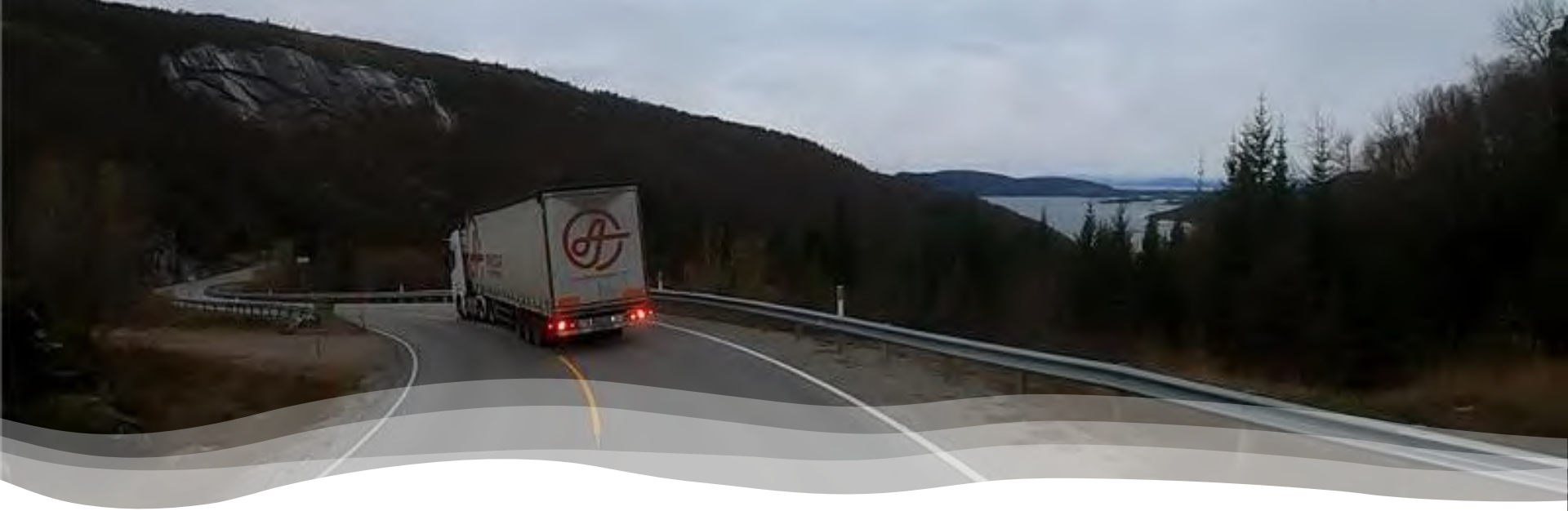


Truck convoys in Norwegian rural freight routes with challenging road and weather conditions

On-road pilot October 2020

Motivation

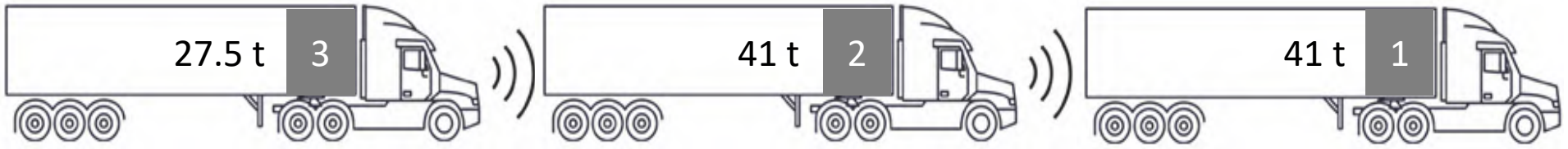
IDENTIFY FUTURE RESEARCH NEEDS
- What can we learn from real-world testing?

ASSESS INFRASTRUCTURE READINESS
- Are the roads good enough?

INFORM FUTURE REGULATIONS
- Impacts on truck drivers and other road users

3 trucks and 3 drivers

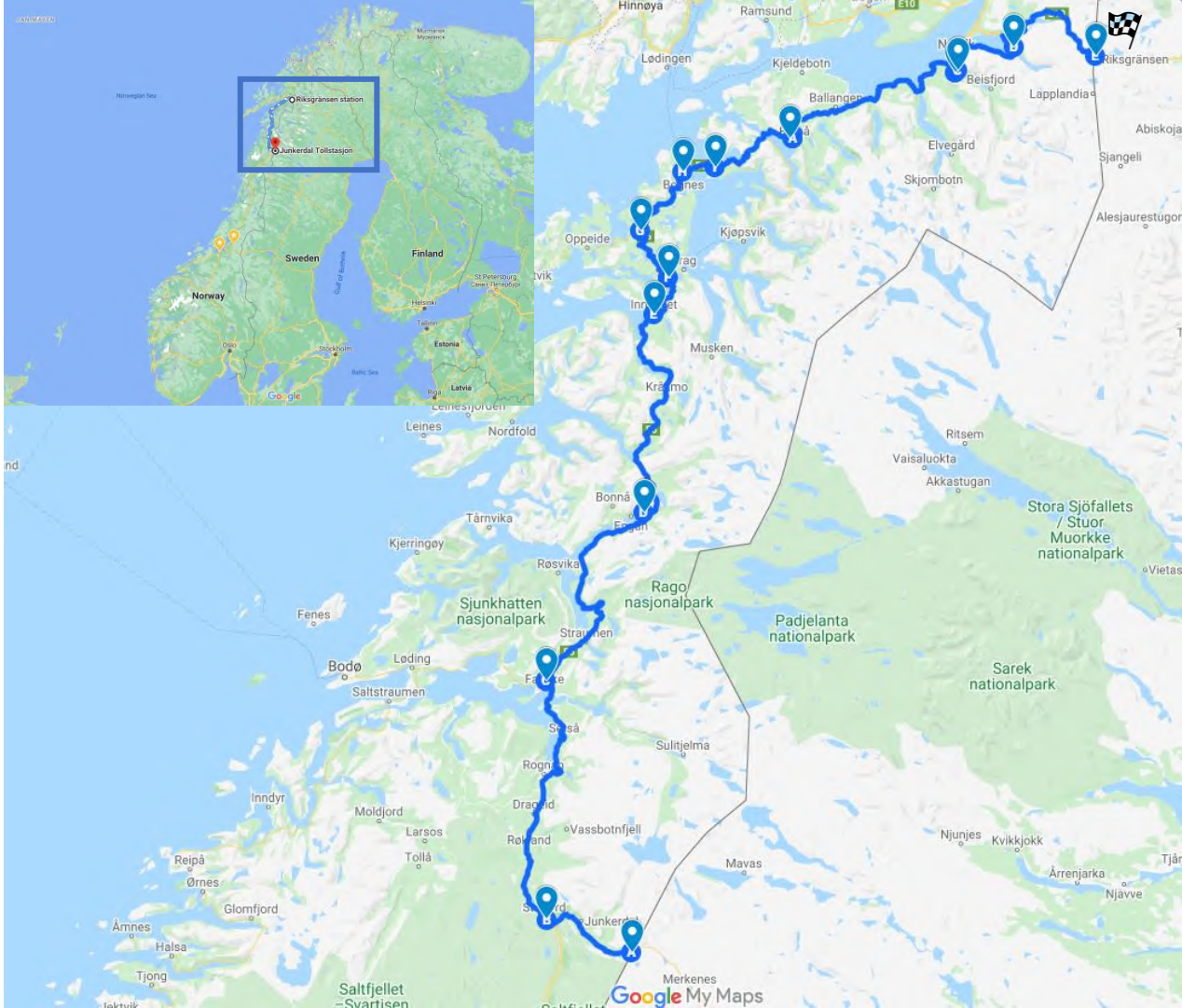
- connected through a convoy system based on radar and camera
- first truck controlled speed and distance between the trucks
- drivers performed steering manually



380 km predefined route

- main freight route between north and south

- curves,
- steep uphill / downhill
- narrow roads,
- tunnels,
- bridges,
- ferry



TRUCK DATA SOURCES

Dashcam

Driver ACC interaction on steering wheel

Driver braking and acceleration pedals

GPS data logger

Fleet management systems

Radar

Top view

Bottom view

Side view

EQUIPMENT

DRIVER DATA SOURCES

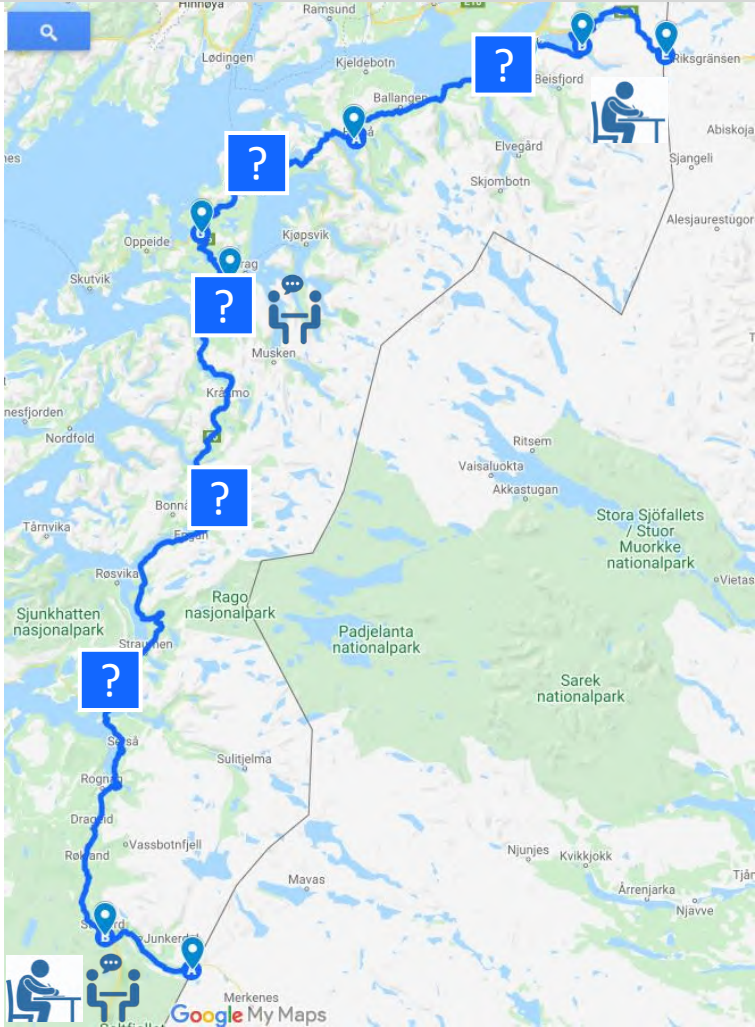
Pretest questionnaires

Questionnaires in breaks

Ratings while driving (every 15 min)

Posttest questionnaires

Interviews



Bittium Faros 180
heart rate monitoring

Pupil Invisible
eye-tracking glasses


2.6 TB of data

How does platooning affect driver workload?

Simulator studies show mixed results:

- Workload unaffected (Wille et al., 2008)
- Higher workload for partial compared to full automation (Hjälmdahl et al., 2017)

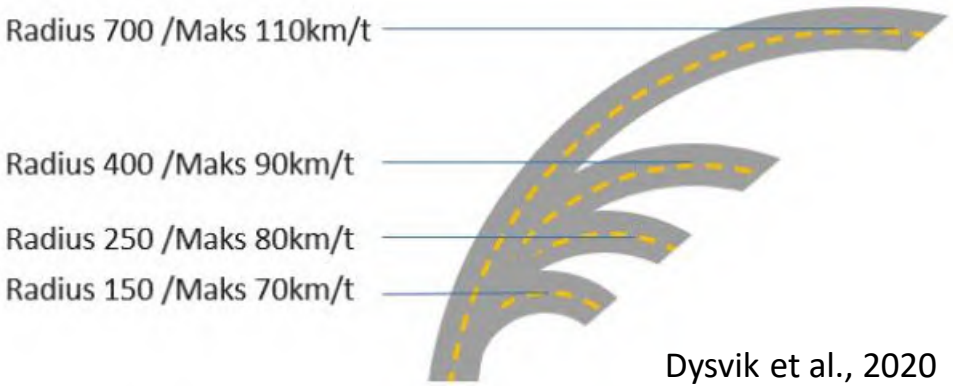
KONVOI 2005 – 2009

Hjälmdahl et al., 2017

How does road geometry affect workload?

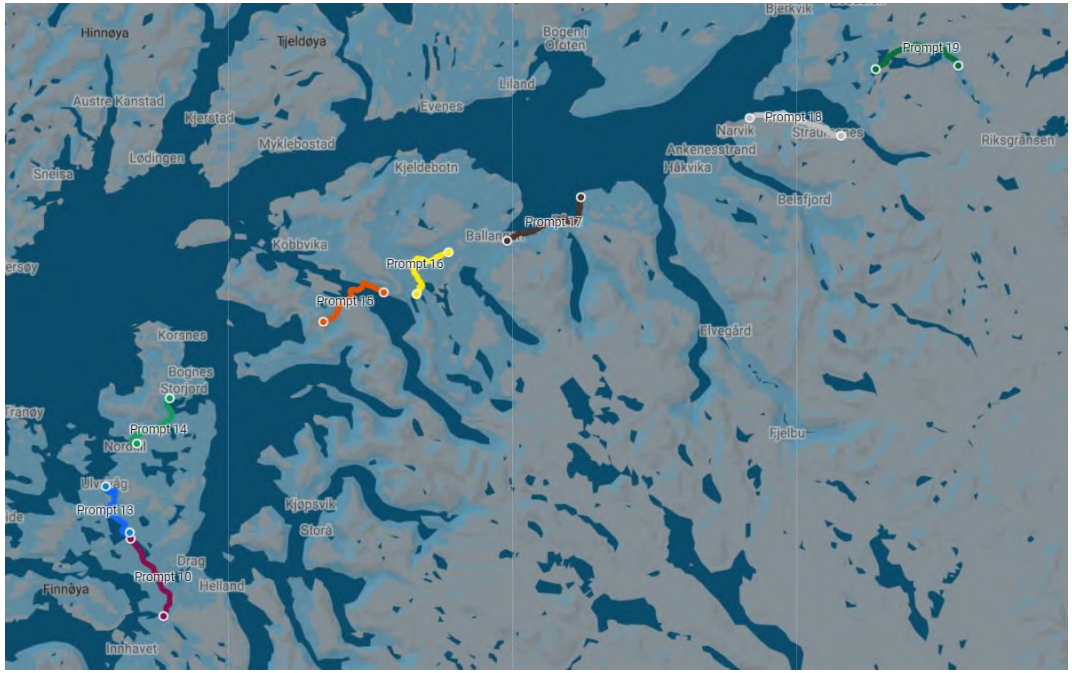
- Driver workload increases linearly with the inverse of radius. As radius becomes smaller driver workload increases. (Fitzpatrick et al., 2000).

Figur 3-9 Illustrasjon horisontalkurvatur

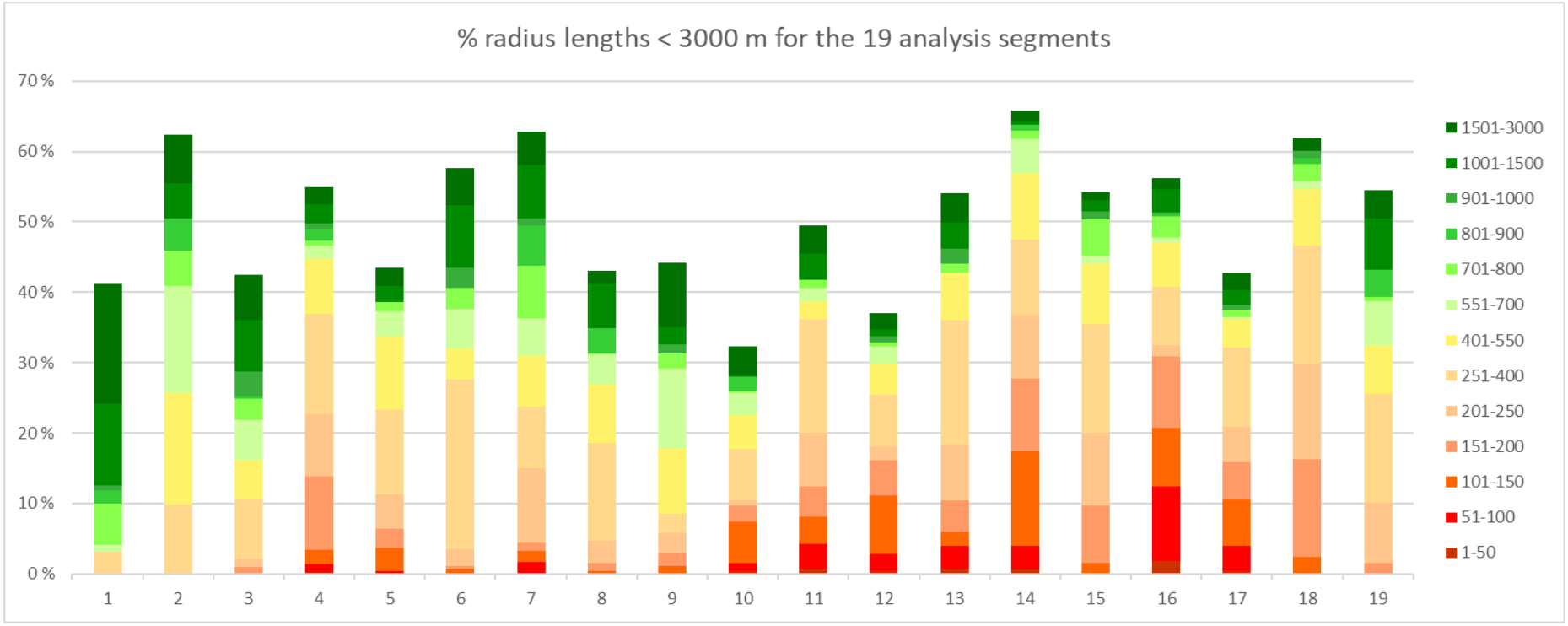


Dysvik et al., 2020

19 analysis segments
(driver oral ratings)

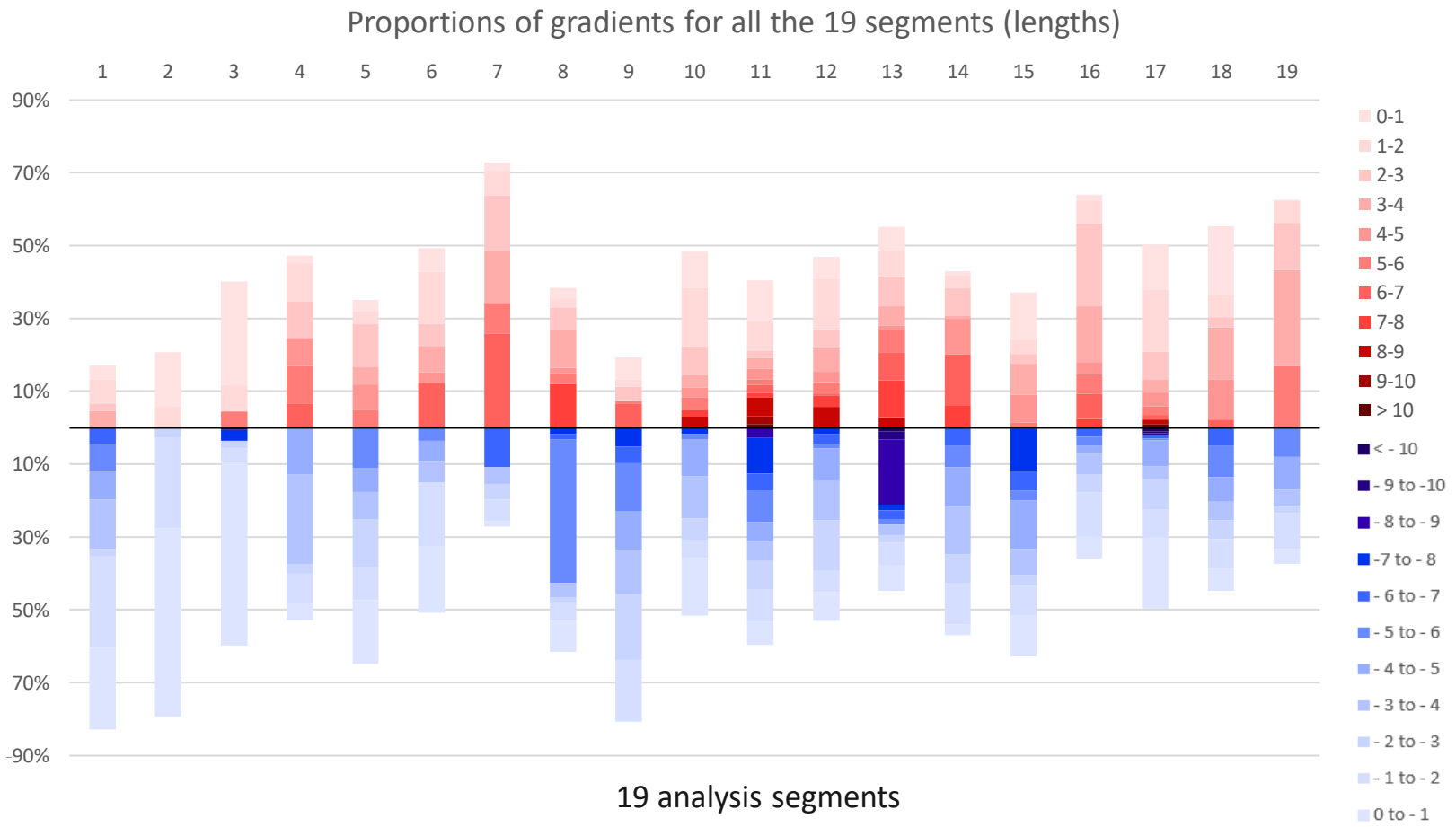


Horizontal geometry

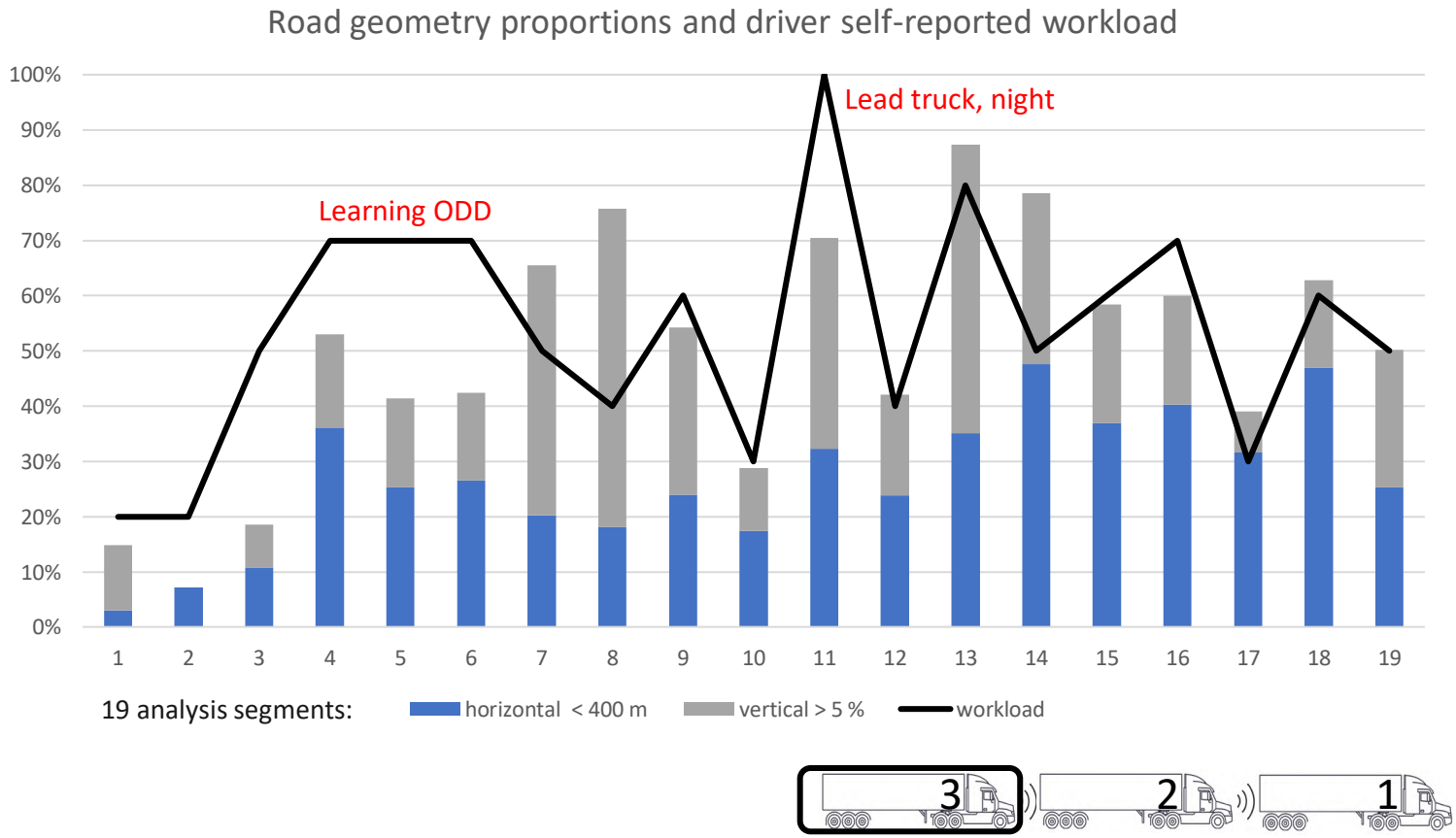


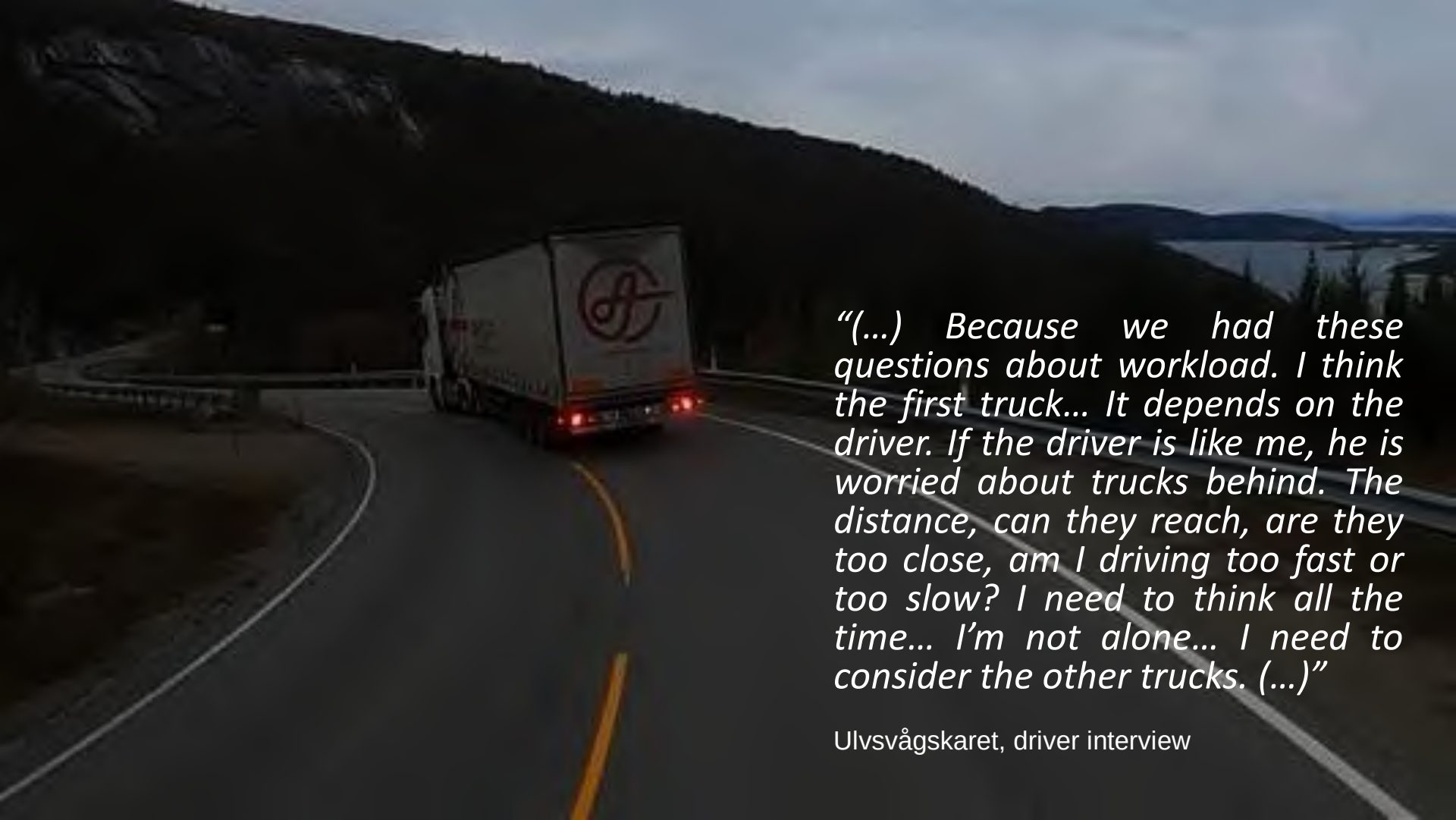
19 analysis segments

Vertical geometry



Road geometry and workload





“(…) Because we had these questions about workload. I think the first truck… It depends on the driver. If the driver is like me, he is worried about trucks behind. The distance, can they reach, are they too close, am I driving too fast or too slow? I need to think all the time… I’m not alone… I need to consider the other trucks. (…)”

Ulvsvågskaret, driver interview

Valuable insights from conducting the on-road pilot

- Road geometry, overtaking lanes and stop pockets
- Operation of truck platoons in normal traffic
- Platoon system connection
- Driver workload and trust in the technology
- Applicable research methods and promising approaches
- Future research needs

Thank you
for your attention

Questions?

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