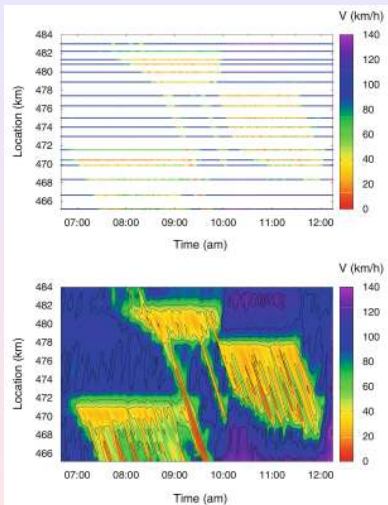


# Reconstructing the traffic fields

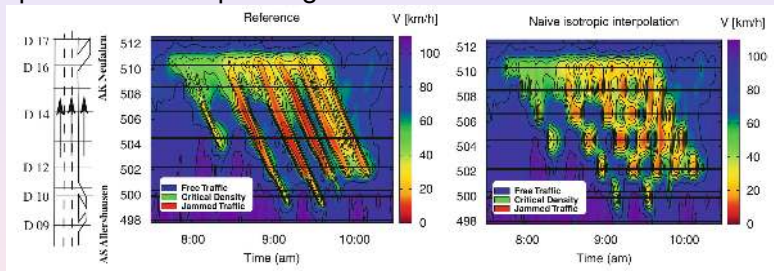
- (Top) Speed measured by loops
- (Bottom) Reconstructed speed field
- Autobahn A5 near Frankfurt/Main, Germany (2001).
- 2 on-ramps
- 1 accident (km 478)



From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]

# Reconstructing the traffic fields

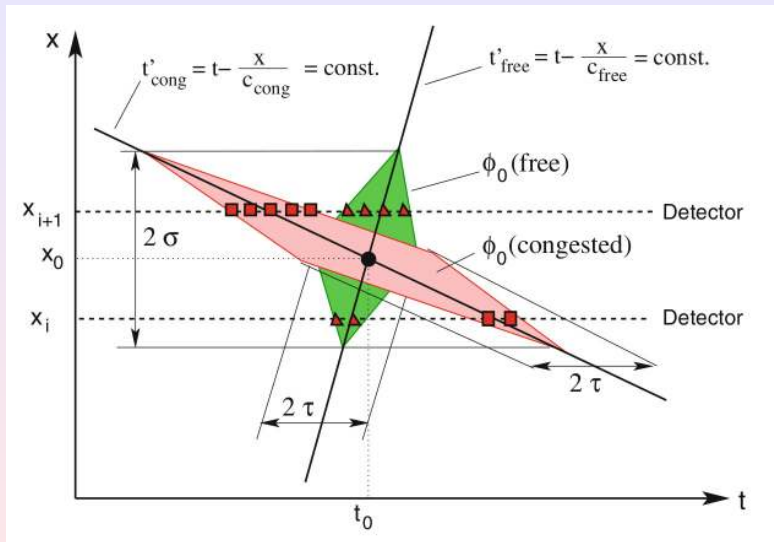
In the presence of stop-and-go waves



From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]

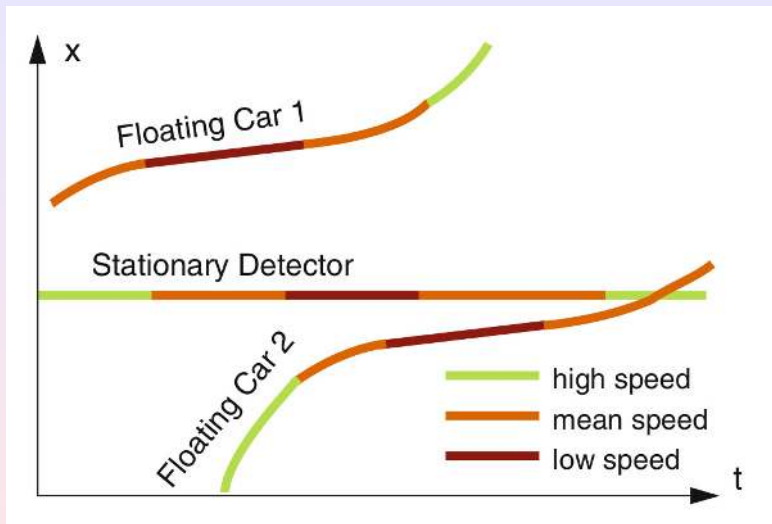
Bad reconstruction.

# Reconstructing the traffic fields



From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]

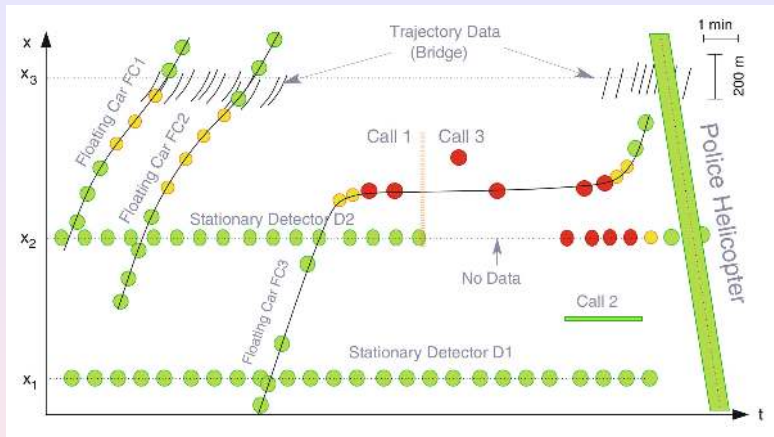
# Data fusion



From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]

Stationnary detectors + car-following data

# Data fusion



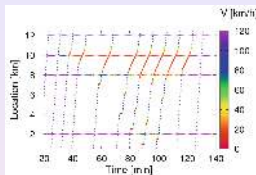
From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]

Stationary detectors + car-following data

Caller 1 gave the information that there was an accident but he could give only approximate location (vertical line).

Caller 3 said he was in a jam:

# Data fusion

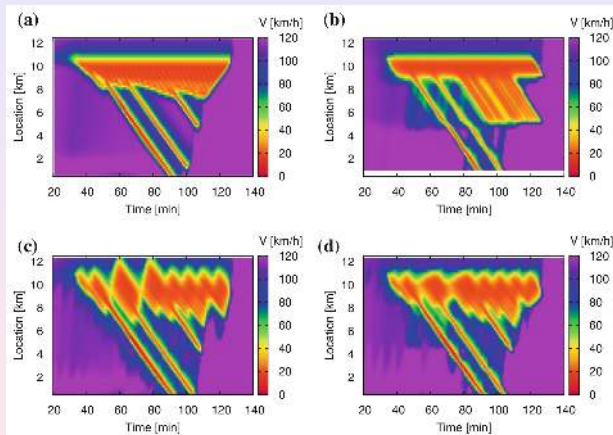


Data generated numerically;

• (a) Ground truth Reconstruction using:

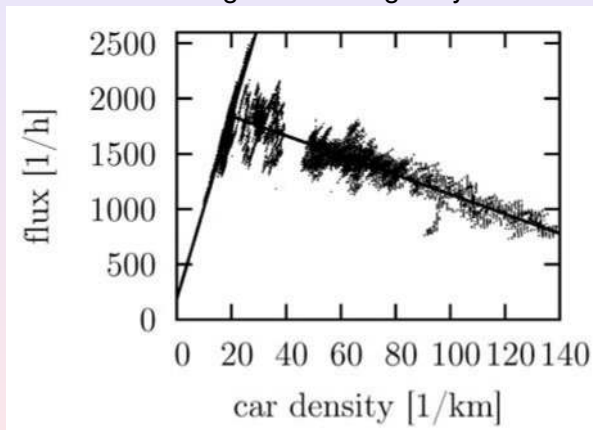
- (b) Loops
- (c) Car-following
- (d) Both

From [Treiber & Kesting (2013) "Traffic Flow Dynamics"]



# Metastability

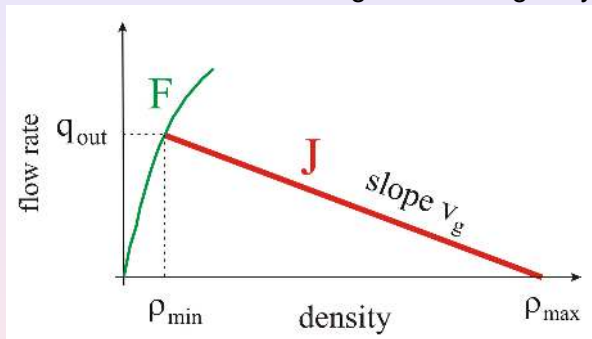
## Fundamental diagram on a highway



From [Liebe & al, TRB (2011)]

# Metastability

Sketch for fundamental diagram on a highway



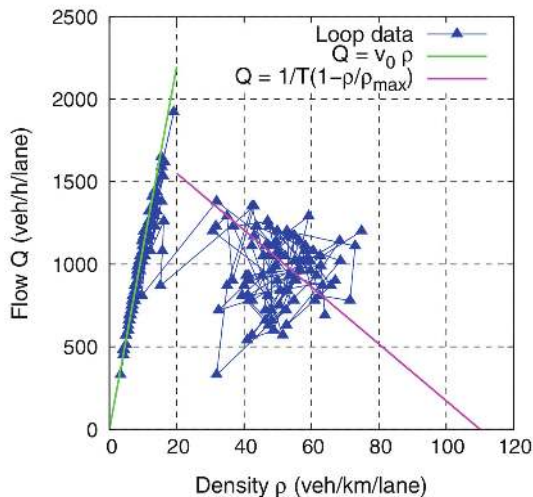
From [B. Kerner (2011), 75 Years of FD]

➡ cannot be used in a macroscopic model.



# Metastability

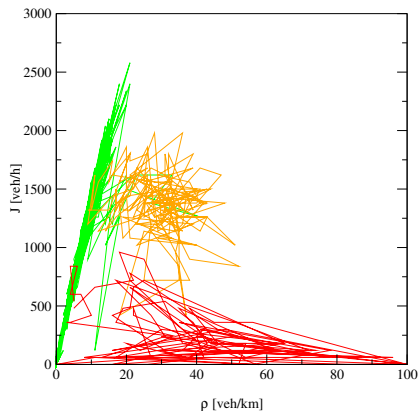
## Hysteresis and capacity drop



From [Martin Treiber & Arne Kesting (2013) "Traffic Flow Dynamics"]

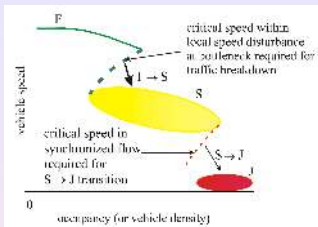
# Synchronized traffic

## Fundamental diagram on a highway

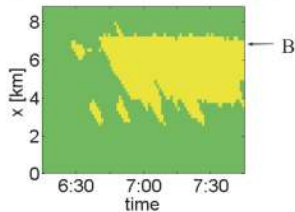


From Ludger Santen

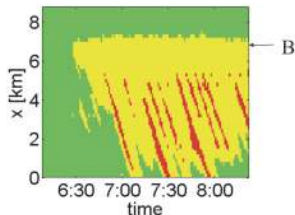
# Three-state model



(a) Synchronized flow pattern (SP)

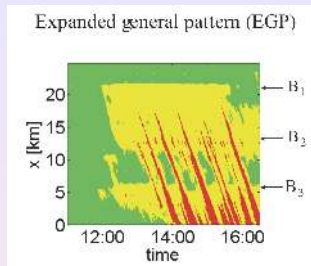
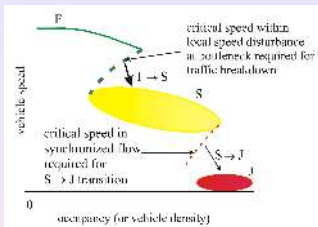


(b) General congested pattern (GP)



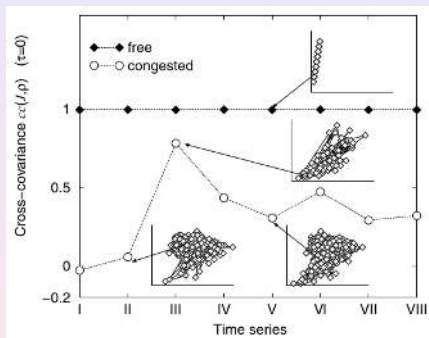
B = location of an on-ramp

# Three-state model



B1, B2, B3 = locations of on-ramps

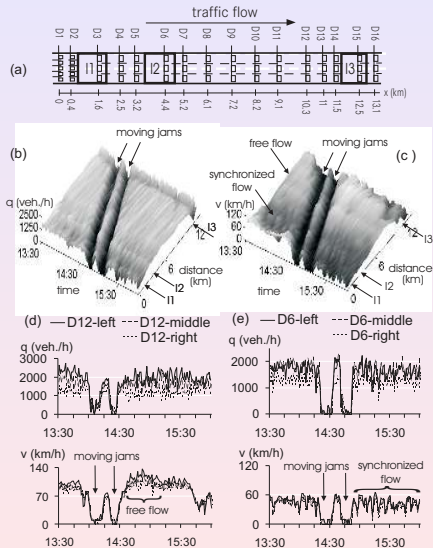
# Cross-correlation



From [Knospe et al (2000)], after [Neubert et al, PRE (1999)]

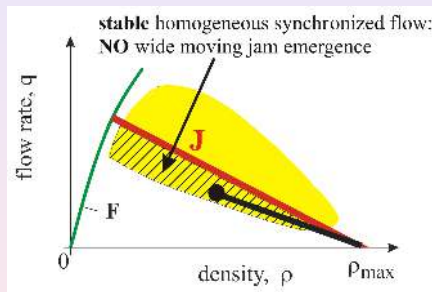
# Three-state model

Freeway A5-North, 09.10.1992

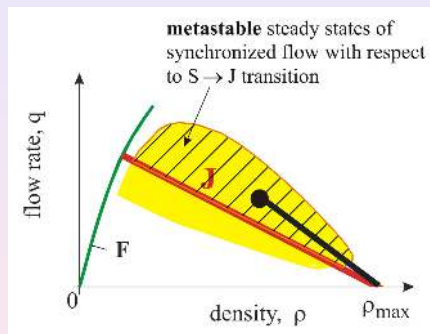


From [B.S. Kerner, TGF'00]

# Three-state model

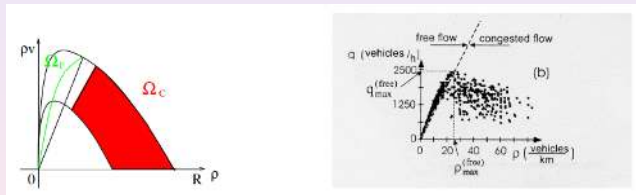


From [B. Kerner (2011), 75 Years of FD]



# Coupled models

- In free flow: LWR
- In congested flow: Aw-Rascle model



From [P. Goatin (2006)], right figure from [B.S. Kerner, TGF'99]

model

real data



# Limitations: 1D traffic per lane

Not true in every country



From [Wikimedia, by Deepak Gupta]

Traffic in Delhi (India)

# Traffic regulation

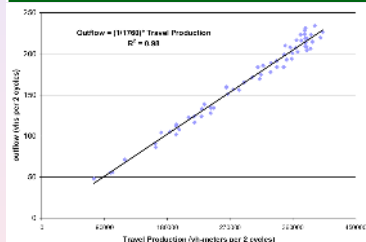


# Traffic regulation



# MFD from simulations on a real network

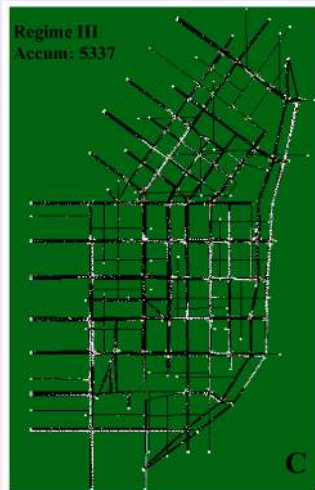
Lincoln avenue, Los Angeles.



From [Geroliminis and Daganzo (2007)]

# MFD from simulations on a real network

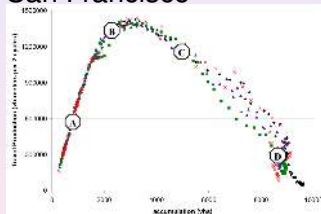
San Francisco in congested regime  
white dots = vehicles



From [Geroliminis and Daganzo (2007)]

# MFD from simulations on a real network

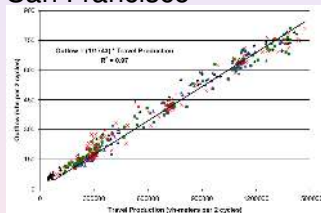
## San Francisco



From [Geroliminis and Daganzo (2007)]

# MFD from simulations on a real network

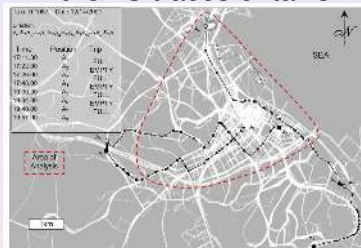
## San Francisco



From [Geroliminis and Daganzo (2007)]

# Yokohama data

- 500 ultrasonic and loop detectors
- 140 GPS traces of taxis

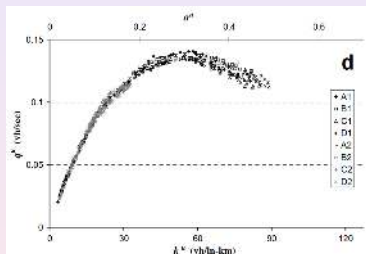


From [Geroliminis and Daganzo (2008)]

- Trajectory of one specific taxi
- Superposition of all the taxi trajectories (white) ➡ area map

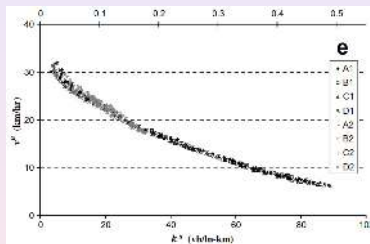


- From 500 ultrasonic and loop detectors



From [Geroliminis and Daganzo (2008)]

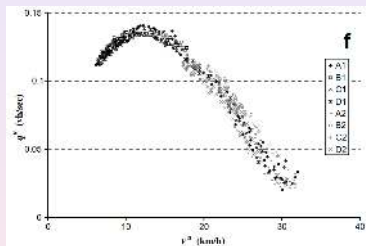
- From 500 ultrasonic and loop detectors



From [Geroliminis and Daganzo (2008)]

# Yokohama data

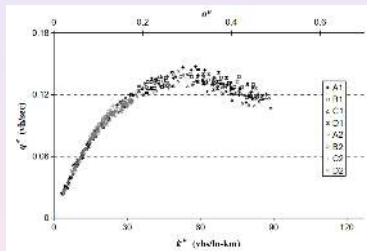
- From 500 ultrasonic and loop detectors



From [Geroliminis and Daganzo (2008)]

# Yokohama data

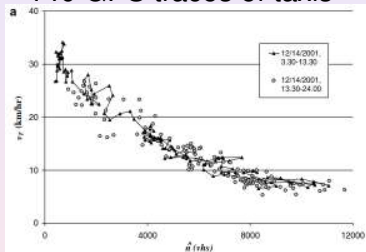
- From 500 ultrasonic and loop detectors



From [Geroliminis and Daganzo (2008)]

(flux weighted by the street length)

- 140 GPS traces of taxis



From [Geroliminis and Daganzo (2008)]