested roads in NL

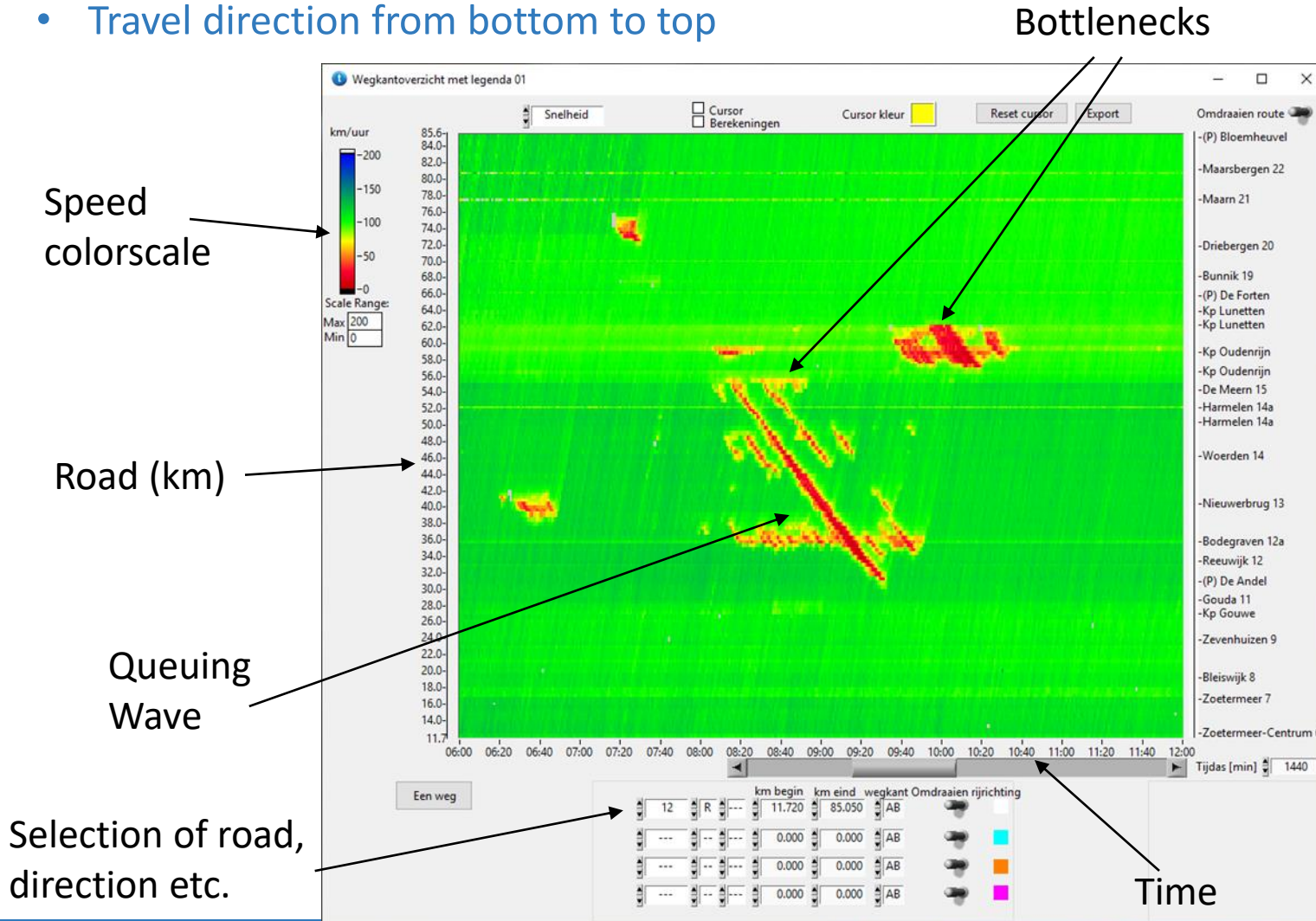
Input data (2)

- Driving in all lanes simultaneously (no overtaking possibilities)
- Police cars with steady speed 60 km/h



Transpute's Viewer: Data Visualization Tool

- Space – Time diagram (Tijdwegdiagram)
- The speed is represented as a quantity in color
- Travel direction from bottom to top



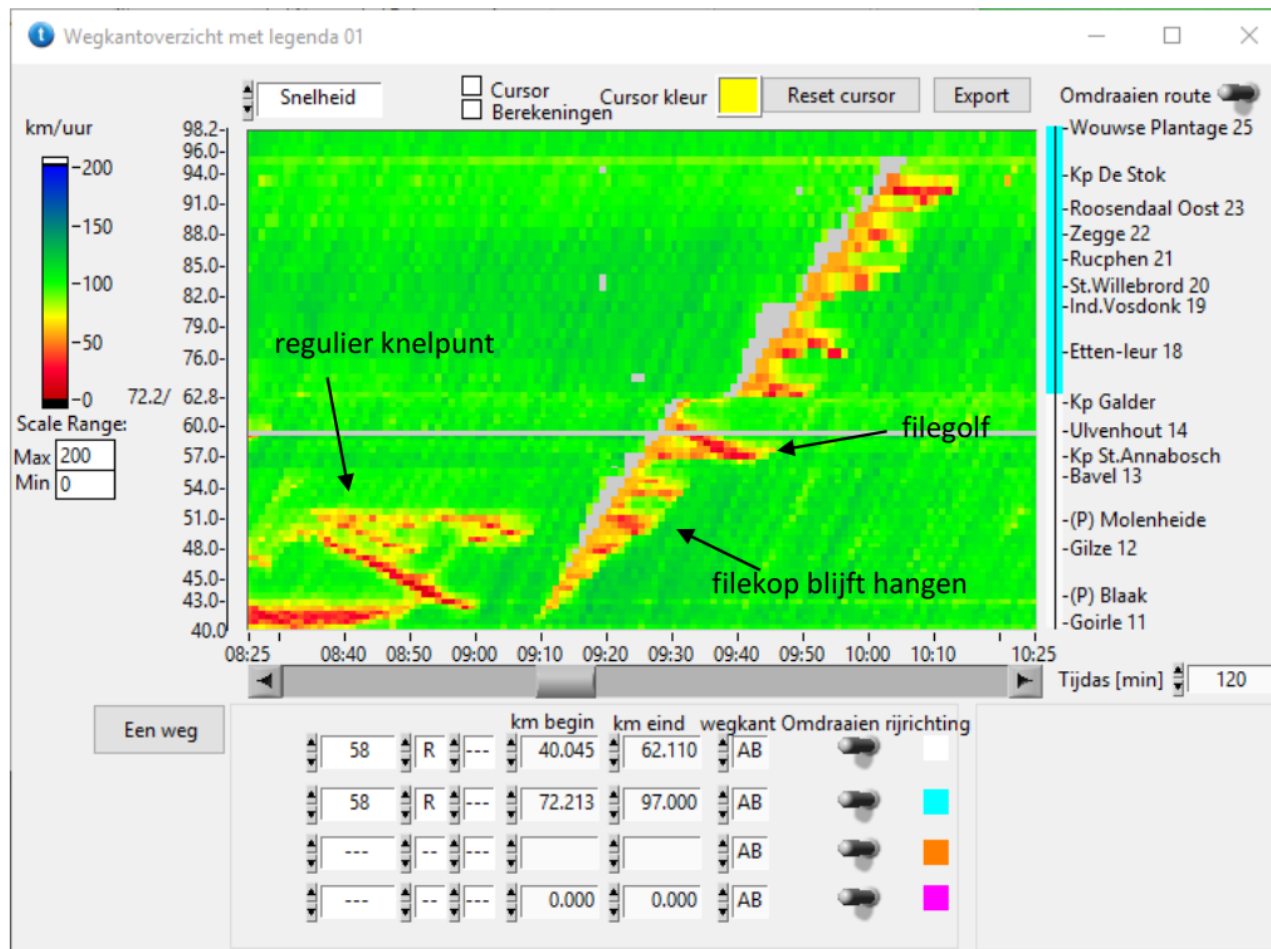
Example 1

- Tuesday 7 April 2015
- From Tilburg to Vlissingen
- Both directions of A58
- Begun at 9.10 am (after spits)

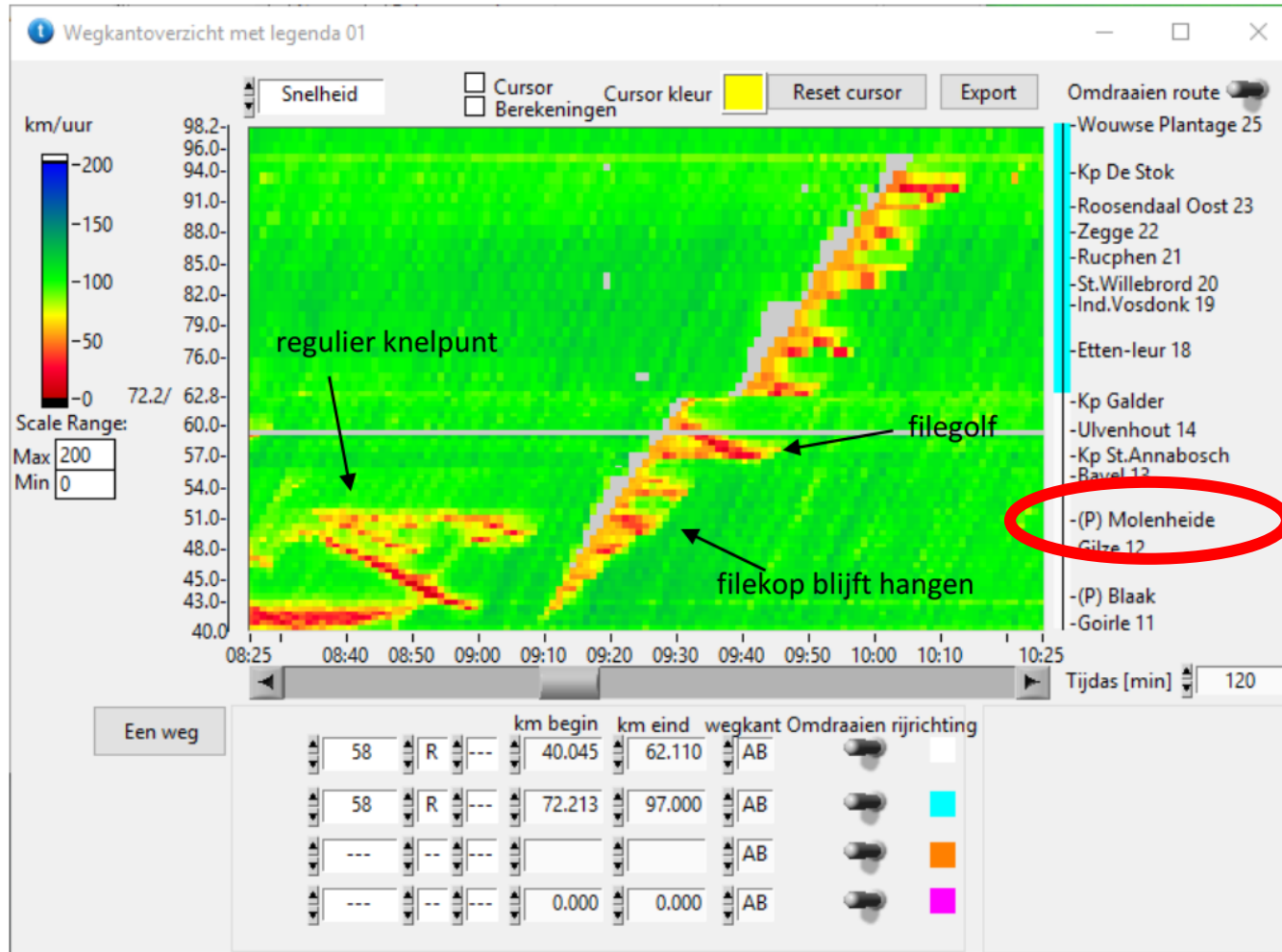


Bron: www.bd.nl

- Grey zone above moving bottleneck: no cars measured (traffic vacuum).
- Waves are coming off the moving bottleneck.
- The head of the traffic jam hangs for a while => temporary bottlenecks.
- “Green” in between.
- Traffic splits: a leading group (moving bottleneck) and temporary traffic jam (weak spot).



- Comparison with normal congestion during rush hour.



Example 2

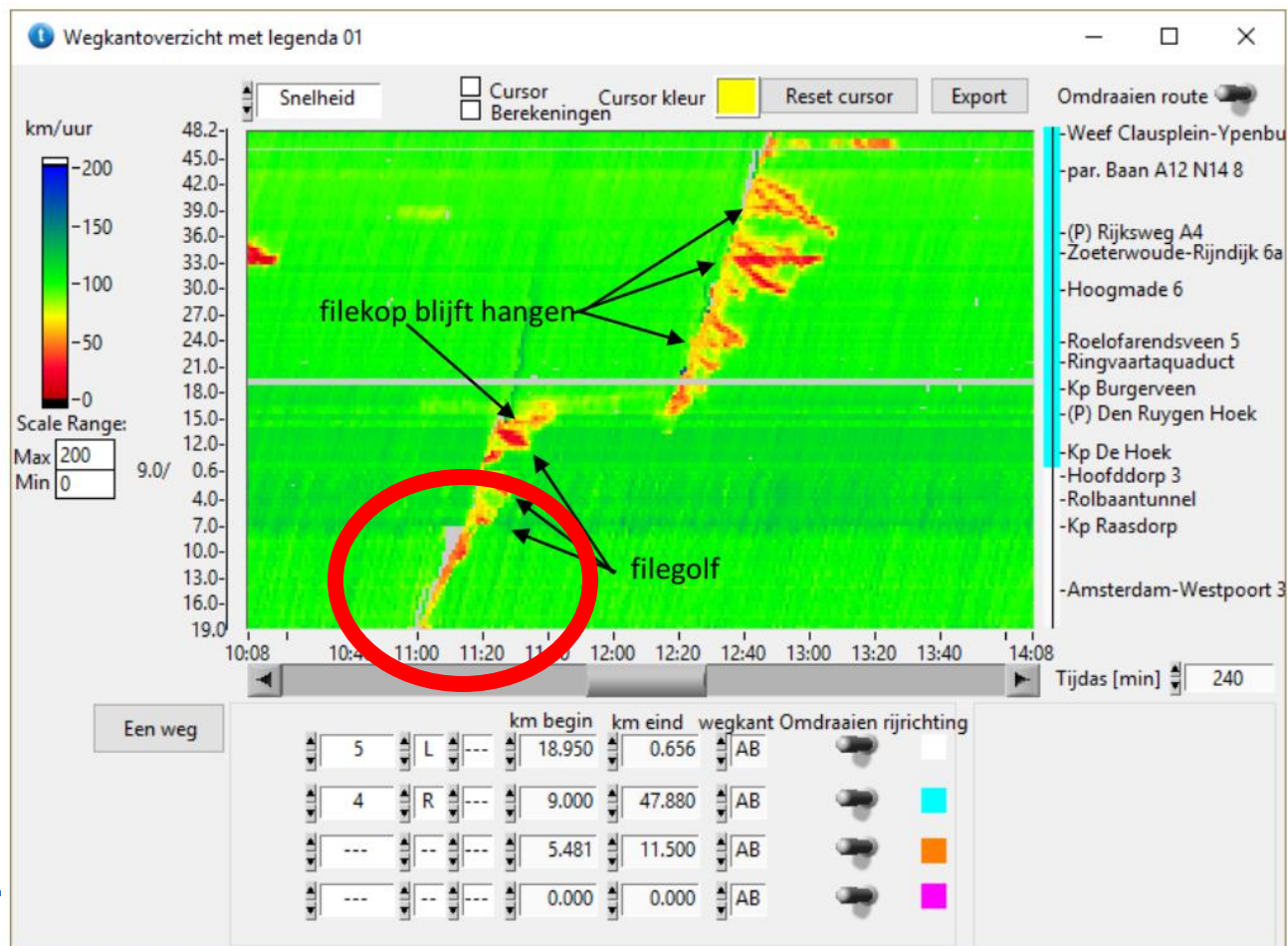
- Wednesday 22 April 2015
- Bigger area to draw attention
- From 7am to 8pm
- Next slide: A5-A4



Bron: RTL news

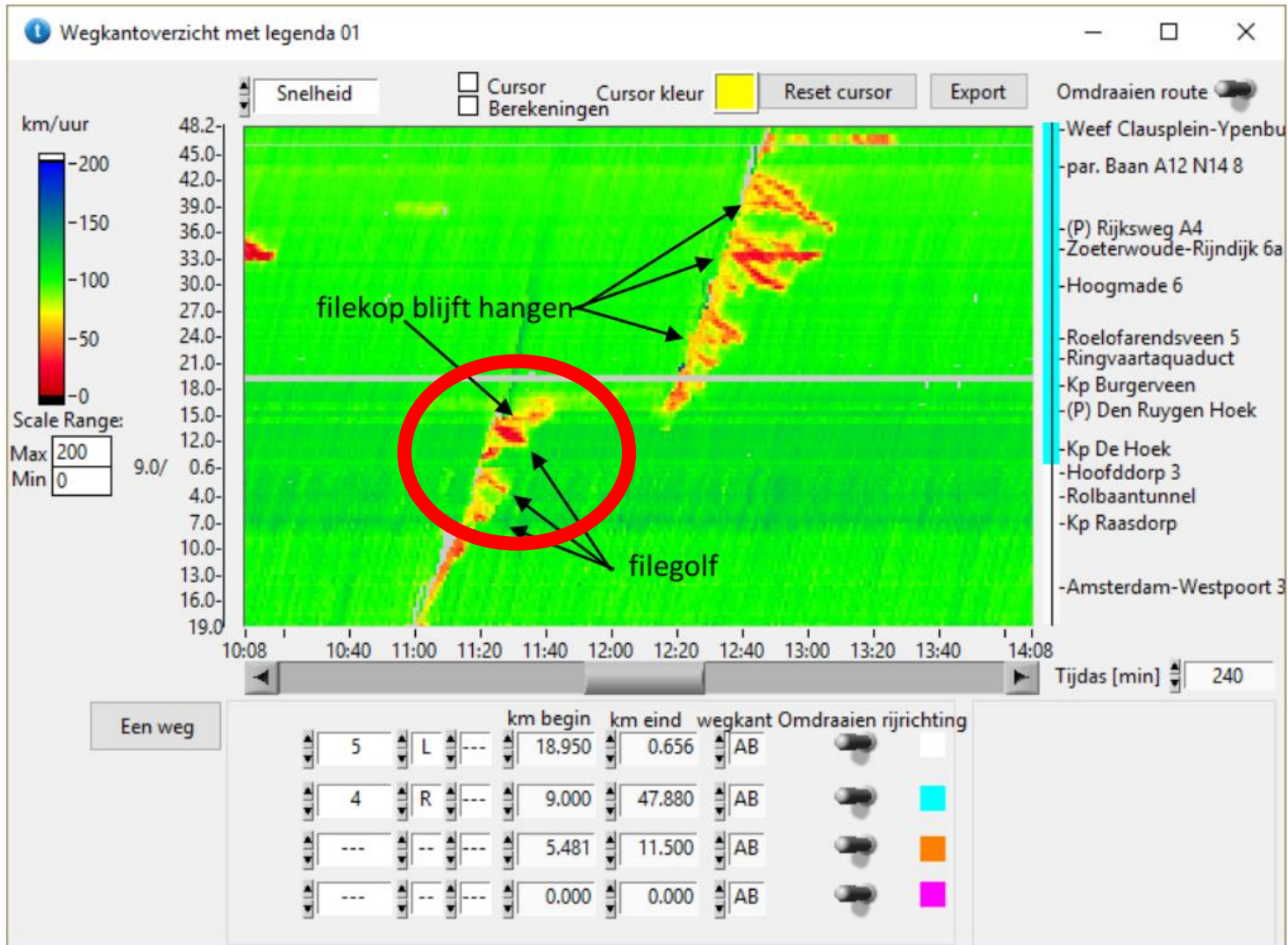
First stage, first part:

- Everything is generated by the action.
- A short, compact moving bottleneck.
- Speed drops far below the 60 km/h.
- Nothing special happens.
- Weak spots free area? OR Traffic load not enough?



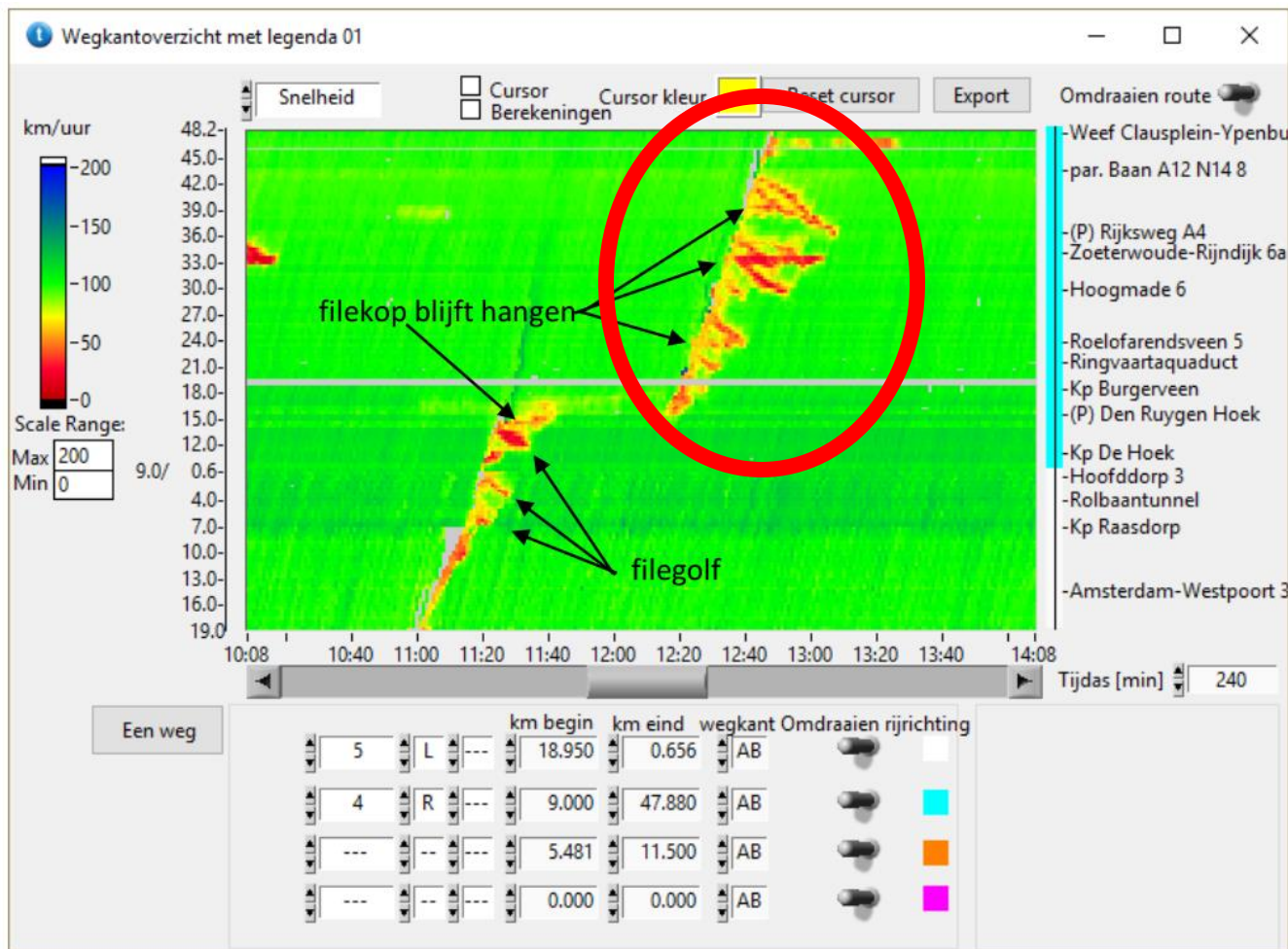
First stage, second part:

- Three waves, at km 5, km 2 and km 14.
- No weak spots, more likely that they arose spontaneously.



Second stage:

- Three times the head of the traffic jam hangs: at km 24, km 33 and km 39.
- At Zoeterwoude (km 33) coincides with a known bottleneck (the connection with N11).
- The other two also indicate weak spots.
- Capacity of weak locations: Measure the outflow of the head of the traffic jam.



Results

- Already known bottlenecks were reproduced.
- Where there was no known bottleneck, it was affected by the road geometry.
- So, the method seems to work.
- The police actions are sufficient for location determination.
- Such data not enough to measure capacity.

Possible real applications

- Improvement of our knowledge (so better planning).
- Next step: Investigate cases with a longer queue.
For example: - by digging through old data.
- by obtaining an experiment set up by the road administrator.
- Periodical tests – e.g. 5 years.
- Speed of 70 km/h is enough.

Conclusions

- Knowledge important to overcome for unwanted situations (events, evacuation, road planning).
- Consistent results.
- Method needs validation and elaboration of test design.
- Periodic measurement of roads should be included in road management.

Questions



Adviseur en specialist in verkeersoplossingen, verkeersdata en praktijkgericht onderzoek

 www.transpute.nl
 info@transpute.nl
 033-4618100

transpute

Further discussion

- To know weak spots and hidden bottleneck capacities: how valuable is this knowledge?
- But is it ok to do so? (block the road on purpose)
- Does the goal justify the means? (e.g. cause some delay, what if an accident happens?)

www.transpute.nl

Adviseur en specialist in verkeersoplossingen, verkeersdata en praktijkgericht onderzoek

 www.transpute.nl
 info@transpute.nl
 033-4618100

transpute