DCAS Testing Campaign

Public road testing

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European Commission Joint Research Centre

Introduction

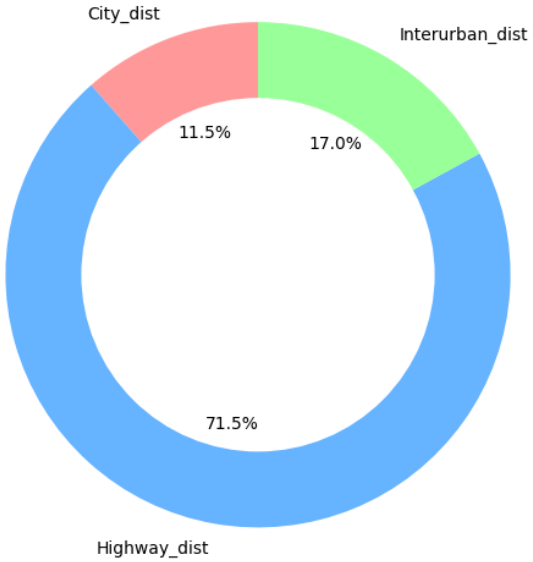
- Public road tests
  - 2 weeks of testing
  - 1st week's results included presented hereafter (2000 km driven per vehicle)
- NOT to perform benchmarking among them
- Carry out pre-normative research to support DCAS legislation

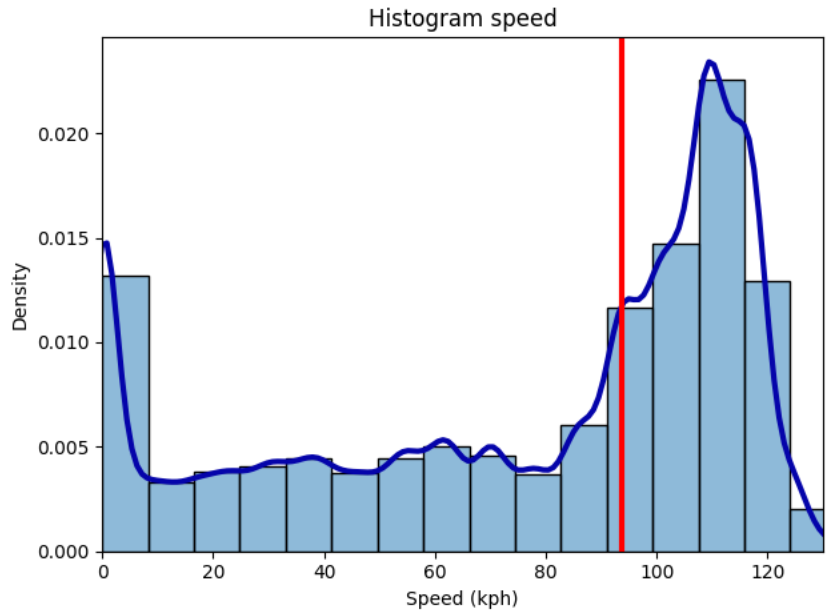
General statistics

Public road

Overall – Vehicle 1 stats

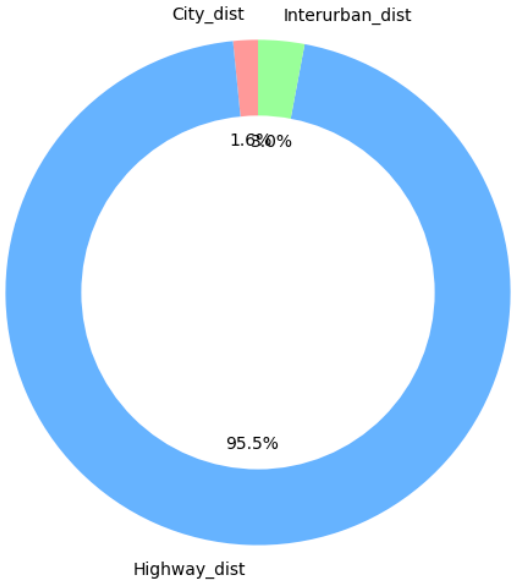
	Total	Mean	Median	Q1	Q3
Events (-)	355				
Distance (km)	1939				
Speed (kph)		80.72	93.60	57.04	107.18
a_x (m/s²)		-0.01	0.00	-0.05	0.06
Sun time (%)	72				
Cloud time (%)	19				
Rain (%)	9				
Fog (%)	<1				

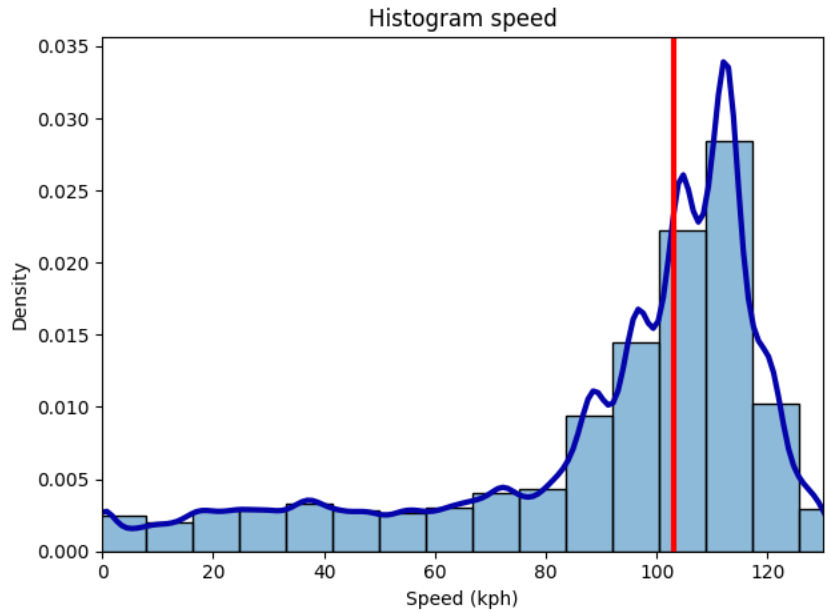




Overall – Vehicle 2 stats

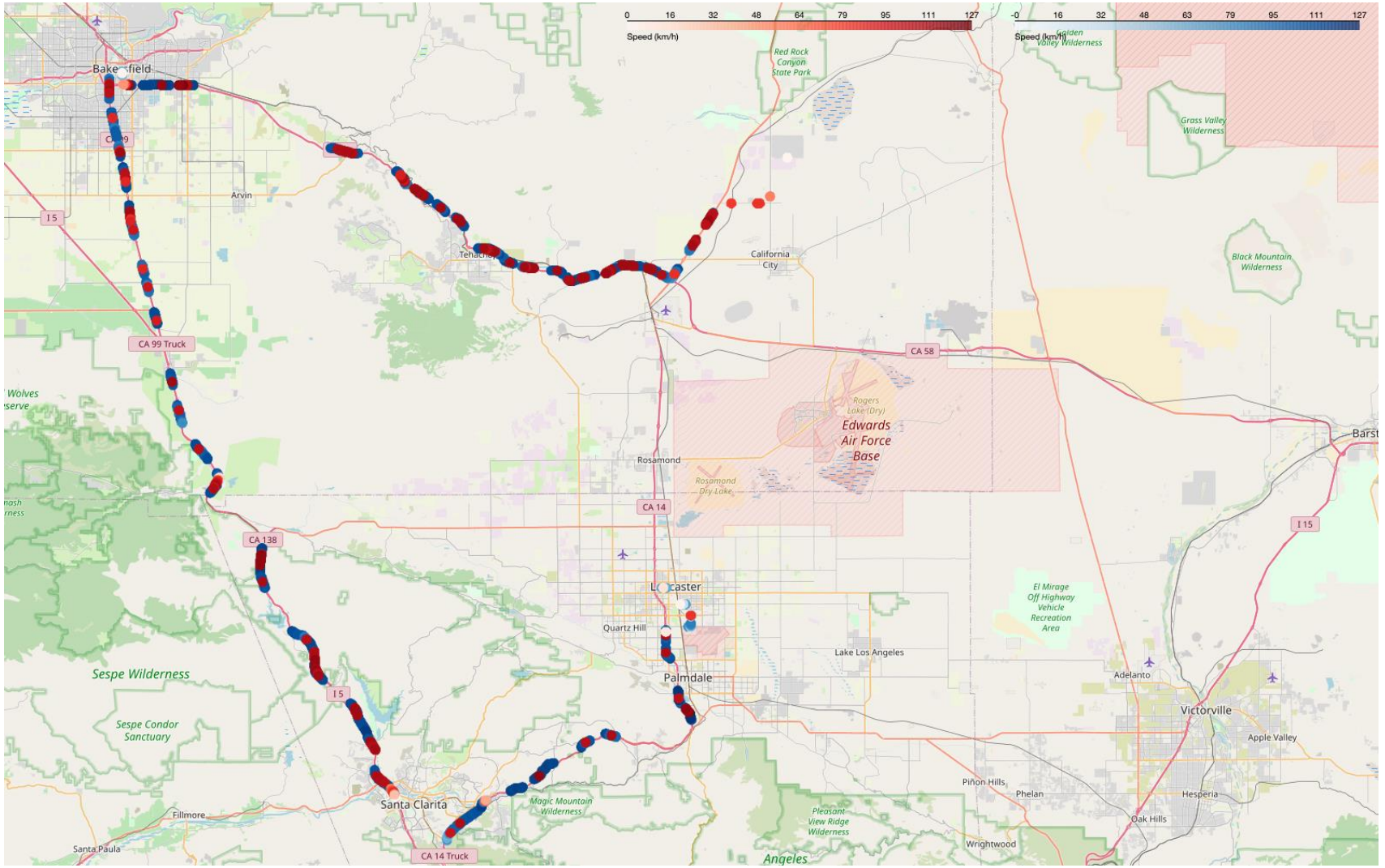
	Total	Mean	Median	Q1	Q3
Events (-)	295				
Distance (km)	1939				
Speed (kph)		87.61	99.12	75.33	110.81
a_x (m/s²)		0.03	0.01	-0.9	0.17
Sun time (%)	72				
Cloud time (%)	23				
Rain (%)	4				
Fog (%)	<1				





Detailed statistics

Day 1 – map



Legend:

- Global
- Event

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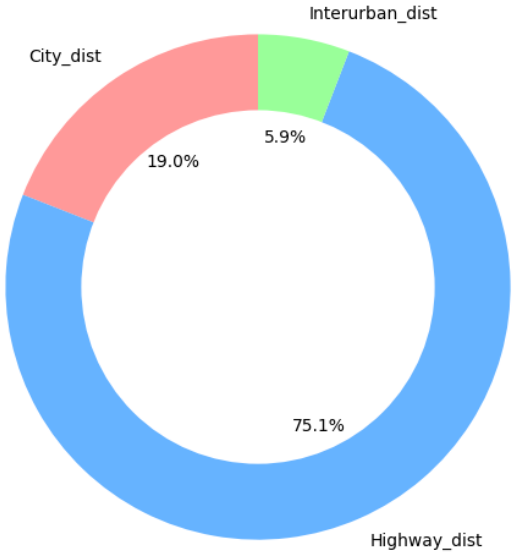
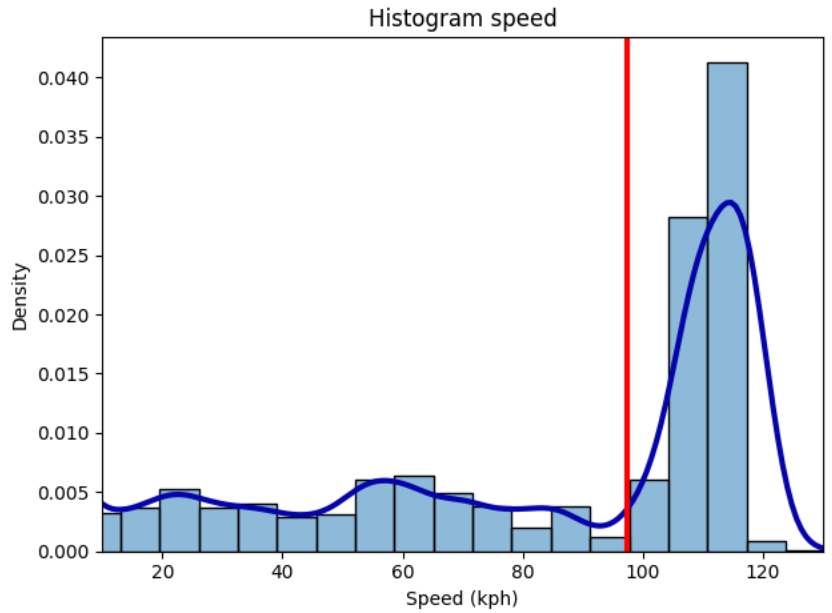
Day 1 – Vehicle 1 stats

	Total	Mean	Median	Q1	Q3
Events (-)	58				
Distance (km)	408				
Speed (kph)		73.89	97.31	32.40	113.04
a_x (m/s²)		-0.0058	6.14e-10	-0.011	0.027
Sun time (min)	166				
Cloud time (min)	13				
Rain (min)	0				
Fog (min)	0				





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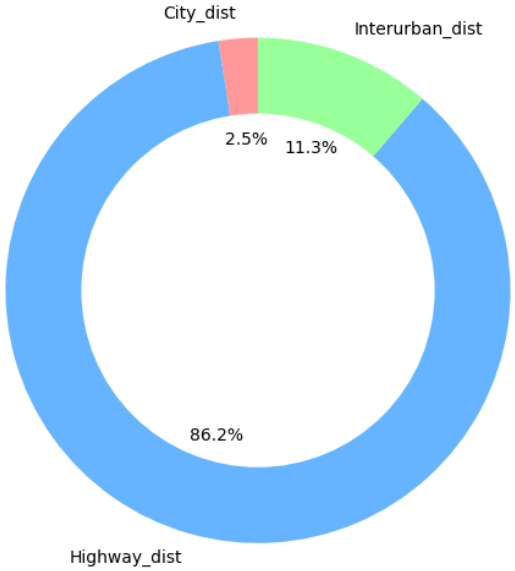
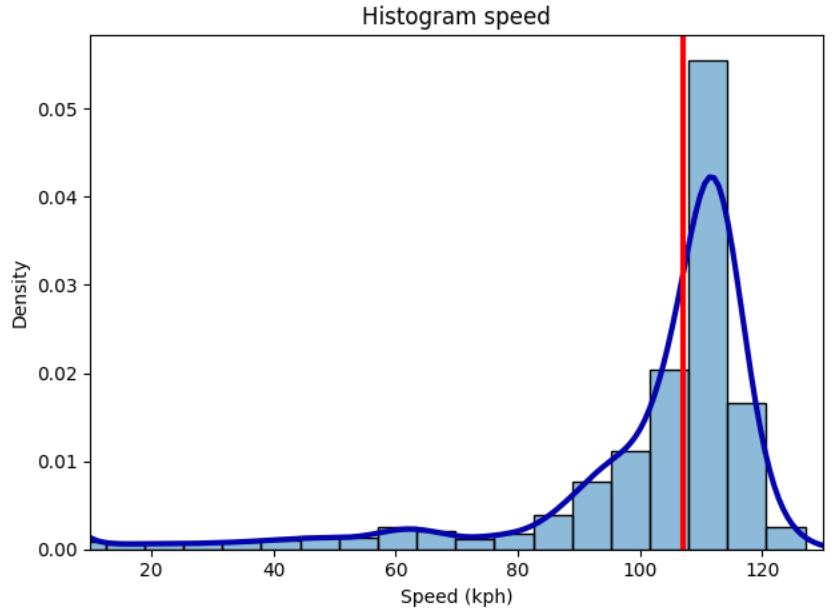
Day 1 – Vehicle 2 stats

	Total	Mean	Median	Q1	Q3
Events (-)	67				
Distance (km)	408				
Speed (kph)		85.89	107.10	82.19	112.61
a_x (m/s²)		0.021	0.0033	-0.078	0.14
Sun time (min)	133				
Cloud time (min)	67				
Rain (min)	0				
Fog (min)	0				





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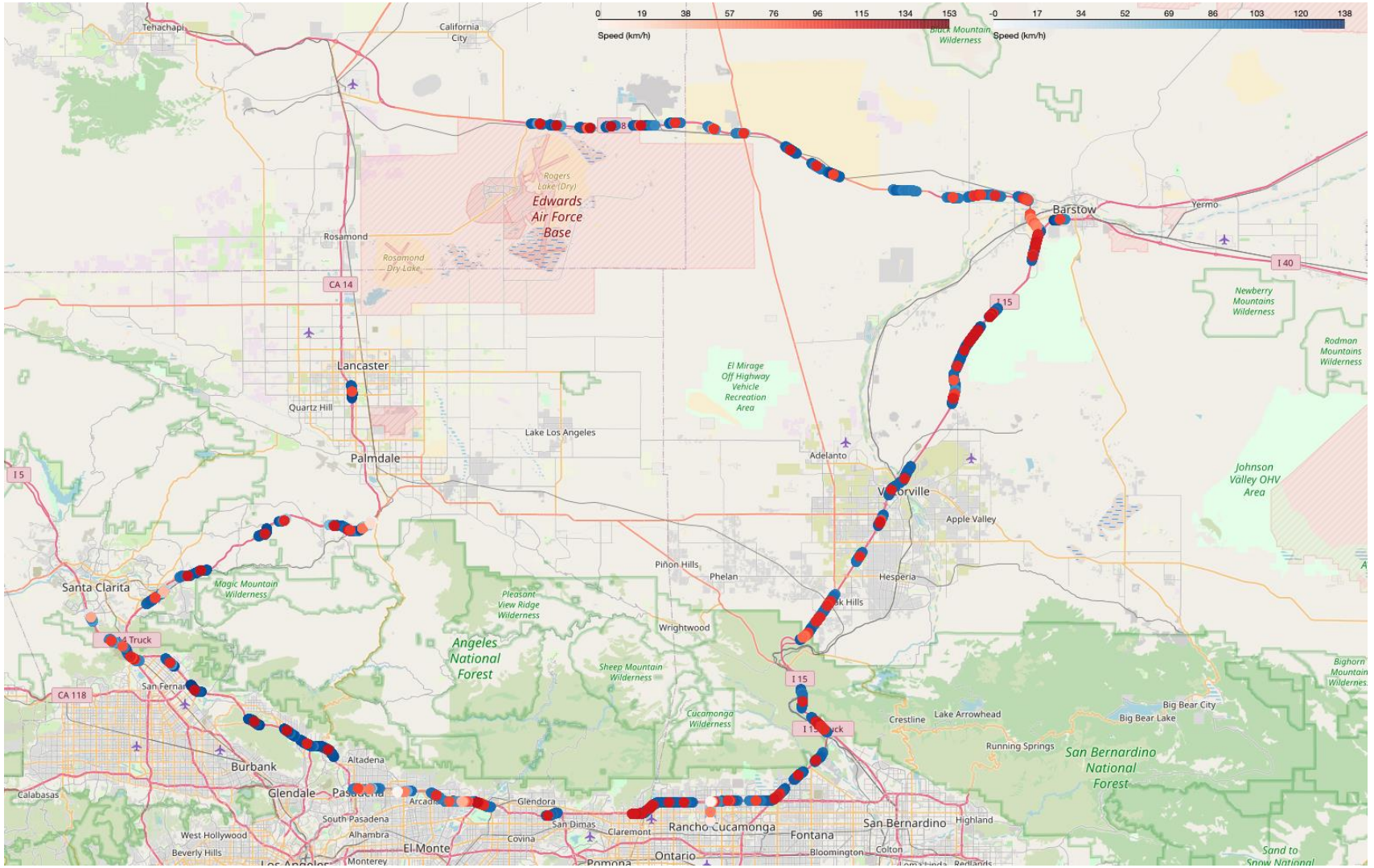
Day 2 – map



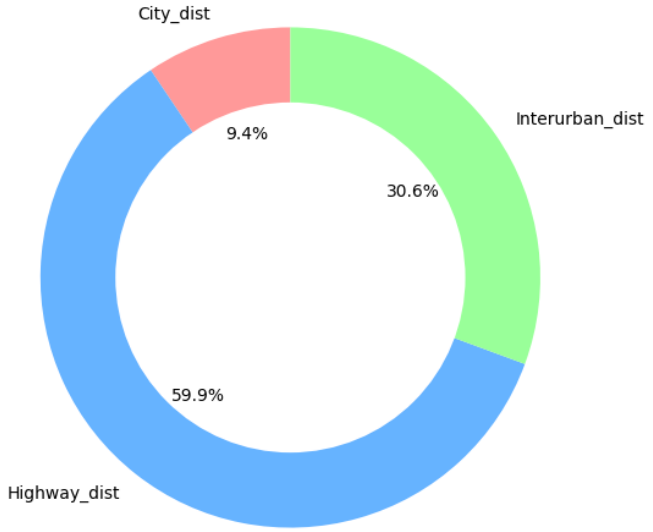
Legend:

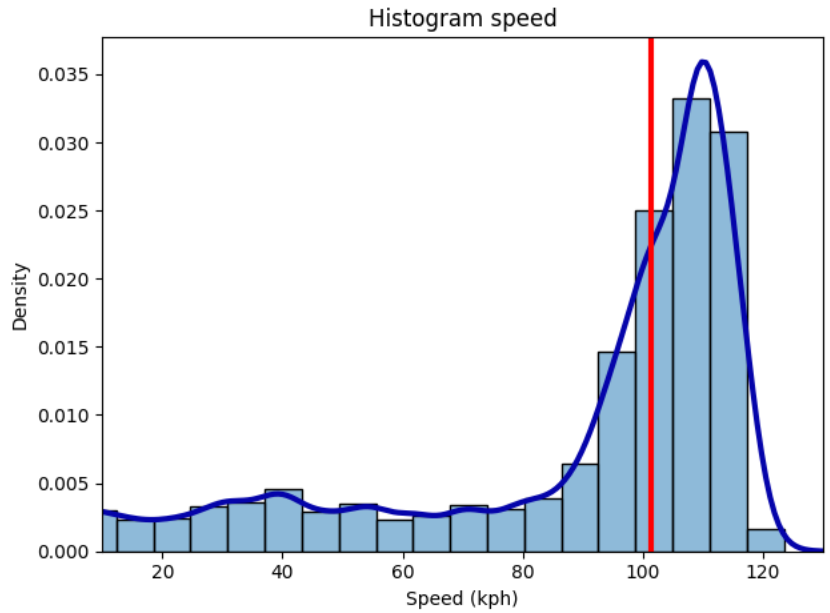
- Global
- Event

European Commission

Day 2 – Vehicle 1 stats

	Total	Mean	Median	Q1	Q3
Events (-)	92				
Distance (km)	490				
Speed (kph)		85.23	101.30	69.50	109.25
a_x (m/s²)		-0.0052	5.11e-9	-0.034	0.052
Sun time (min)	91				
Cloud time (min)	135				
Rain (min)	50				
Fog (min)	3				





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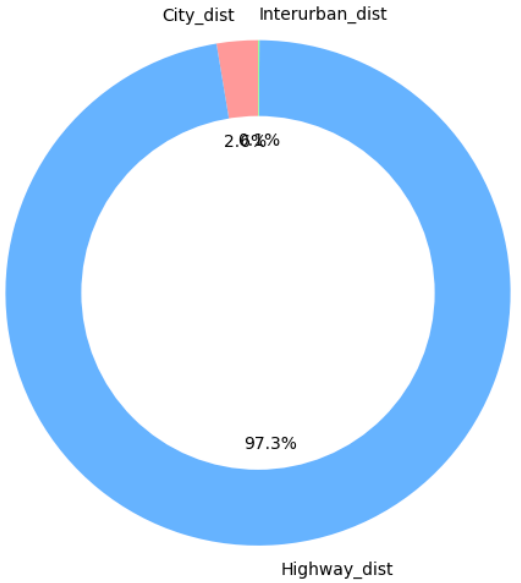
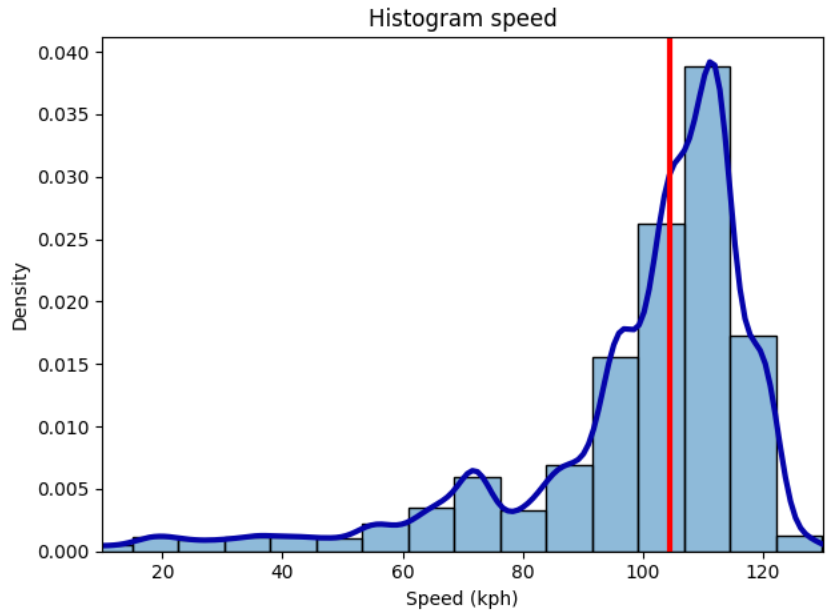
Day 2 – Vehicle 2 stats

	Total	Mean	Median	Q1	Q3
Events (-)	78				
Distance (km)	490				
Speed (kph)		96.34	104.54	92.81	112.43
a_x (m/s²)		-0.0070	0.0033	-0.055	0.093
Sun time (min)	138				
Cloud time (min)	57				
Rain (min)	28				
Fog (min)	3				





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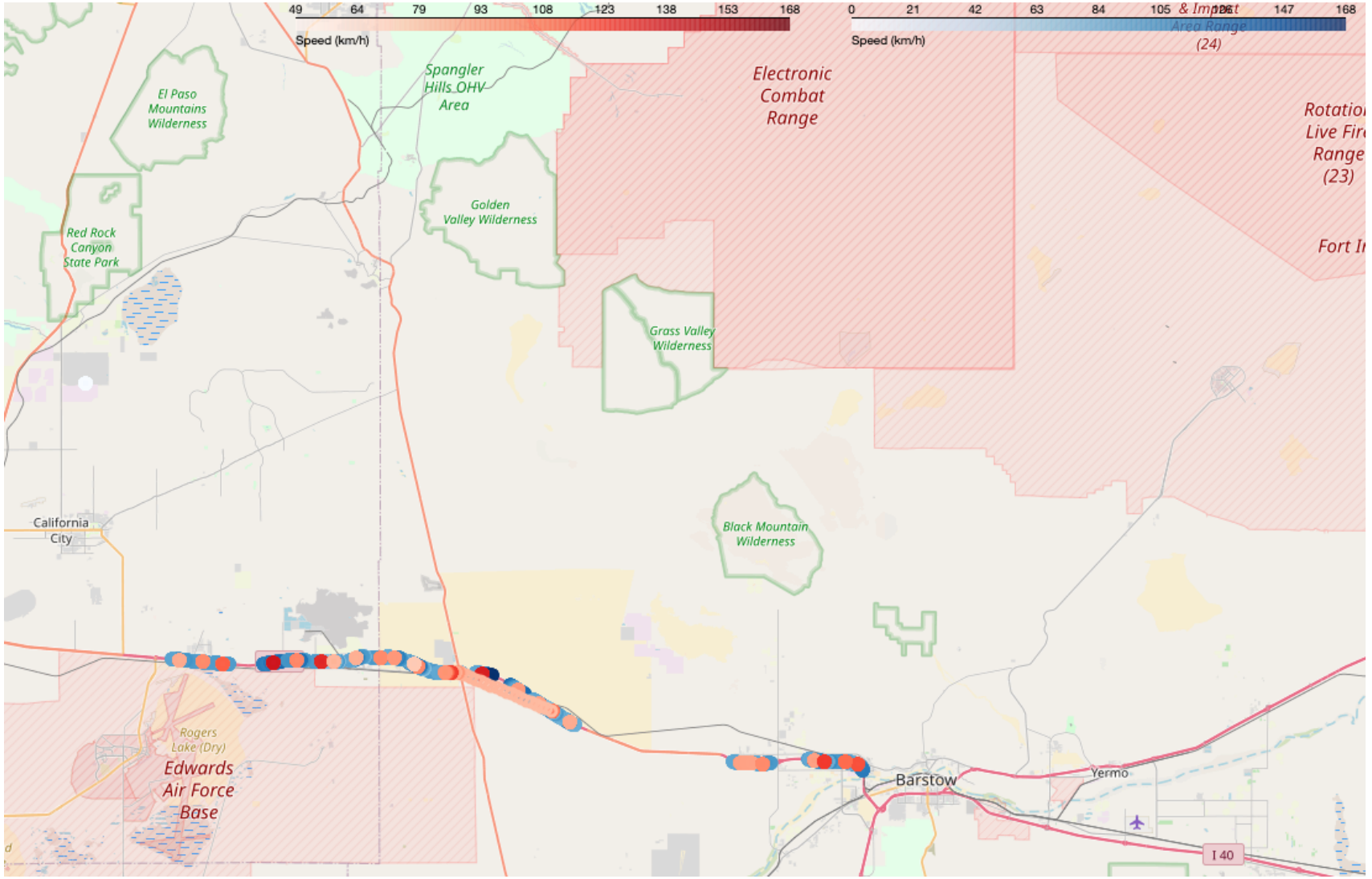
Day 3 – map



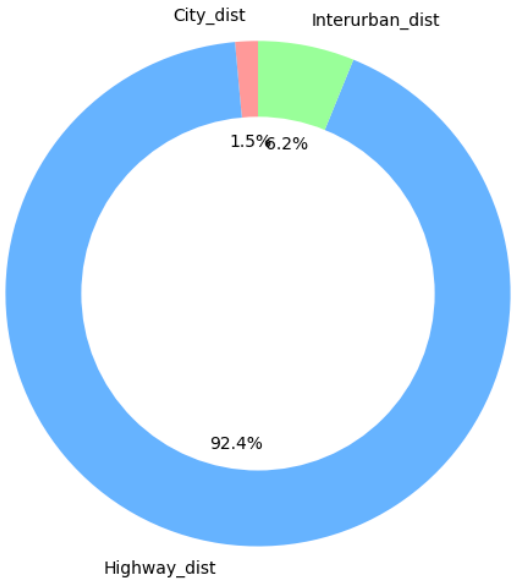
Legend:

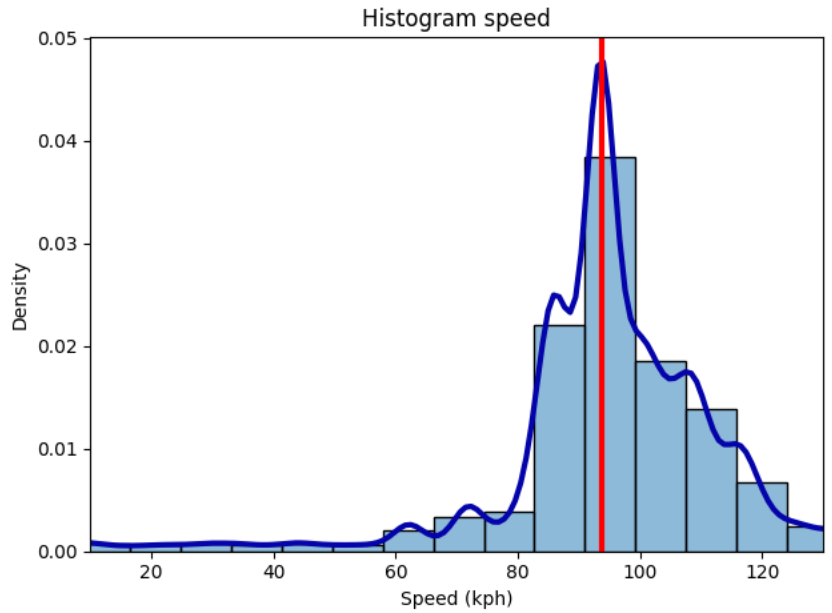
- Global
- Event

European Commission

Day 3 – Vehicle 1 stats

	Total	Mean	Median	Q1	Q3
Events (-)	35				
Distance (km)	255				
Speed (kph)		95.22	93.65	87.40	105.81
a_x (m/s²)		-0.0010	-1.1e-06	-0.11	0.081
Sun time (min)	108				
Cloud time (min)	0				
Rain (min)	0				
Fog (min)	0				





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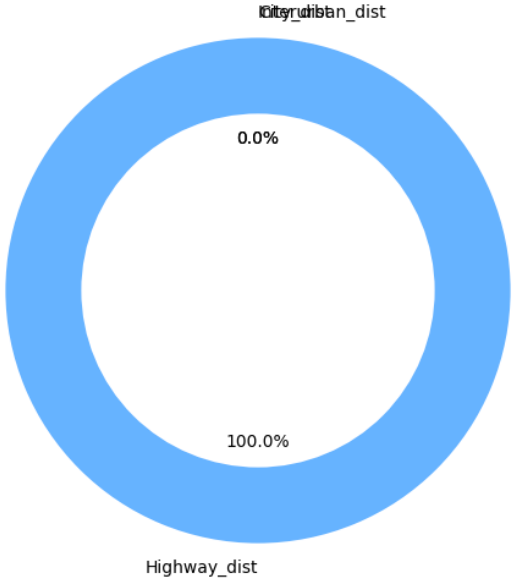
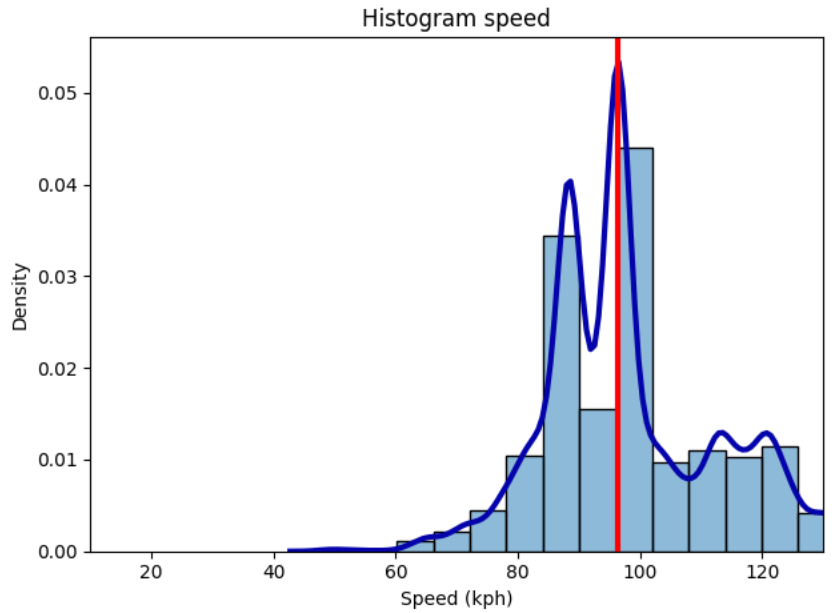
Day 3 – Vehicle 2 stats

	Total	Mean	Median	Q1	Q3
Events (-)	25				
Distance (km)	255				
Speed (kph)		99.98	96.44	88.34	110.81
a_x (m/s²)		0.0097	-0.0025	-0.14	0.12
Sun time (min)	72				
Cloud time (min)	0				
Rain (min)	0				
Fog (min)	0				





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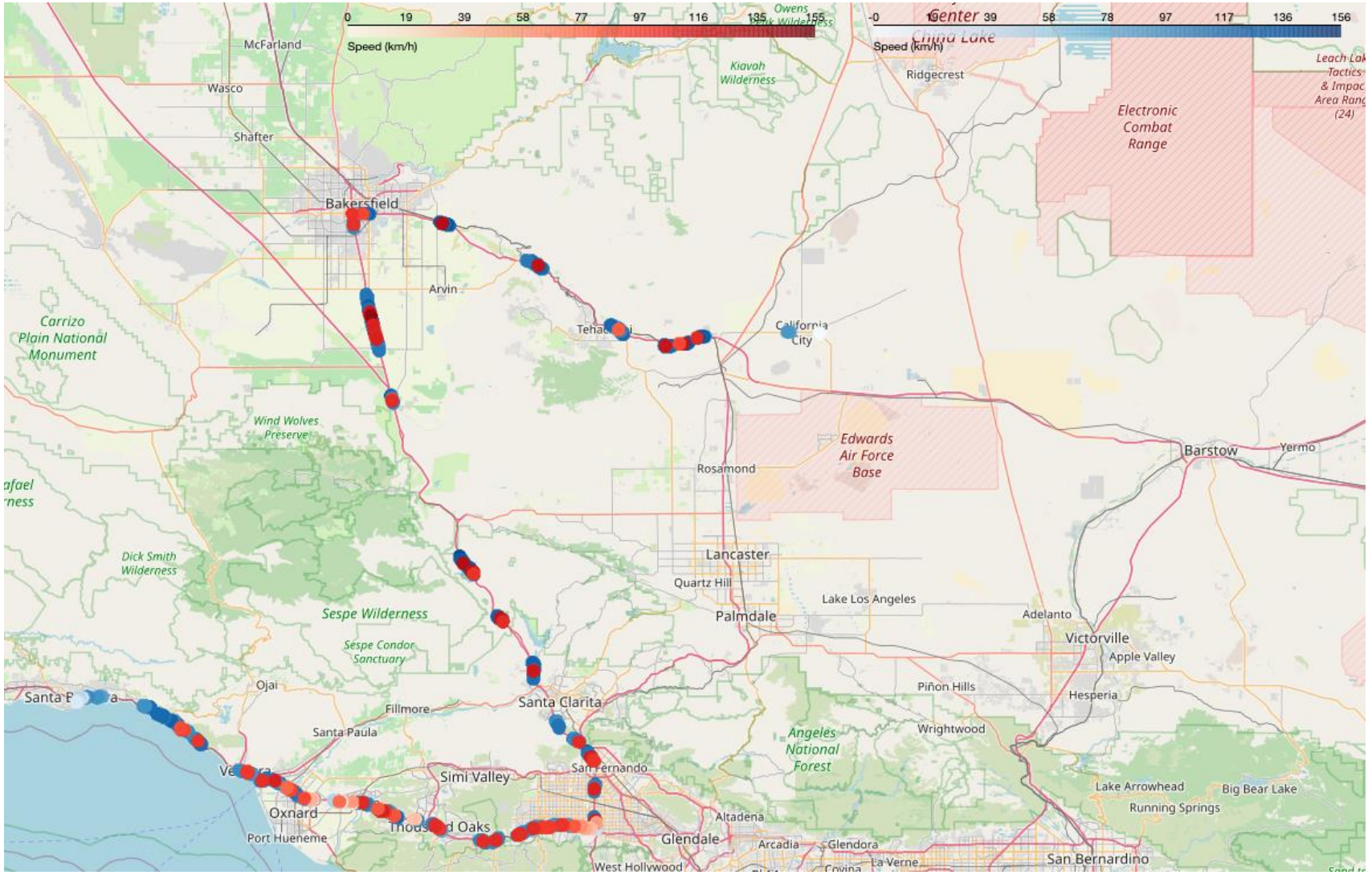
Day 4 – map



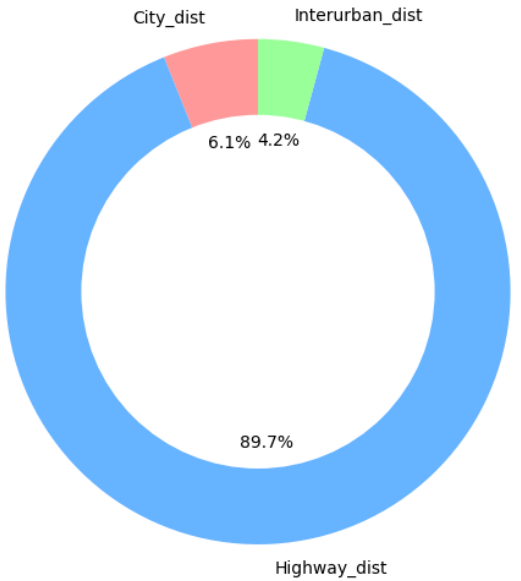
Legend:

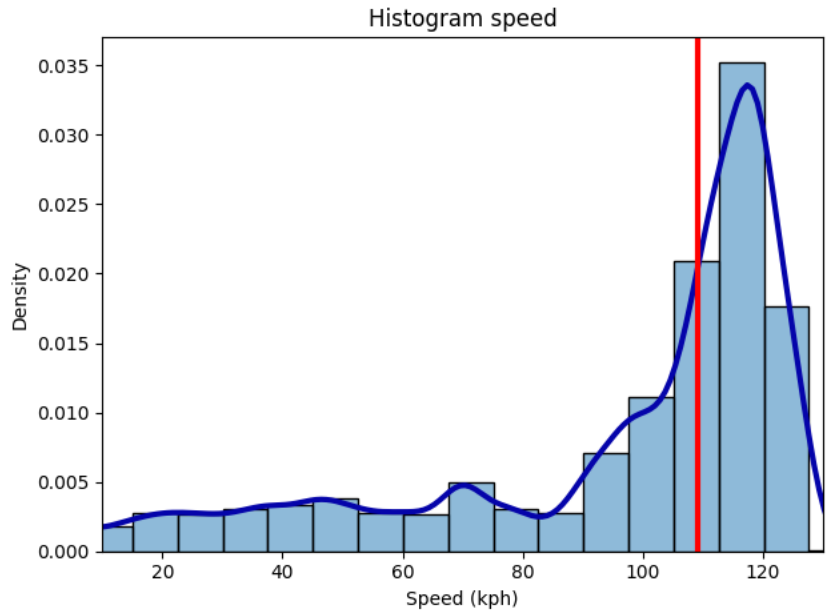
- Global
- Event

European Commission

Day 4 – Vehicle 1 stats

	Total	Mean	Median	Q1	Q3
Events (-)	78				
Distance (km)	424				
Speed (kph)		91.42	109.18	70.43	118.34
a_x (m/s²)		-0.014	0.00083	-0.030	0.053
Sun time (min)	207				
Cloud time (min)	6				
Rain (min)	0				
Fog (min)	0				





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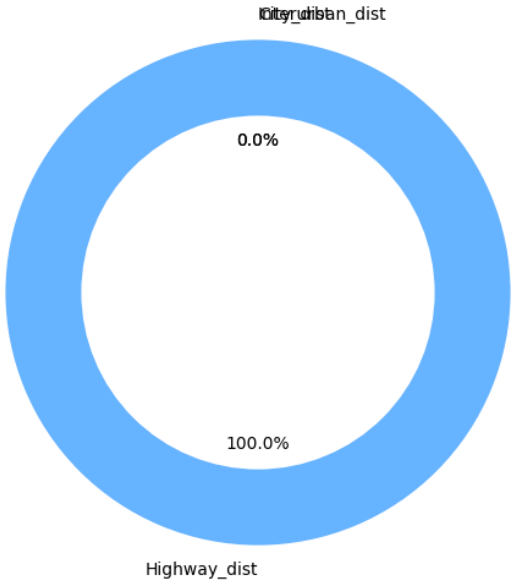
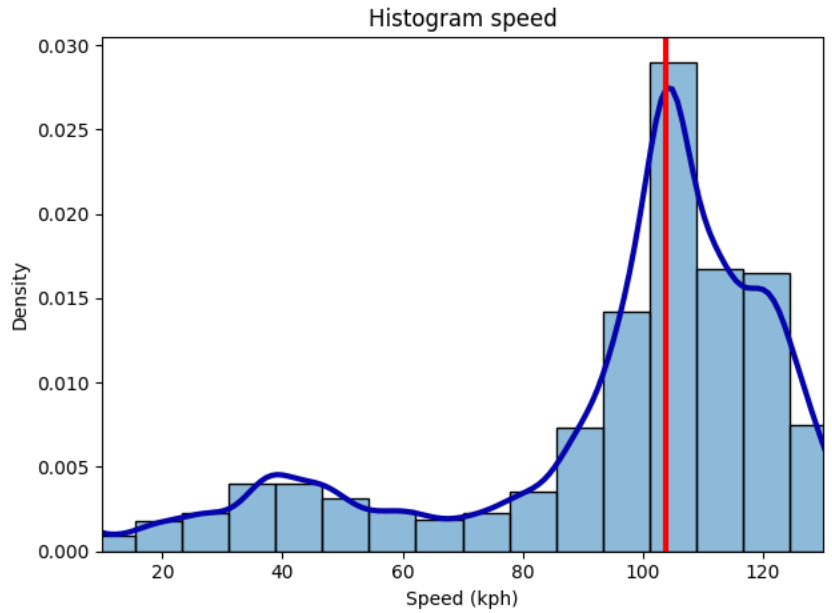
Day 4 – Vehicle 2 stats

	Total	Mean	Median	Q1	Q3
Events (-)	51				
Distance (km)	424				
Speed (kph)		89.98	103.82	79.89	112.90
a_x (m/s²)		0.047	0.013	-0.090	0.24
Sun time (min)	162				
Cloud time (min)	0				
Rain (min)	0				
Fog (min)	0				





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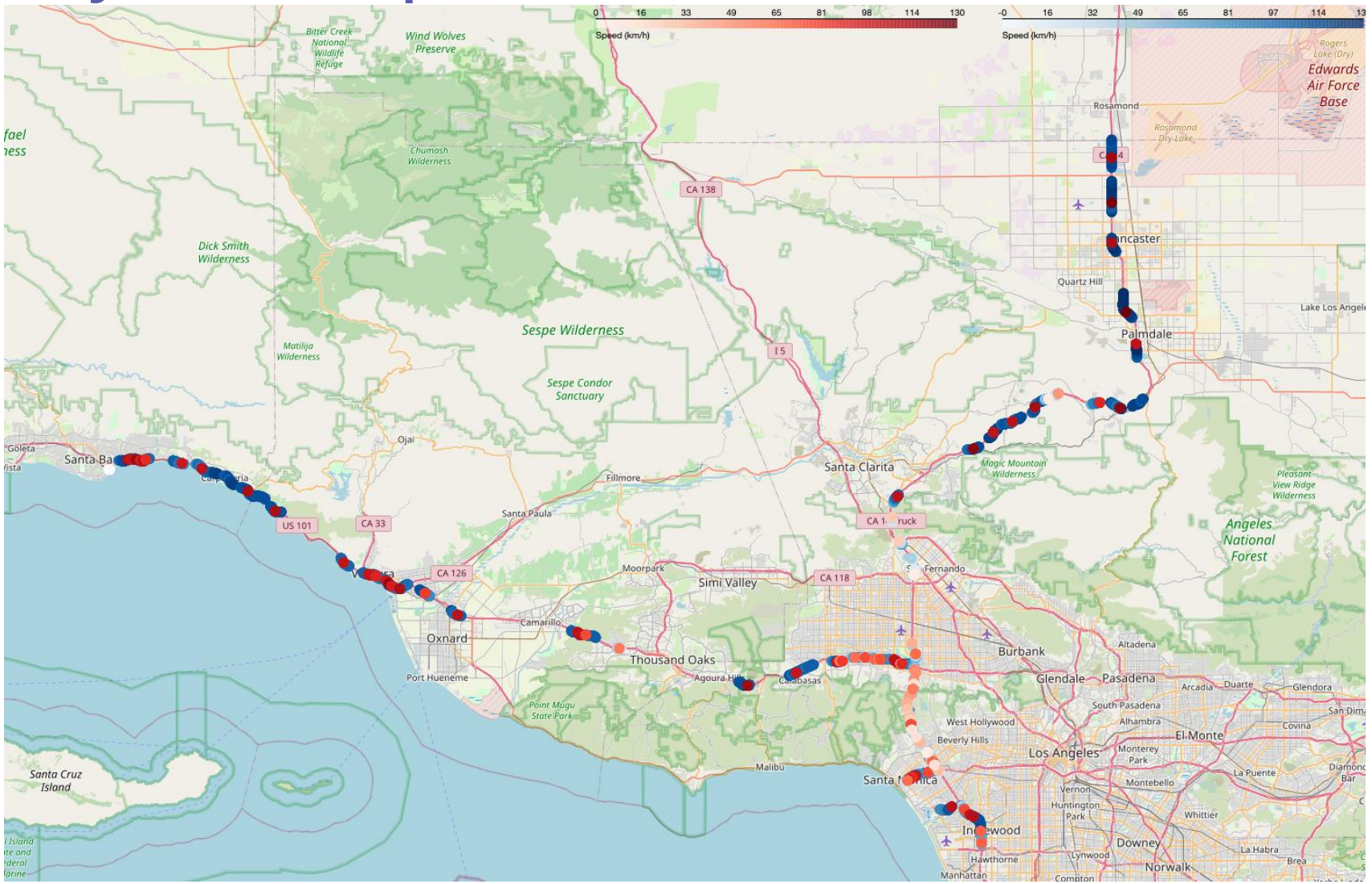
Day 5 – map



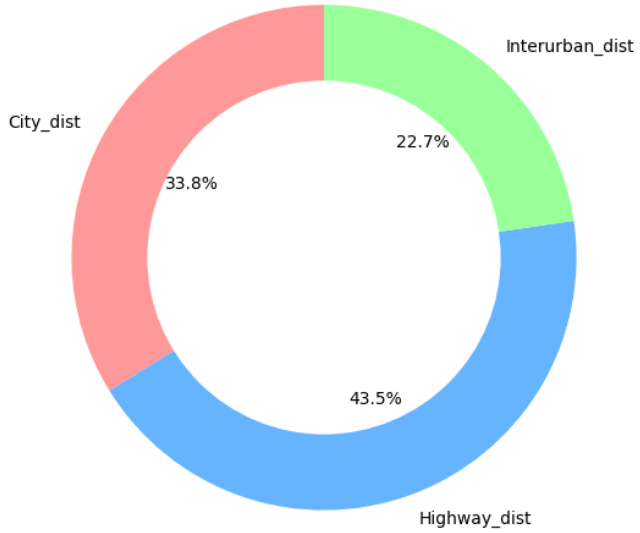
Legend:

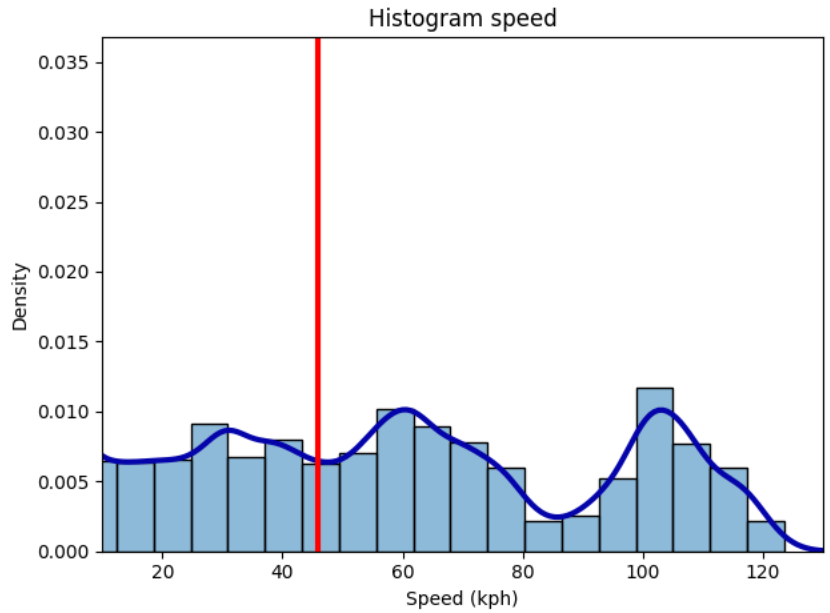
- Global
- Event

European Commission

Day 5 – Vehicle 1 stats

	Total	Mean	Median	Q1	Q3
Events (-)	92				
Distance (km)	362				
Speed (kph)		48.54	45.90	11.43	77.53
a_x (m/s²)		-0.0071	1.42e-05	-0.12	0.15
Sun time (min)	168				
Cloud time (min)	38				
Rain (min)	43				
Fog (min)	0				





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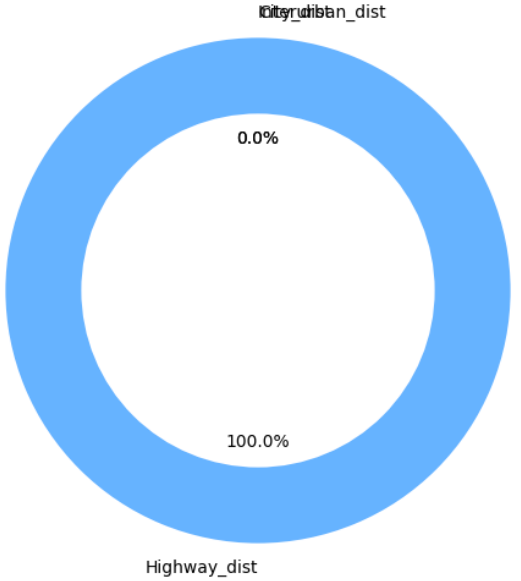
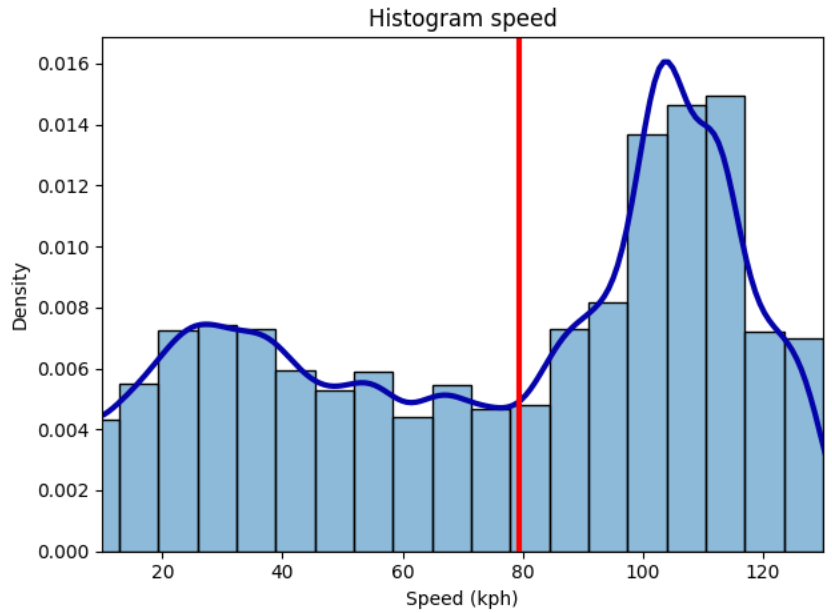
Day 5 – Vehicle 2 stats

	Total	Mean	Median	Q1	Q3
Events (-)	74				
Distance (km)	362				
Speed (kph)		70.13	79.49	33.80	104.66
a_x (m/s²)		0.076	0.015	-0.15	0.26
Sun time (min)	131				
Cloud time (min)	80				
Rain (min)	10				
Fog (min)	0				





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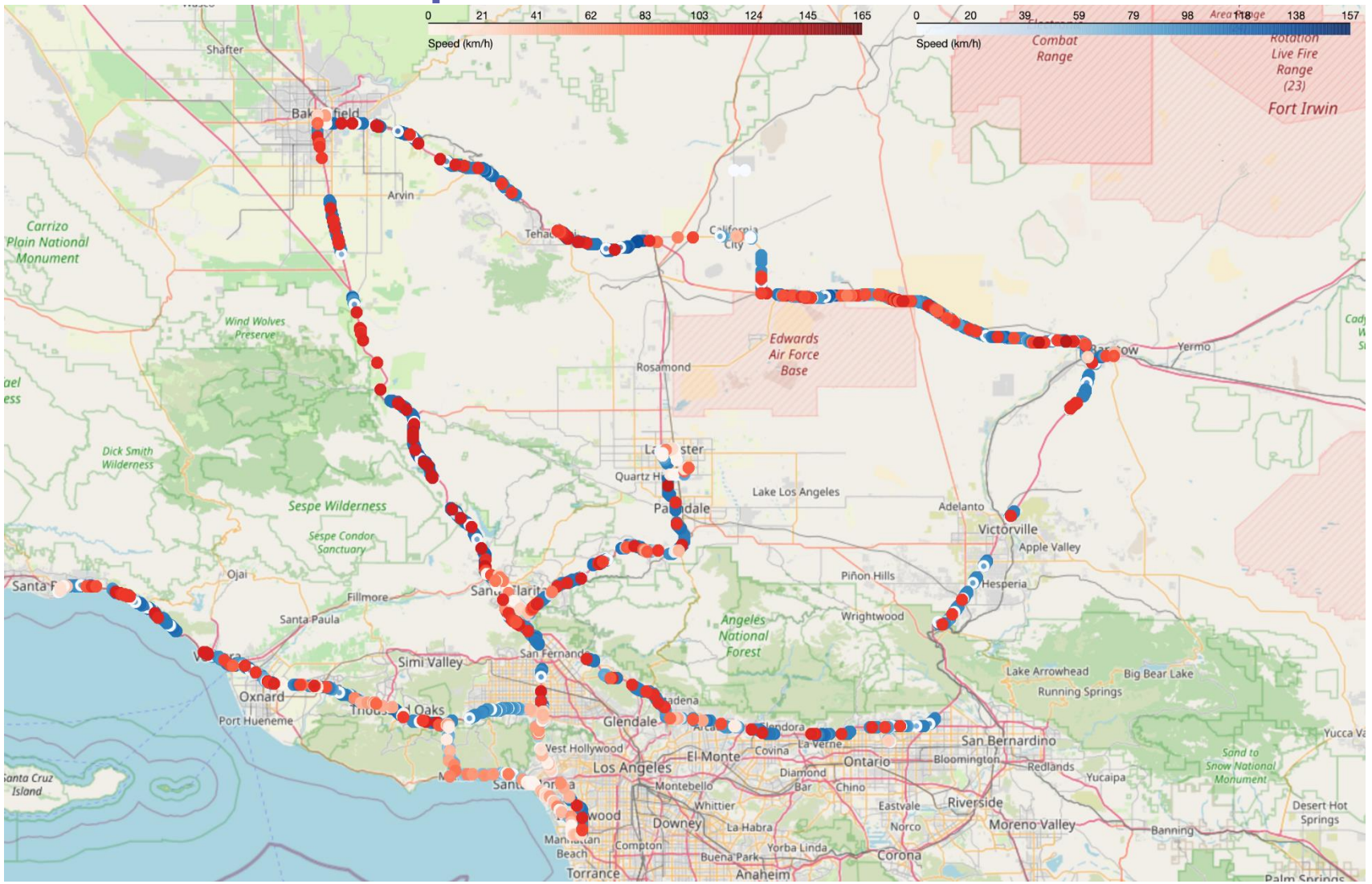
Overall - map



Legend:

- Global
- Event

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Relevant events

Public road

Day1 - Relevant event

- Occluded animals crossing the road

Day1 - Relevant event

- Truck cut-in
- LC initiated but cancelled by the driver

Day 4 Cut-in, braking and AEB

- System reacted before the driver could
- 5-6s between cut-in and AEB
- 1-2s to react for the braking

Day1 - Relevant event

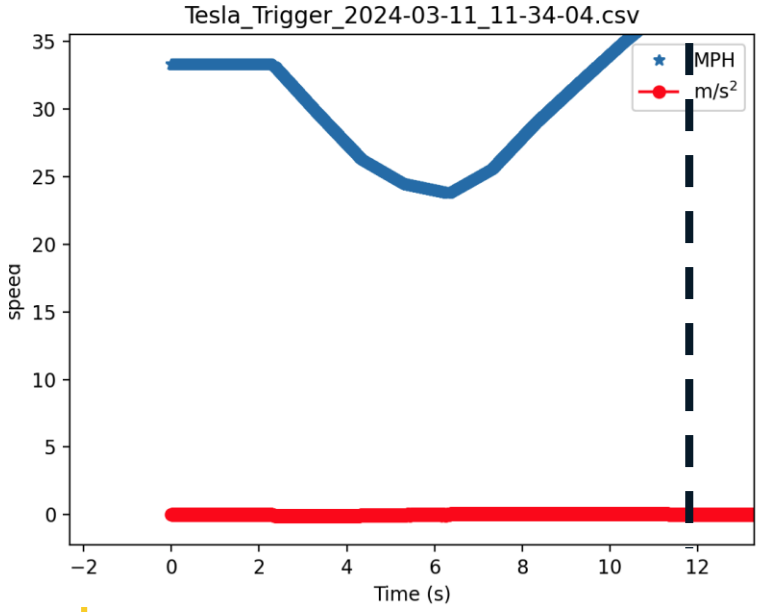
- Vehicle 2 hands-on request approaching curve
- Speed decreased
- Many of similar occurrences took place during testing

Day1 - Relevant event

- Roadwork
- No indication on the HMI
- Driver was confused first what to do
- Roadwork was not in the capability of the system, however according to 5.3.5.5. in R171 it can be considered as a boundary

Day1 - Relevant event

- Pedestrian on road
- Vehicle did recognize and slowed down



Day1 – Relevant event

- Vehicle 1 managing city intersection

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Day2 - Relevant event

- Driver initiated lane change on double solid line
- Driver is responsible

Day2 – Relevant event

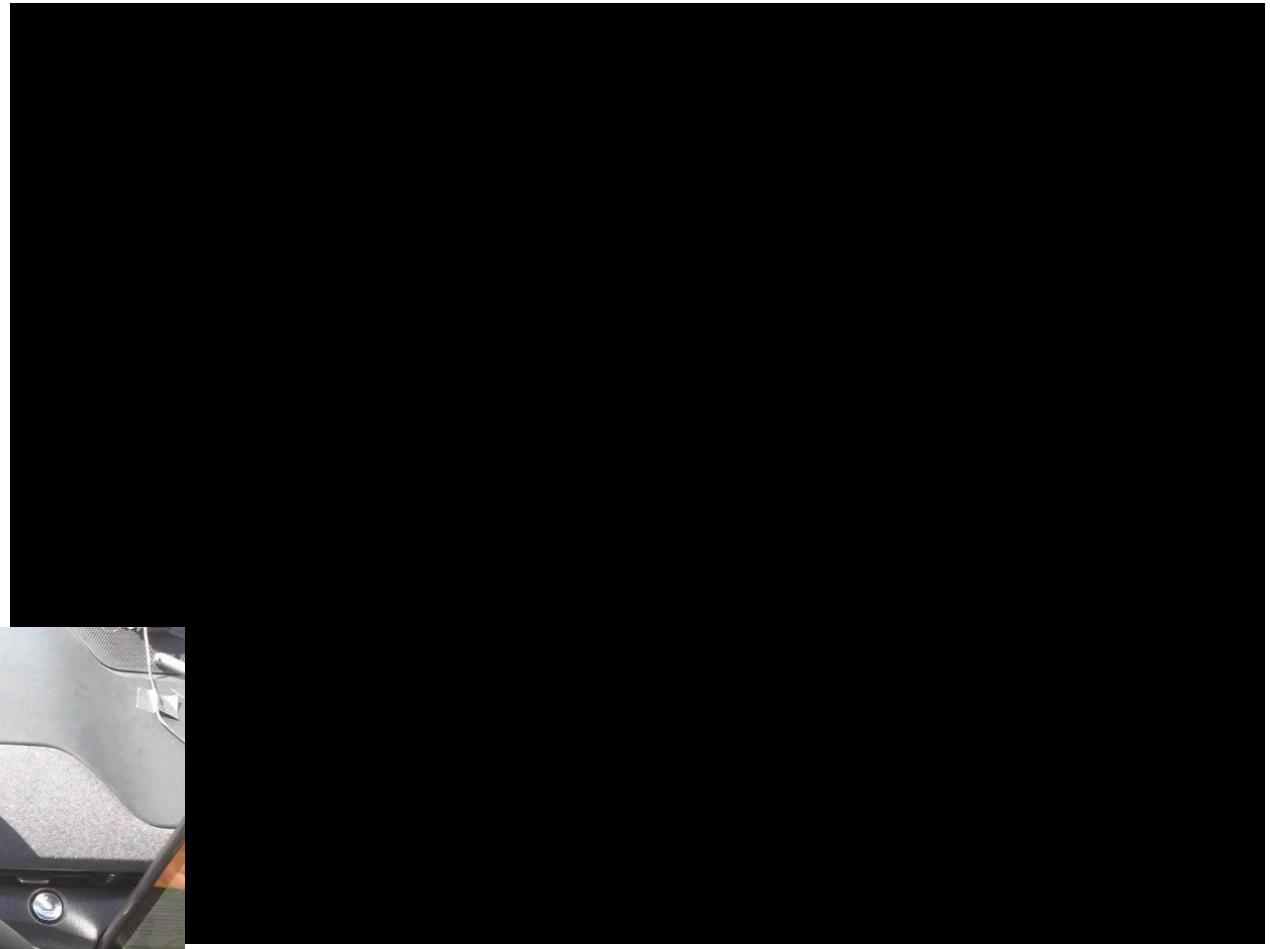
- Vehicle 2 managing roundabout in urban environment

Day2 - Relevant event

- Disengagement when reaching end of merging lane
- Time between the first appearance of the sign and the end of lane was 5-6s (4s EOR for hands-off)
- End of boundary requirement in 5.3.5.5. of R171 shall be applicable
- System needs to take into account the additional time of moving back the hands to the steering wheel

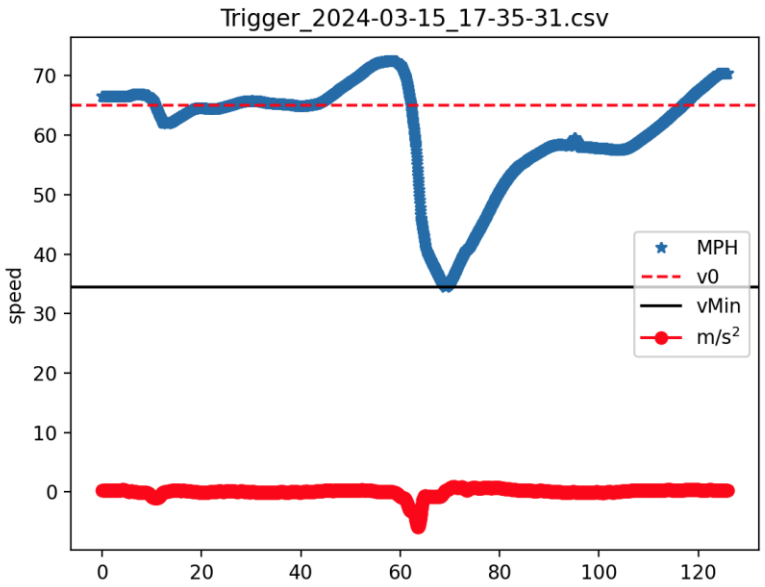
Day4 - Relevant event

- Aggressive motorist
- HF of other driver
- Time gap between trigger of LC and LC was ca. 5s



Day5 - Relevant event

- Vehicle 2 asks for driver takeover during harsh braking



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Day 5 relevant event – slow cut in

Day 5 LC for exit

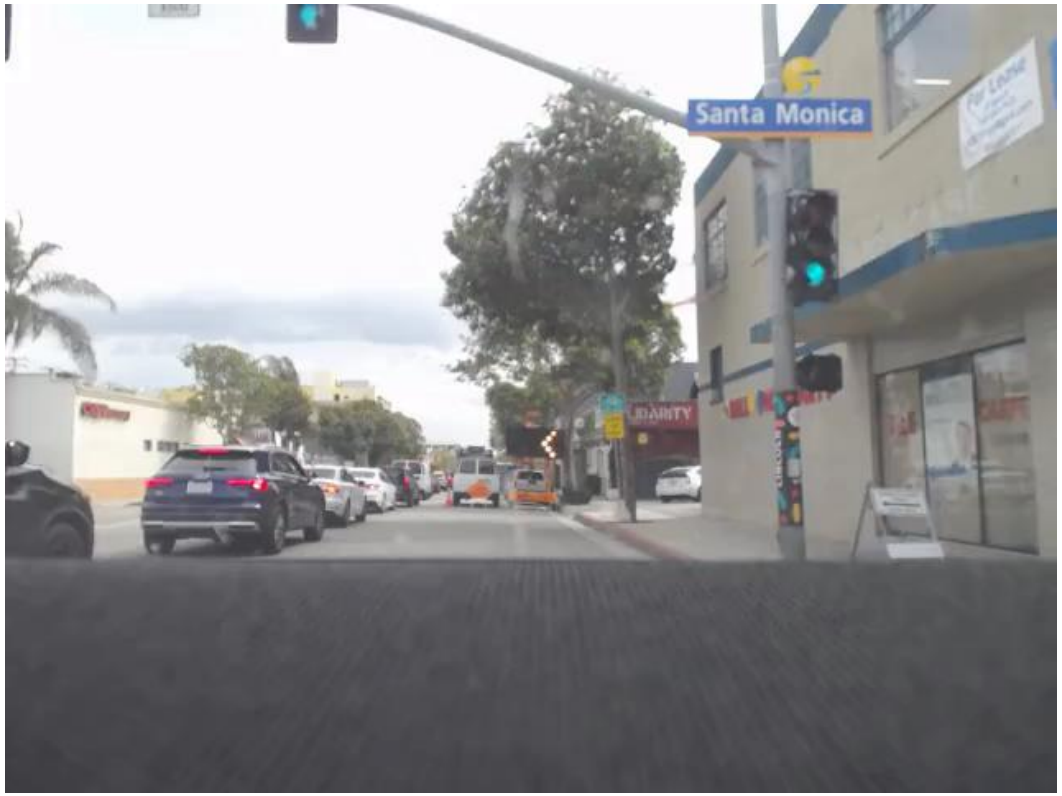
- First indication of LC 17s, second indication 5-7s before LC

Day 5 Navigating around a cyclist

- Continuous adaptation to the traffic situation

Day 5 Navigating around pedestrians

Day 5 Merging – with intervention



Day 5 Merging into small gaps

- 1st LC finished in 5s, 2nd LC finished in 5s

Observations

- Vehicles' behaviour were consistent to the PG tests
- They could manage most of the traffic situations, but still driver intervention and attention were need
  - After AEB or hash braking
  - When disengaged
  - Ambiguous situations
- Timing
  - DILC: initiation is not a guarantee of the execution also not to obeying traffic rules
  - SILC/SIM could mostly be announced in time and then executed timely, but not always possible (cyclist, pedestrian, merging situation
- During a manoeuvre continuous adaptation to the traffic situation is needed regardless of the initiation (+ driver attention)

Thank you

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