Kraftstoffsparen durch den richtigen Tankzeitpunkt

Flotte! Der Branchentreff

Messe Düsseldorf, 23. März 2017

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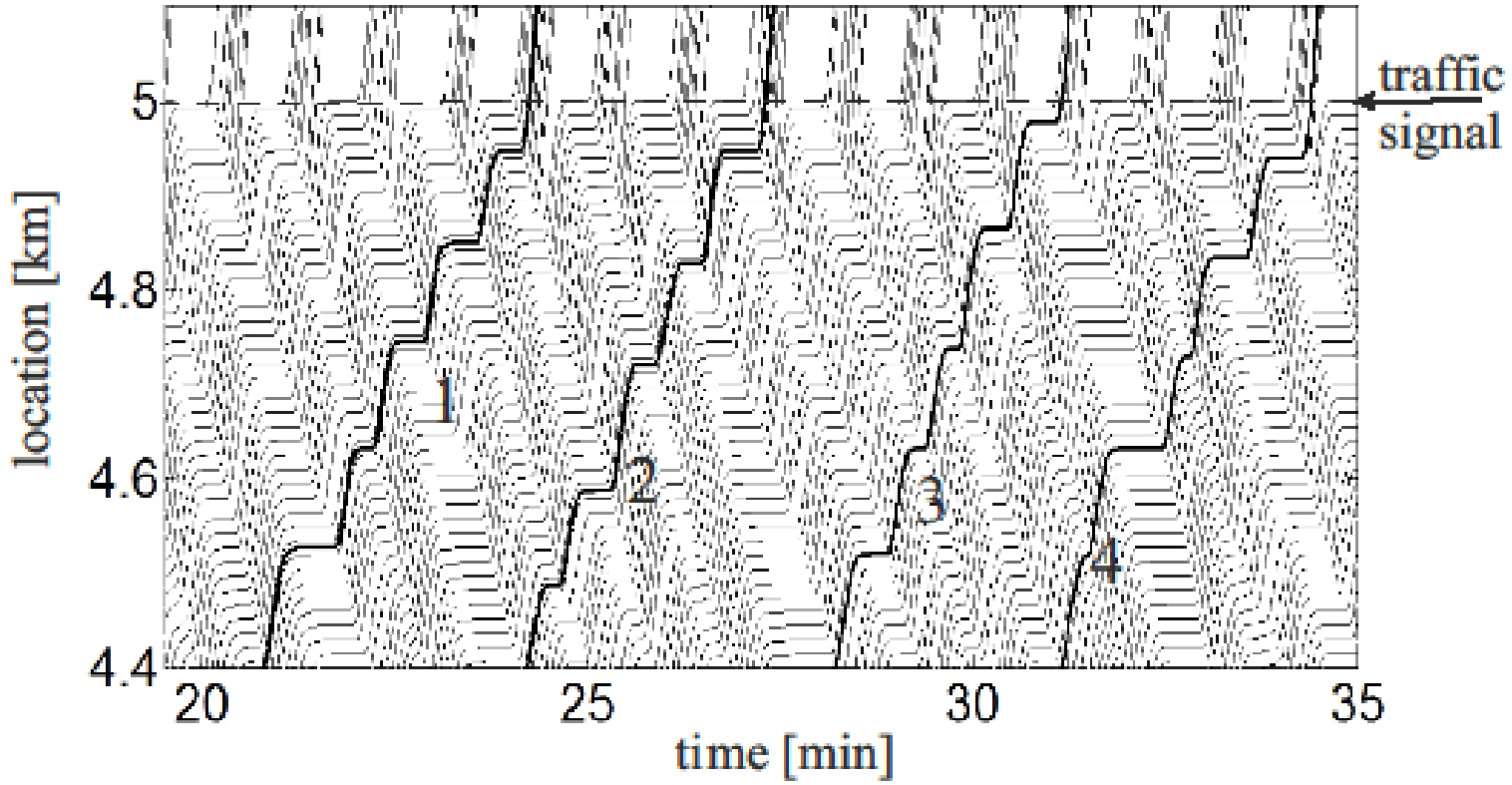
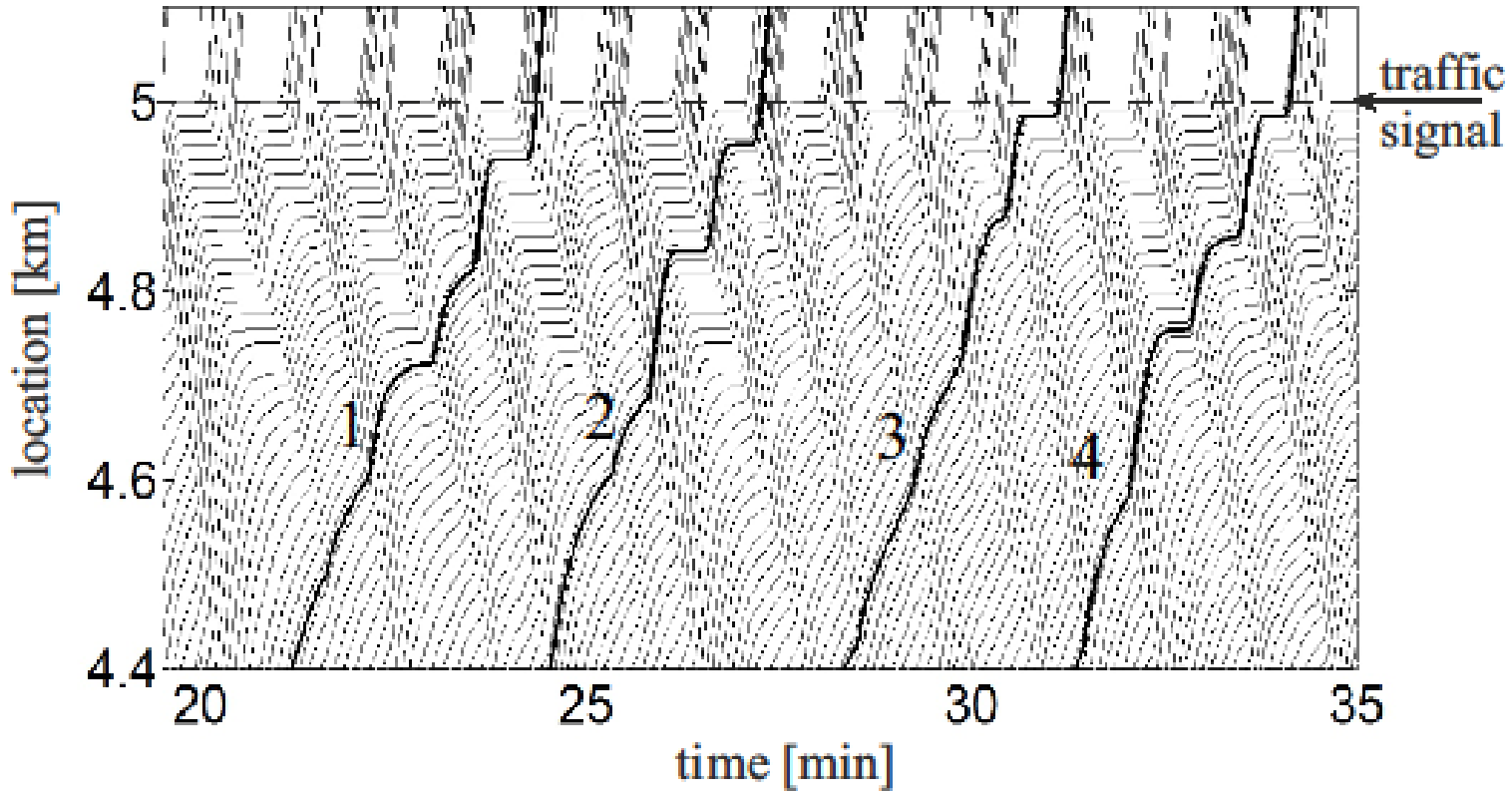
Physik von Transport und Verkehr
Universität Duisburg-Essen


location [km]
5
4.8
4.6
4.4
20
25
30
35
time [min]
traffic
signal
1
2
3
4


location [km]
5
4.8
4.6
4.4
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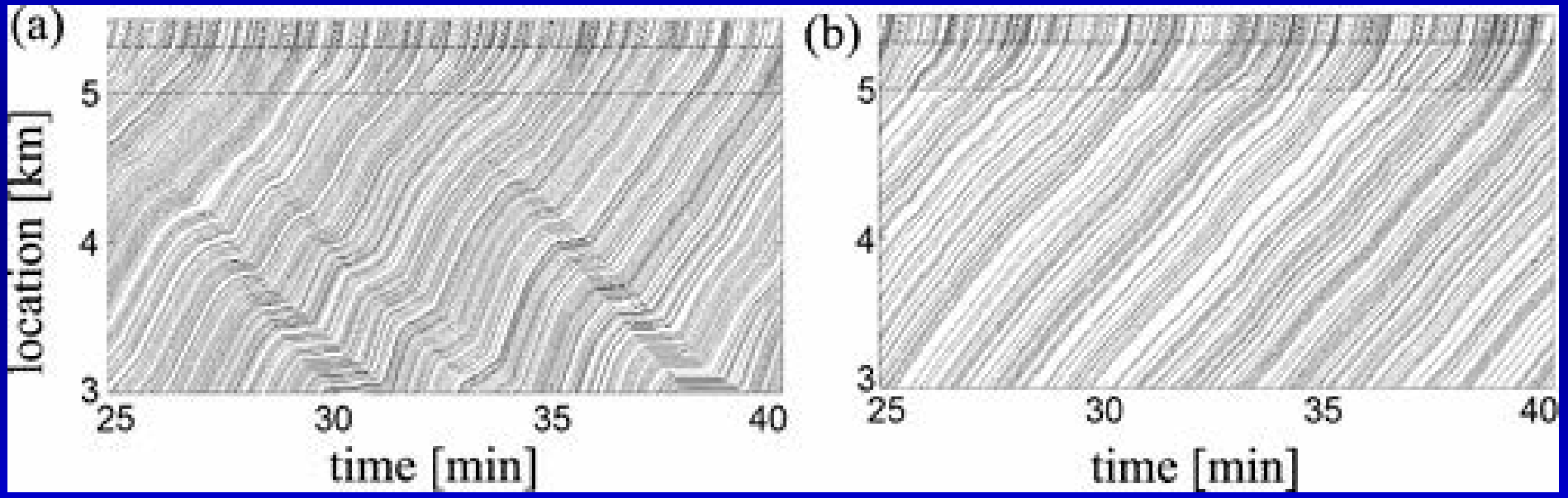
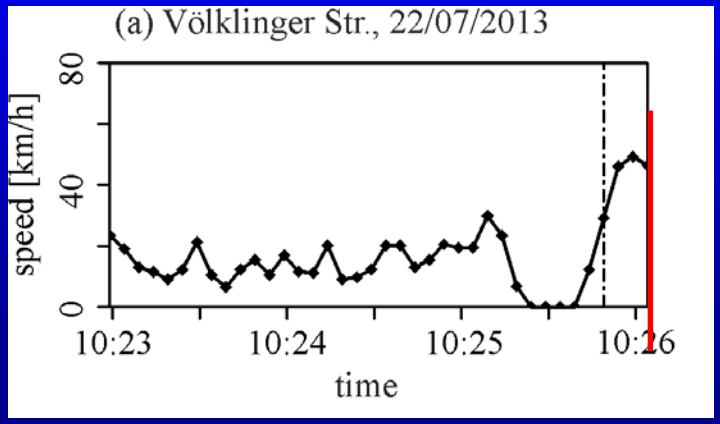
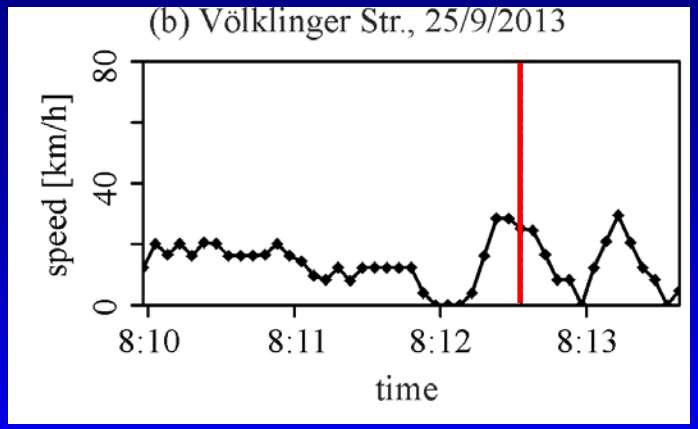
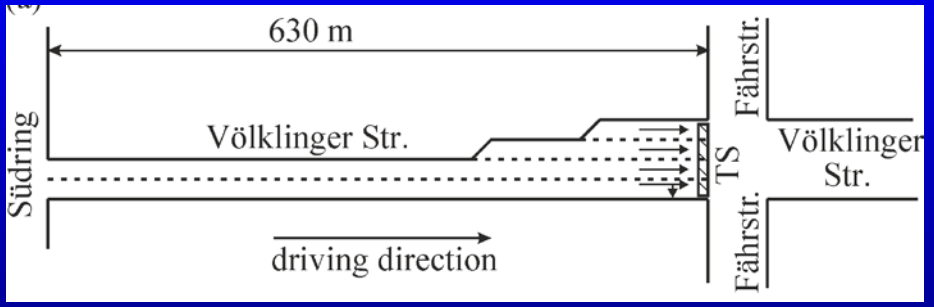
25
30
35
time [min]
traffic
signal
1
2
3
4


(a)
location [km]
5
4
3
25
30
35
40
time [min]
(b)
5
4
3
25
30
35
40
time [min]

Empirical Synchronized Flow at Traffic Signal







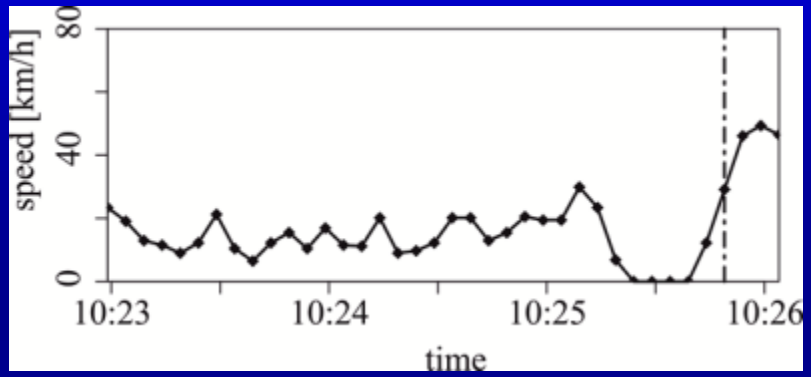
- **Empirical examples:**
  - **TomTom single vehicle probe GPS data (anonymized)**
  - **5-second data intervals**
- **Recently predicted by Kerner et al. [1]**
- **Speed is lower than in Free Flow**
- **Vehicles don't stop more than once in front of traffic signal**

[1] B. S. Kerner, S. L. Klenov, G. Hermanns, P. Hemmerle, H. Rehborn, M. Schreckenberg: "Synchronized Flow in Oversaturated City Traffic", *Phys. Rev. E*, 88 (5), (2013).

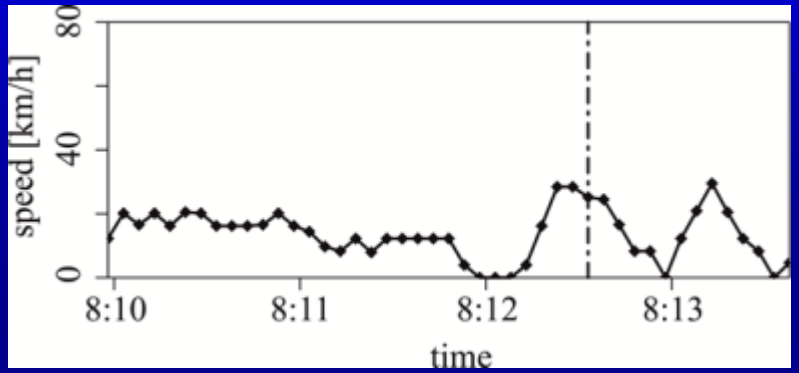
Moving Queues and Synchronized Flow

Synchronized Flow

S1 (Völklinger Straße)

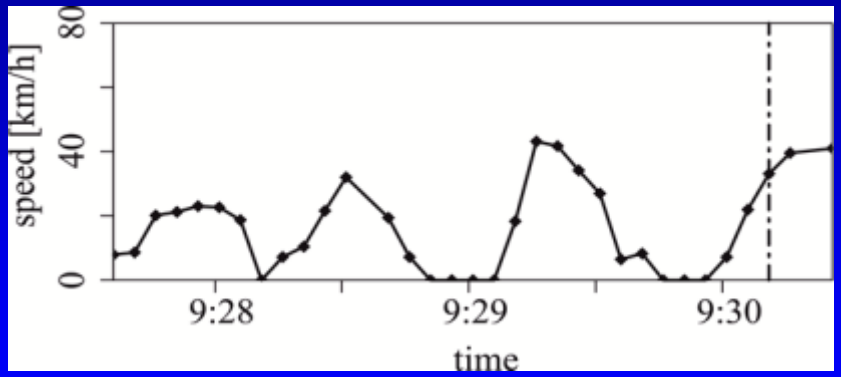


S2 (Völklinger Straße)

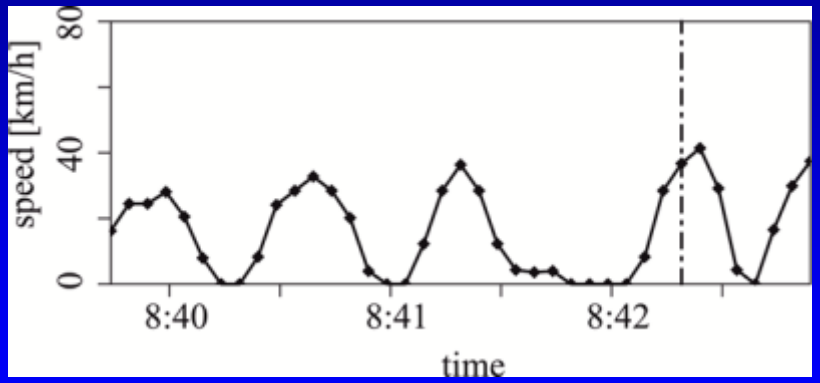


Moving queues

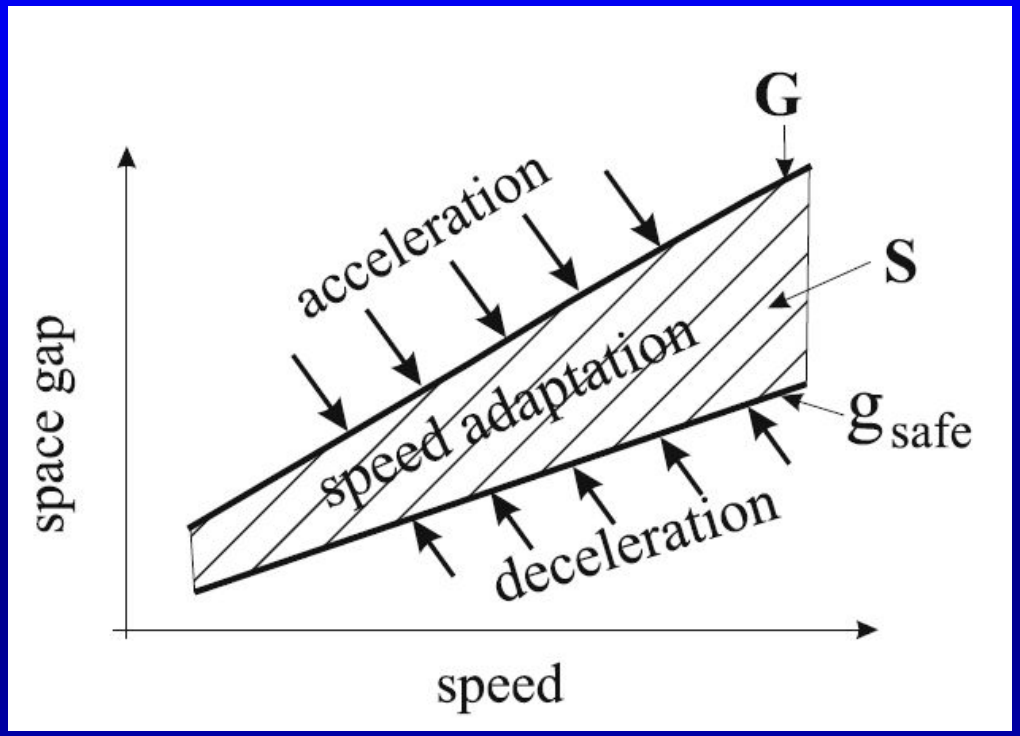
Q1 (Völklinger Straße)



Q2 (Völklinger Straße)



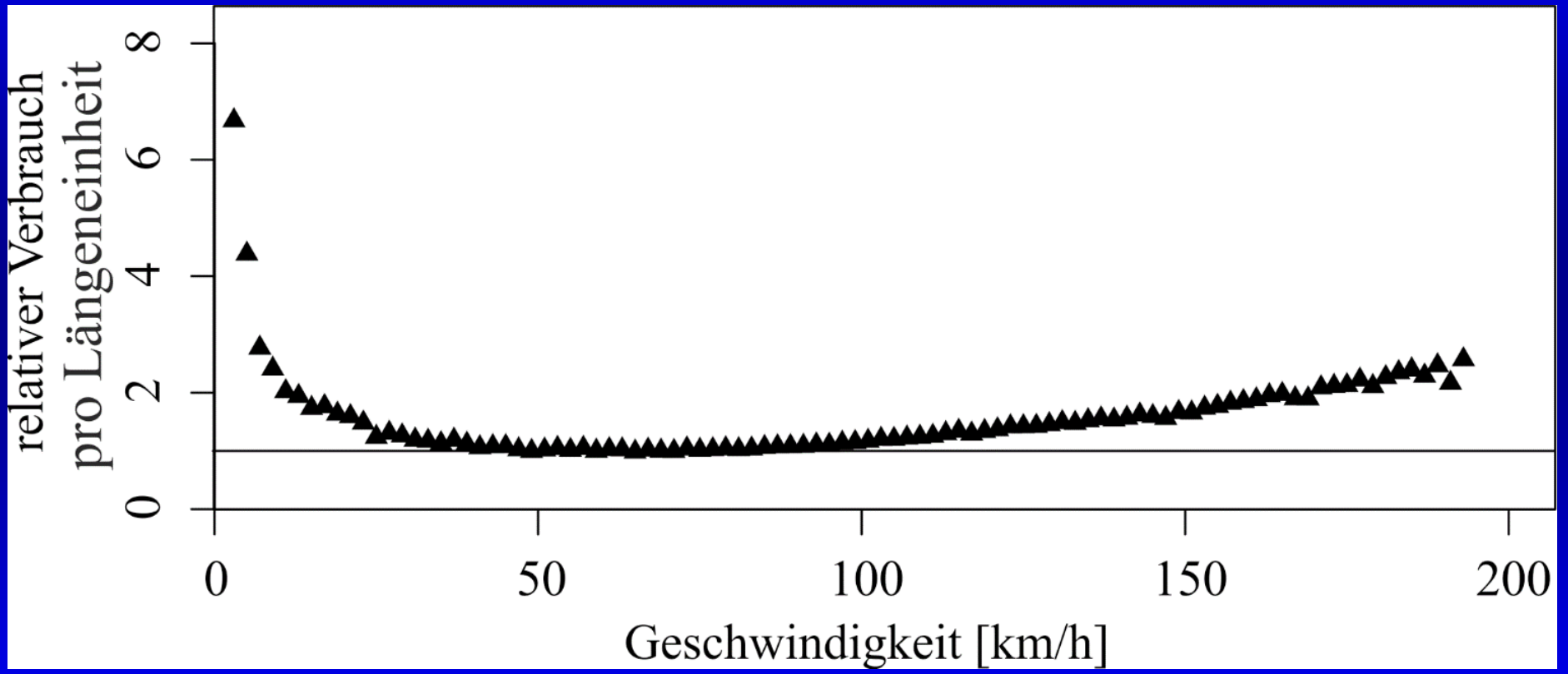
Synchronization Gap

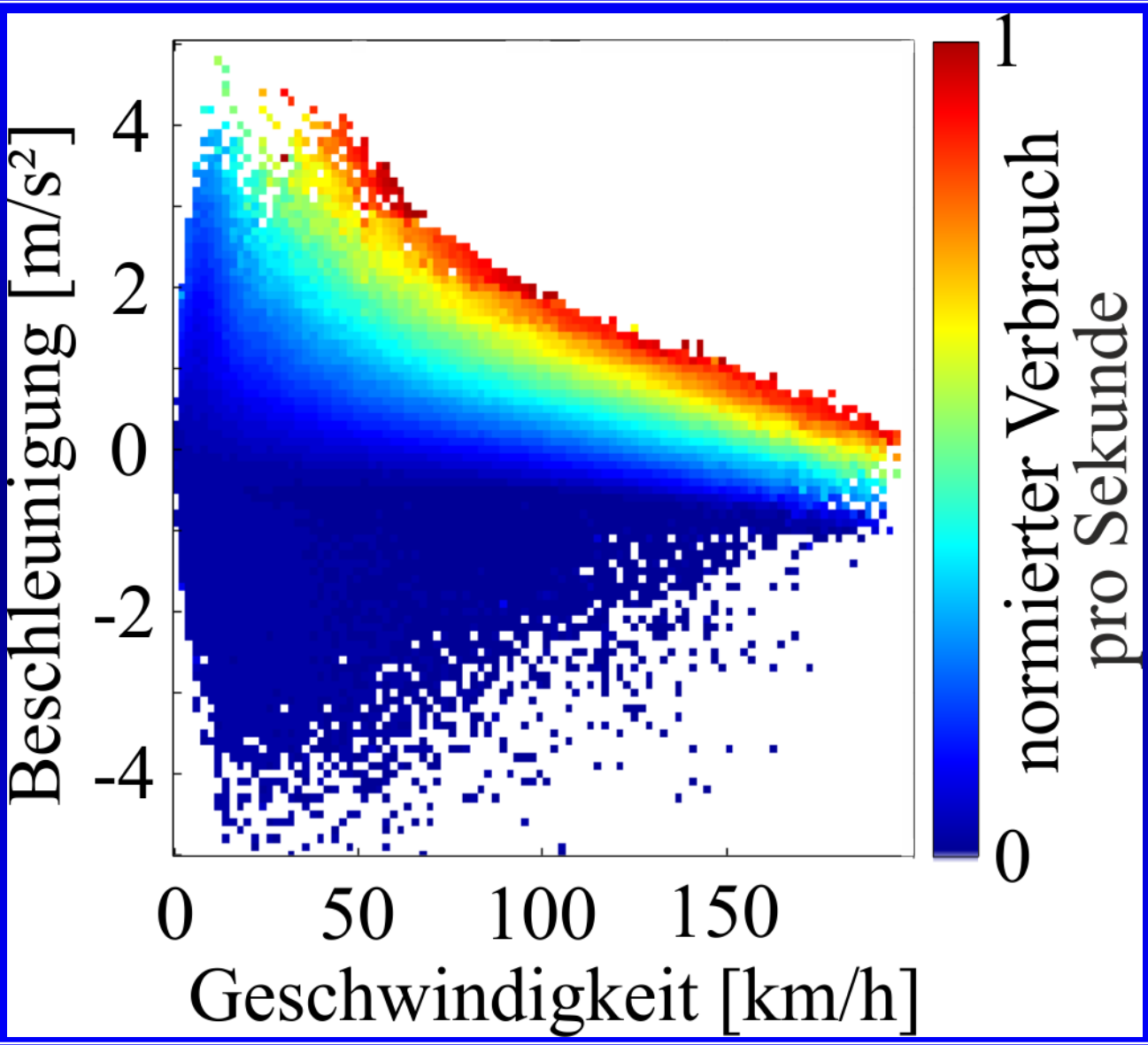


g_{safe} = *safety gap*
S = states of synchronized flow
G = synchronization gap

Synchronization Gap:

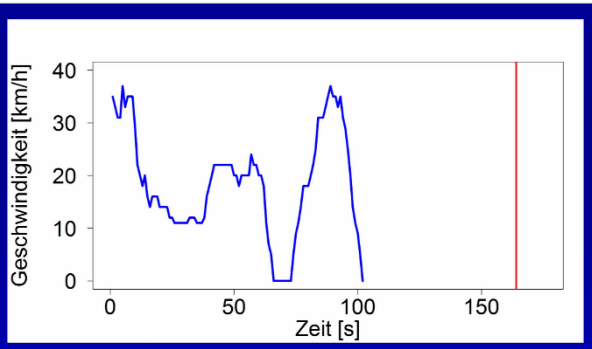
- **Vehicle adapts to speed of leading vehicle**
- **But it can do so in an arbitrary distance within certain distance margin ("synchronization gap")**
- **Competition between two effects:**
- **Over-acceleration (OA)**
- **Speed adaptation (SA)**
- **OA leads to jam dissolution**
- **SA leads to traffic breakdown**

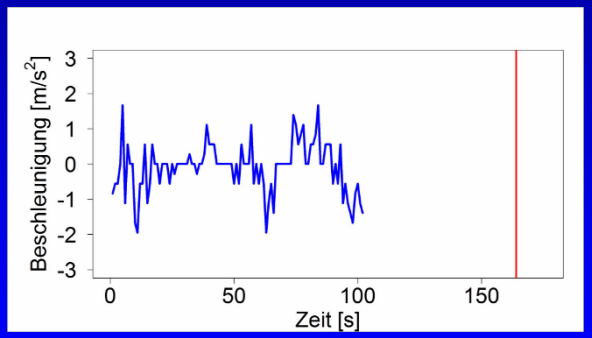

relativer Verbrauch
pro Längeneinheit
0
2
4
6
8
0
50
100
150
200
Geschwindigkeit [km/h]

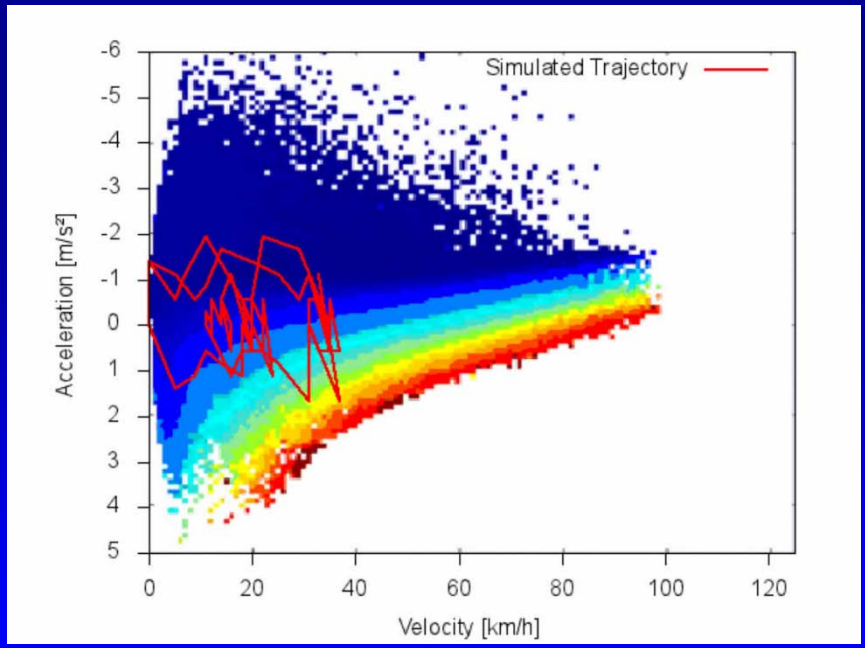

Beschleunigung [m/s²]
4
2
0
-2
-4
0
50
100
150
Geschwindigkeit [km/h]
1
0
normierter Verbrauch
pro Sekunde

UR:BAN – Fuel Consumption Calculation

- Speed and acceleration profiles are taken from simulations.
- These profiles are simulated for characteristic traffic situations for each road section seperately.
- Together with an empirical fuel consumption matrix the additional consumption factors can be calculated.
- The additional consumption factors per road section are input for energy efficient routing strategies.

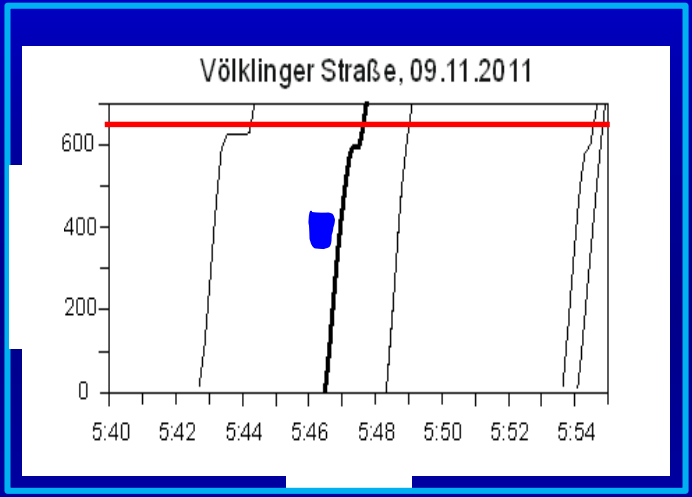




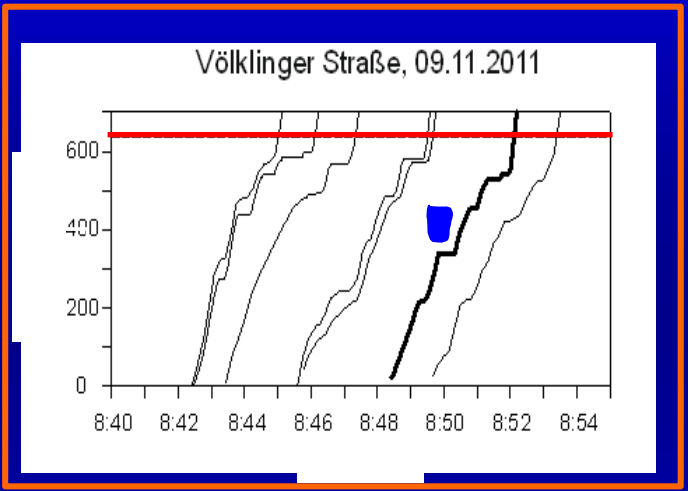


Patterns of City Traffic

Undersaturated

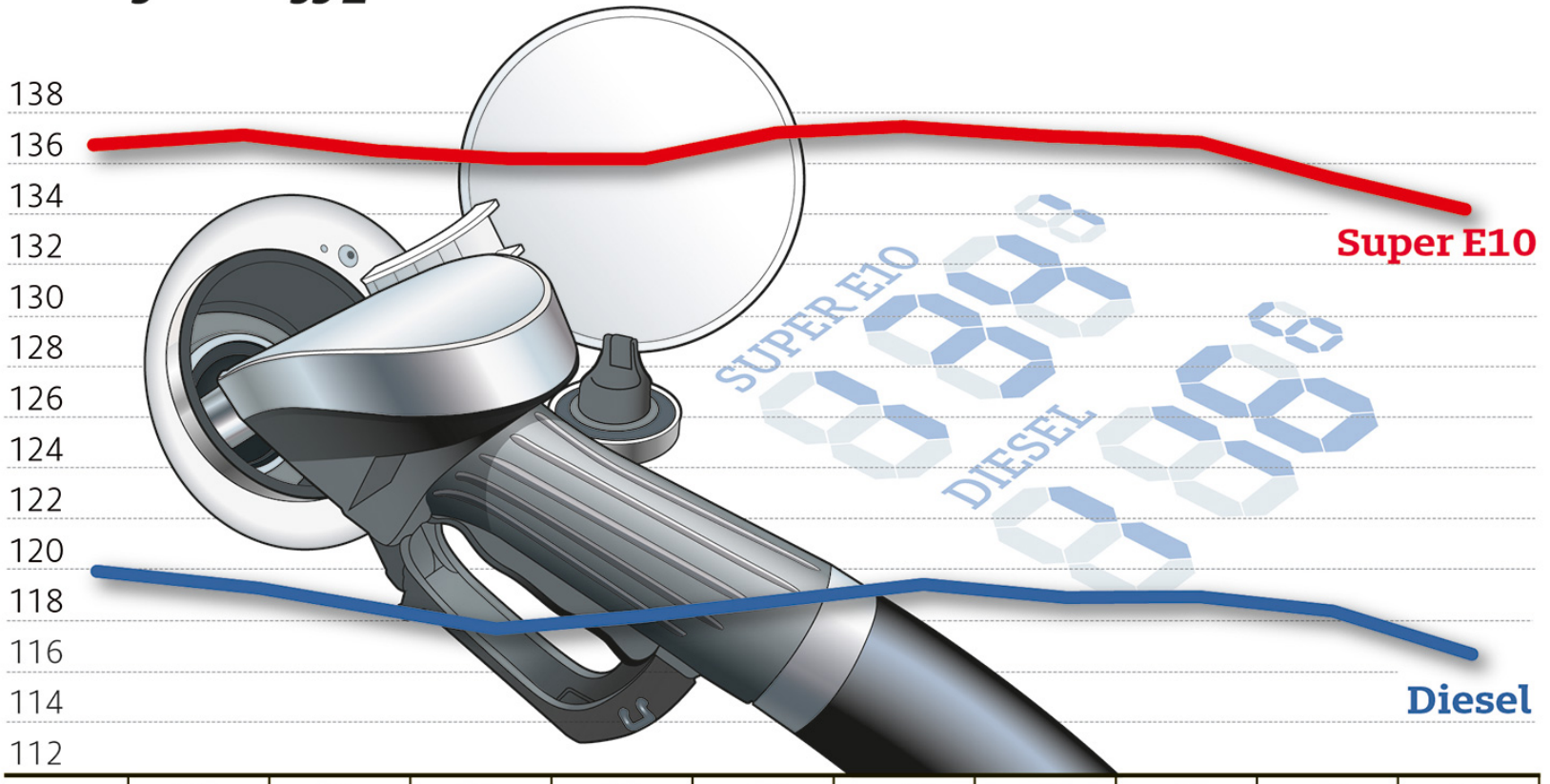


Oversaturated



- **Oversaturated city traffic:**
  - **Not all vehicles of the queue can pass during the next green phase**
  - **Vehicles stop more than once**

Kraftstoffpreise in Deutschland



	10	17	24	31	07	14	21	28	07	14
Super	1,369	1,364	1,362	1,362	1,372	1,378	1,374	1,369	1,353	1,341
Diesel	1,196	1,186	1,178	1,180	1,185	1,187	1,183	1,188	1,183	1,166
	Januar 2017				Februar				März	

Quelle: www.adac.de/tanken © 03.2017 ADAC e.V.

Ressourcen der Erde

- Bei moderatem Anstieg des Erdölverbrauchs ist die Versorgung mit konventionellen Fördermethoden bis 2036 gewährleistet.

  (4,6 Mrd. Tonnen pro Jahr)

  Erdgas hat wesentlich größere Vorkommen,

  aber politisch politisch „heikel“.

Kraftstoffmengenspeicherung

- In Reservekanistern maximal 60 Liter.
- Lagerung zuhause:

  Maximal 100 L Diesel + 1 L Benzin

  Garage 200 L Diesel + 20 L Benzin
- Maximal 20 L aus EU-Ausland einführen erlaubt!

Preisentstehung (02/2017)

Super:

- 65,45 € Energiesteuer (46,95%)
- 39,59 € Produkt (28,4%)
- 22,26 € MWSt. (15,97%)
- 12,09 € Deckungsbeitrag/Kosten (8,67%)

1.39,39 €

Preisentstehung (02/2017)

Diesel:

- 47,04 € Energiesteuer (39,77%)
- 38,66 € Produkt (32,69%)
- 18,88 € MWSt. (15,96%)
- 13,69 € Deckungsbeitrag/Kosten (11,58%)

1.18,27 €

15. März 2017

Super E10, Preis: 1,359 €

- Abgaben: 87,4 Cent
  (MWSt., Ökosteuer, Energiesteuer, EBV)
- Produktpreis: 35,2 Cent
- Kosten: 13,3 Cent