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Commuter's individual travel time estimation: using AFC data of Paris transit system

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Introduction

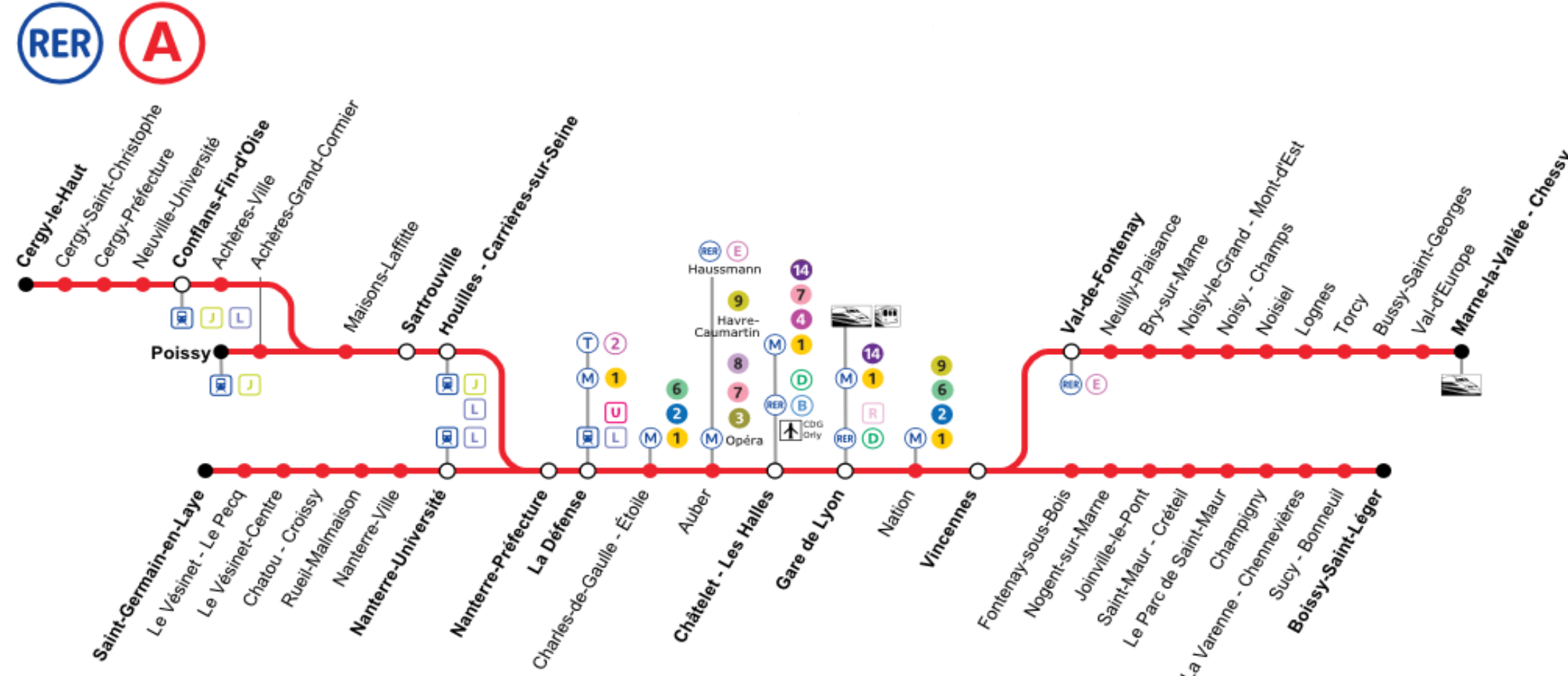
Automated Fare Collection (AFC) data of public transport details more passenger behavior information than manual survey. Based on a AFC dataset of line RER A of Paris transit system, commuter's Origin-Destination (O-D) pair has been generated by two loops. Passenger's gate-to-gate individual travel time between access station and egress station is derived directly from the generated O-D pair.

Key words:
public transport,
travel time,
AFC data,
O-D inference.

AFC Data and Data Processing

Case study and AFC data presentation

(i) RER A services's topological structure



(ii) Paris AFC system records commuter's farecard number which is anonymous, validation moments at access/egress stations' gates, the date, access/egress stations (including transfer station), and station serial number.

Data processing

Data processing is realized by **3 principal steps** combining TCL and SQLite:

Step 1: Data filtering

Extraction of all records of line RER A from mixed data.

Step 2: O-D pair inference

Loop 1: through each farecard number

Loop 2: through each trip

Step 3: Travel time calculation

$$TT = t_j - t_i$$

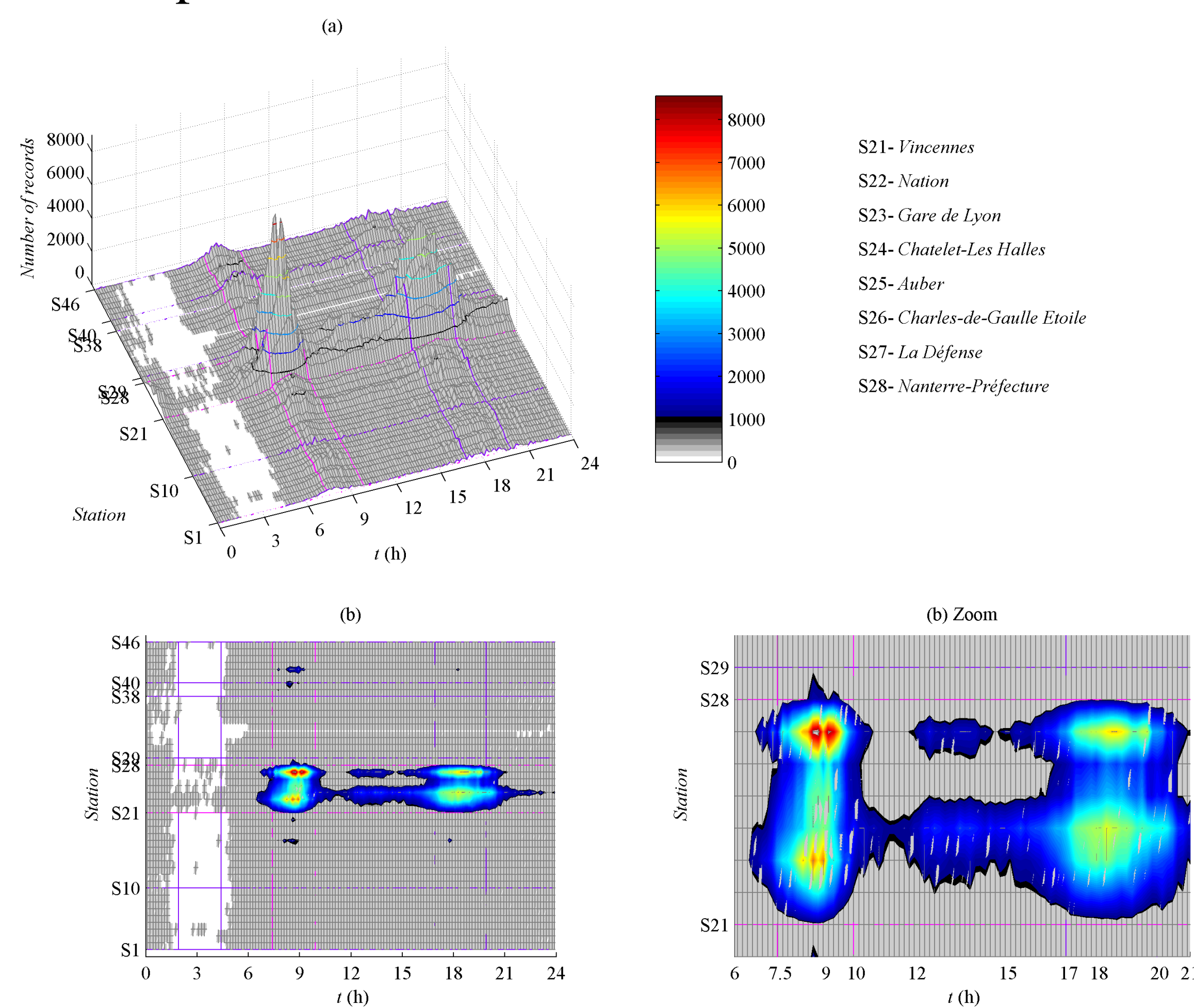
where t_i validation time at access station gate;

t_j validation time at egress station gate.

Results

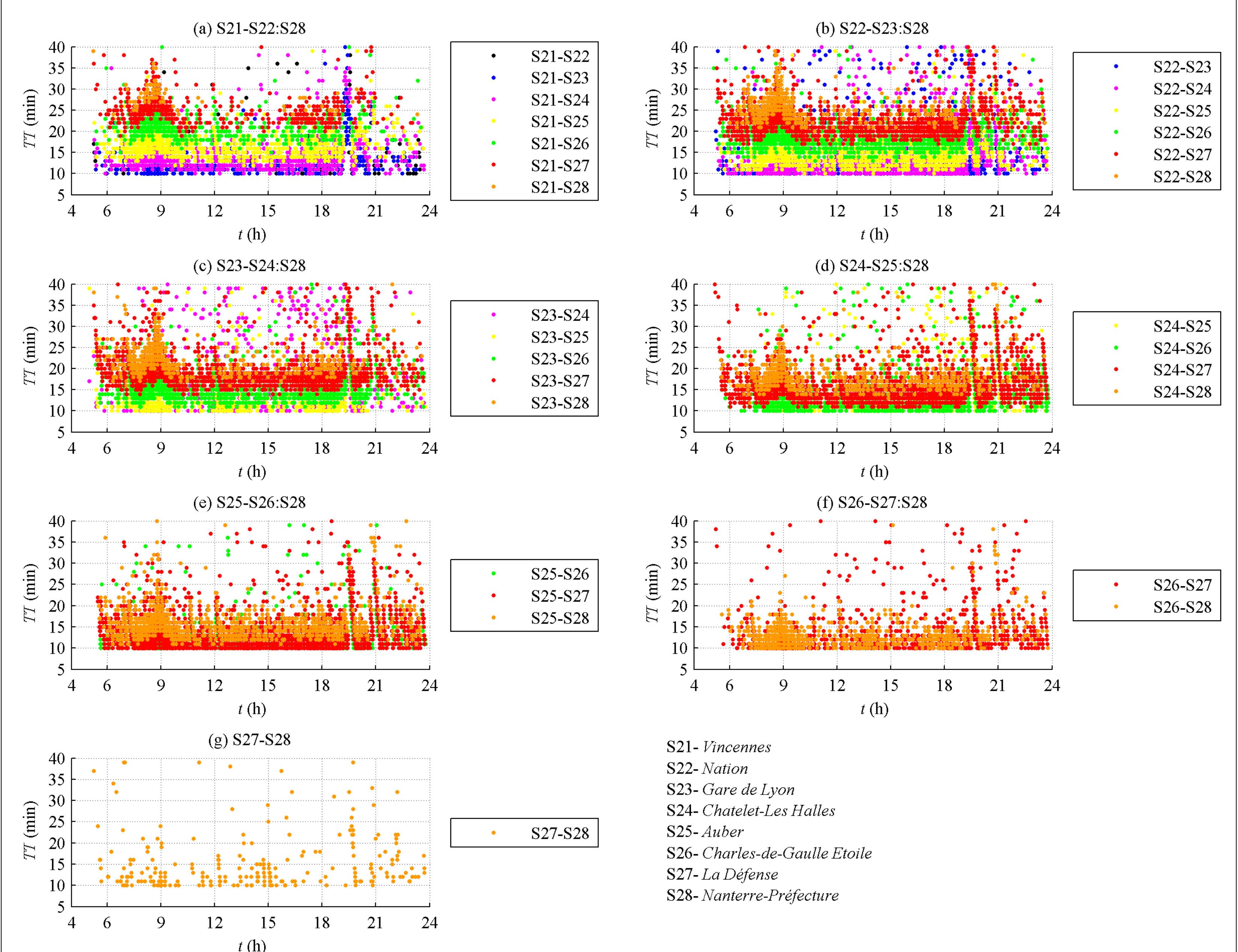
Extracted data of RER A

About 2 millions records of about 750 thousands distinct farecard numbers on April 7th 2011.



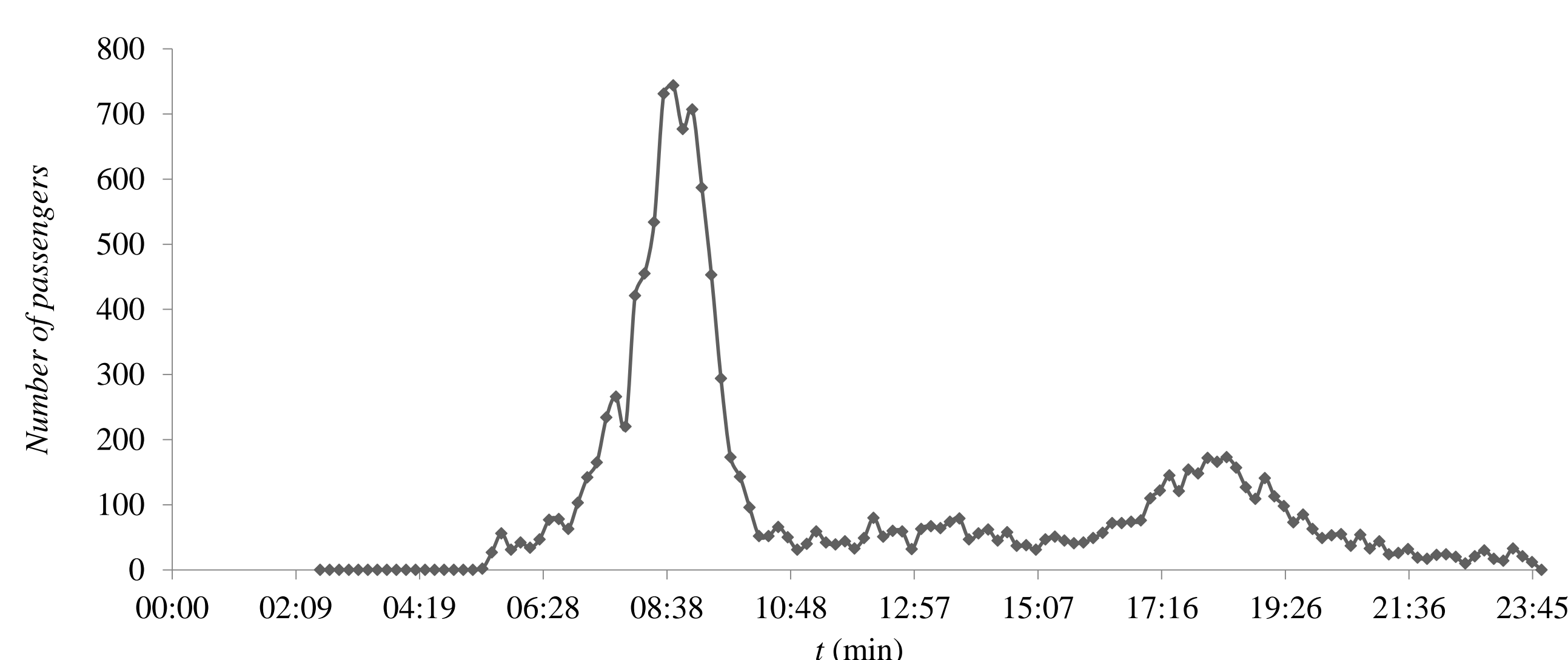
Passenger's gate-to-gate individual travel time

Passenger's gate-to-gate individual travel time (TT) distribution between each O-D pair of central segment of line RER A from Vincennes to Nanterre-Préfecture between 5h00 and 24h00.



Demand distribution of one O-D pair

Passenger's demand from Auber to La Défense.



- TT increases not only with travel distance, but also with the demand while the network is congested during peak hours;
- The morning TT peaks are sharper than evening ones;
- The dispersion of the TT points motivate a further study about the error sources of input AFC data.

Conclusions and perspectives

Passenger's gate-to-gate individual travel time (TT) between each O-D pair has been estimated for high frequency congested transit line, line RER A of Paris transit system, by using AFC data. AFC data provides passenger behavior information at microscopic level. The growing of TT of each O-D pair displays different traffic congestion conditions during morning and evening peak hours.

This work could be continue in two directions: (i) a study about the error sources of input AFC data; and (ii) an statistical analysis on output data.

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