The Daily Flight Time Index:
A NAS Performance Metric

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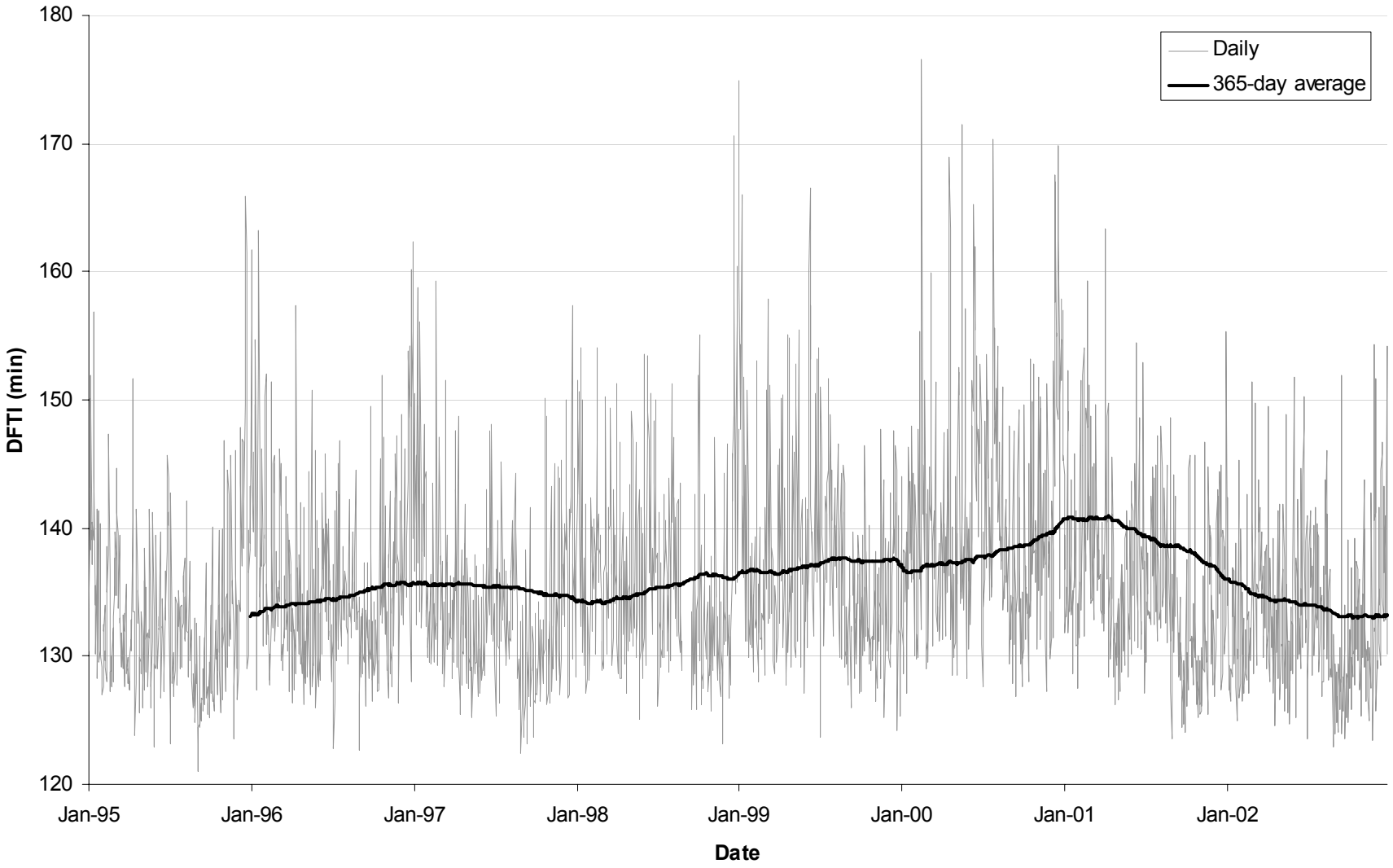
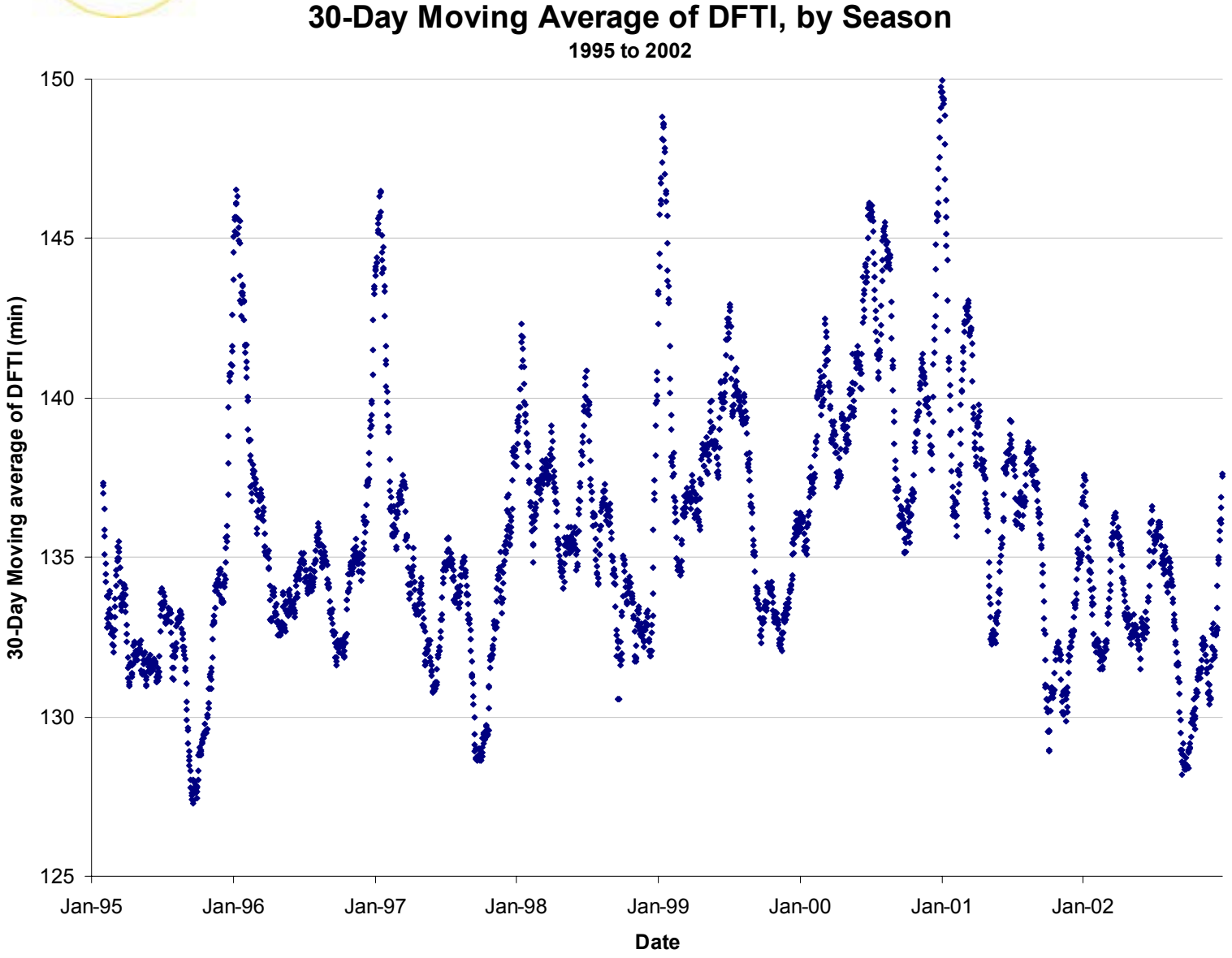
What is the DFTI?

- A Daily Performance Metric
- Measures Daily Variation in Flight Times
- Measure Daily Variation in Flight Time Components:
  - **Departure Delay**
  - **Taxi-Out Time**
  - **Airborne Time**
  - **Taxi-In Time**

What is the DFTI?

- A Weight average flight time
- Weights are constructed to maintain day-to-day comparability
- DFTI controls for:
  - **Changes in schedule padding**
  - **Changes in city-pair distribution of flights**


Daily Flight Time Index, 1995 to 2002
with 365-Day Moving Average
Daily
365-day average
DFTI (min)
180
170
160
150
140
130
120
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Date


30-Day Moving Average of DFTI, by Season
1995 to 2002
30-Day Moving average of DFTI (min)
150
145
140
135
130
125
Jan-95
Jan-96
Jan-97
Jan-98
Jan-99
Jan-00
Jan-01
Jan-02
Date

How is the DFTI constructed?

4 steps

- Identify city pairs
- Compute city-pair weights
- Compute Daily Average Flight Time (DAFT) by city-pair
- Compute DFTI and its components

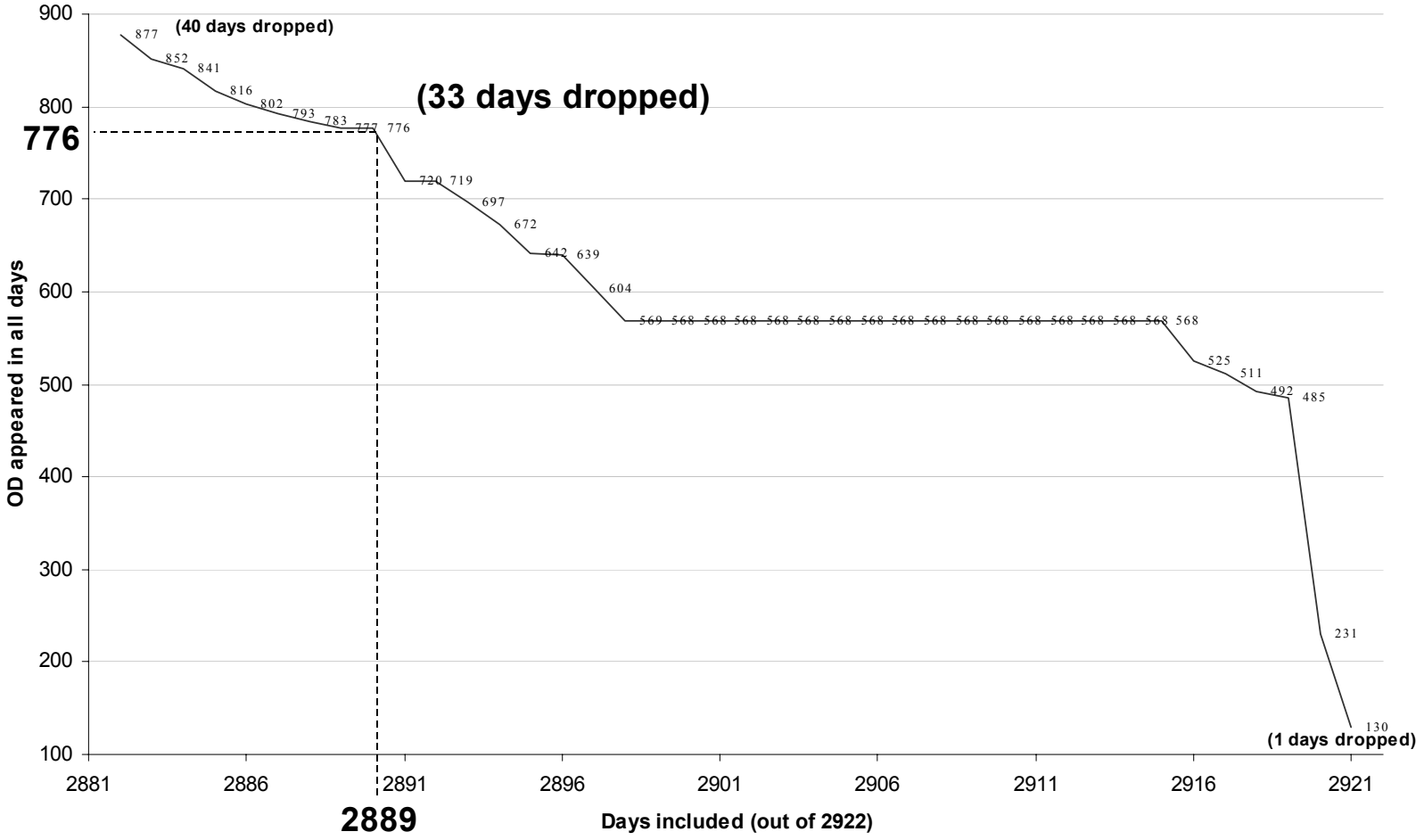
Step 1:

Identify City Pairs

- Data from Jan 1, 1995 to Dec 31 2002 included
- 33 days dropped due to low city-pair representation
- At least one completed flight on every day remained
- 776 city-pairs with more than 7000 daily flights
- Can increase city-pair representation by dropping more days and vice versa

Step 1:

Days included vs. ODs available



Step 2:

Compute City-Pair Weights

$$W_i = \frac{F_i}{\sum_{j \in CP} F_j}$$

W_i - Weight for city-pair i

F_j - Flights for city-pair j during study period

CP - Set of city-pairs in the DFTI

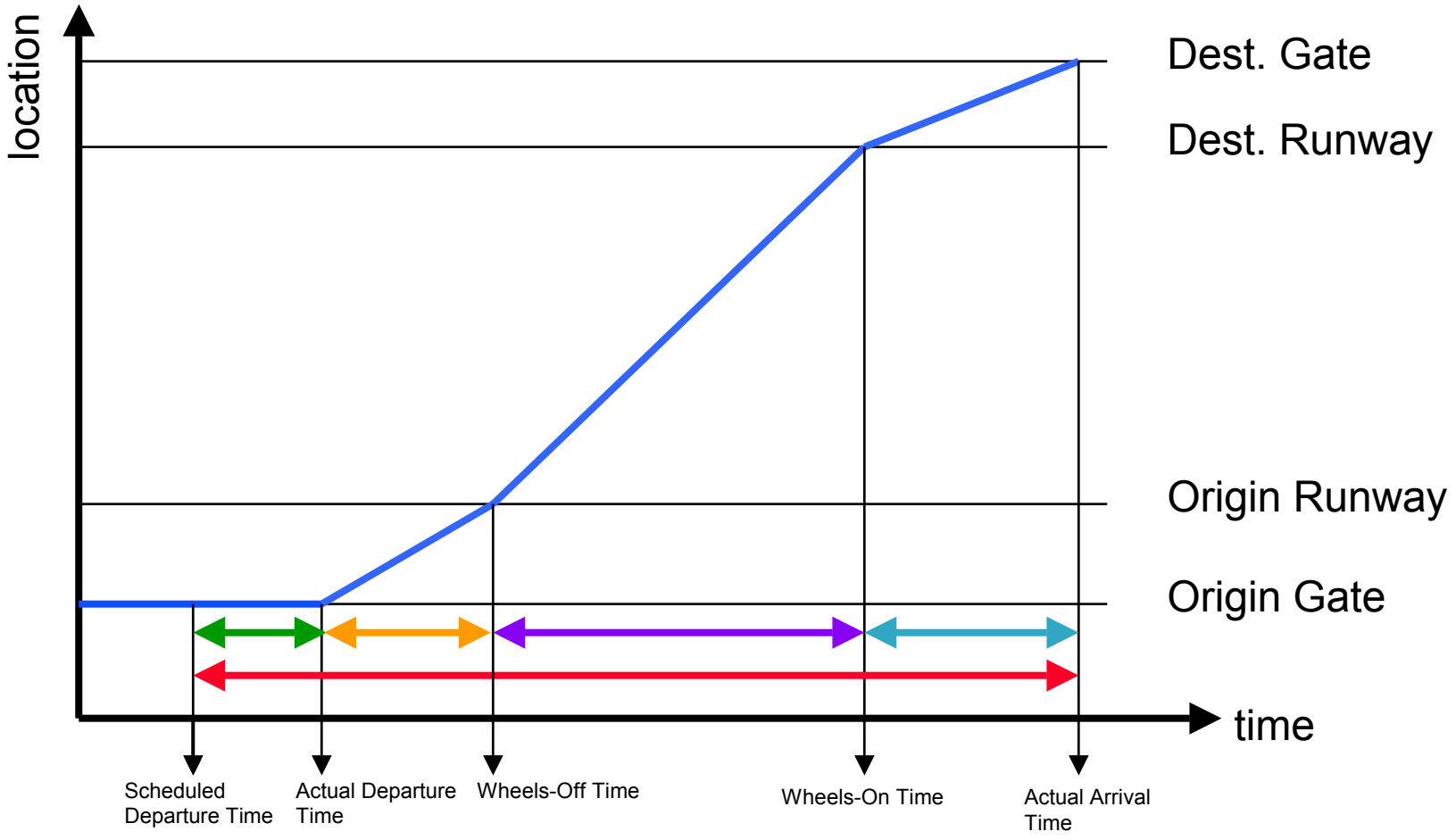
Step 3:

Compute Daily Average Flight Time

- Flight Time Defined as Total Time from **Scheduled Departure** to **Actual Arrival**
- Flight Time is the sum of **four components**
  - **Origin delay (against schedule)**
  - **Taxi-out Time**
  - **Airborne Time**
  - **Taxi-in Time**

Step 3: compute DAFT

Flight Time and Its Components



Step 3:

DAFT Calculation

f—Flight index

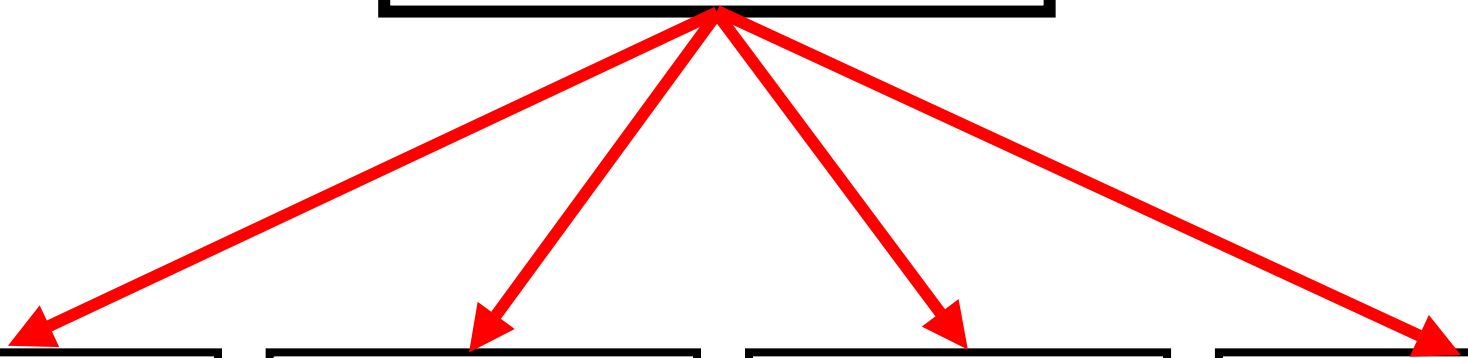
i—City-pair index

d—Day index

$$DAFT_{id} = \frac{\sum_{f \in S_{id}} FT_f}{N_{id}}$$

S_{id}—Set of flights for city-pair *i* on day *d*

N_{id}—Number of flights in S_{id}



$$DAOD_{id} = \frac{\sum_{f \in S_{id}} OD_f}{N_{id}}$$

Origin Delay

$$DATO_{id} = \frac{\sum_{f \in S_{id}} TO_f}{N_{id}}$$

Taxi-out Time

$$DAAB_{id} = \frac{\sum_{f \in S_{id}} AB_f}{N_{id}}$$

Airborne Time

$$DATI_{id} = \frac{\sum_{f \in S_{id}} TI_f}{N_{id}}$$

Taxi-inTime

Step 4:

Compute Daily Flight Time Index

- Weighted average of DAFTs
- Weights obtained as explained above
- Overall DFTI and its components calculated in similar manner

Step 4:

DFTI calculation

i—City-pair index

d—Day index

$$DFTI_{id} = \sum_{i \in CP} W_i \cdot DAFT_{id}$$

CP—Set of city-pairs in the DFTI

W_i—Weight for city-pair *i*

$$DODI_d = \sum_{i \in CP} W_i \cdot DAOD_{id}$$

Origin Delay

$$DTOI_d = \sum_{i \in CP} W_i \cdot DATO_{id}$$

Taxi-out Time

$$DABI_d = \sum_{i \in CP} W_i \cdot DAAB_{id}$$

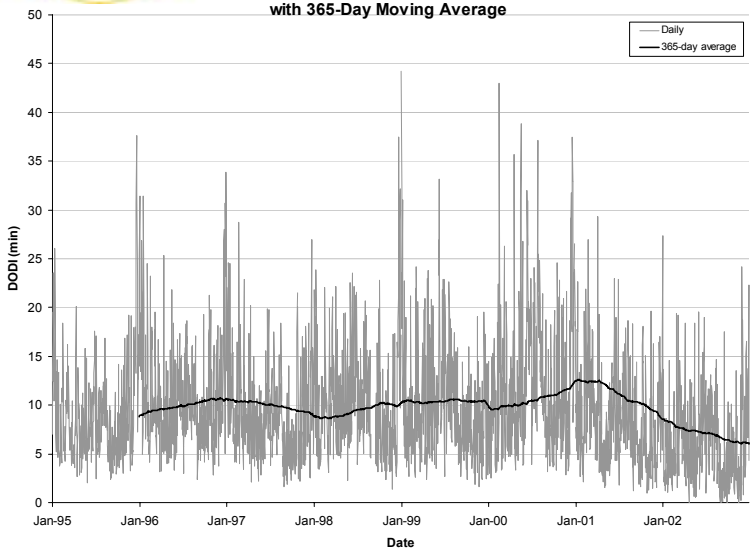
Airborne Time

$$DTII_d = \sum_{i \in CP} W_i \cdot DATI_{id}$$

Taxi-in Time

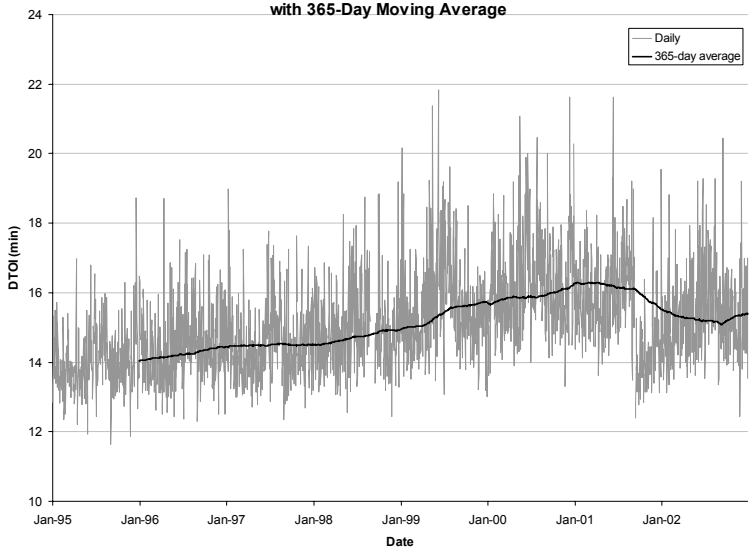
Daily Origin Delay Index, 1995 to 2002

with 365-Day Moving Average



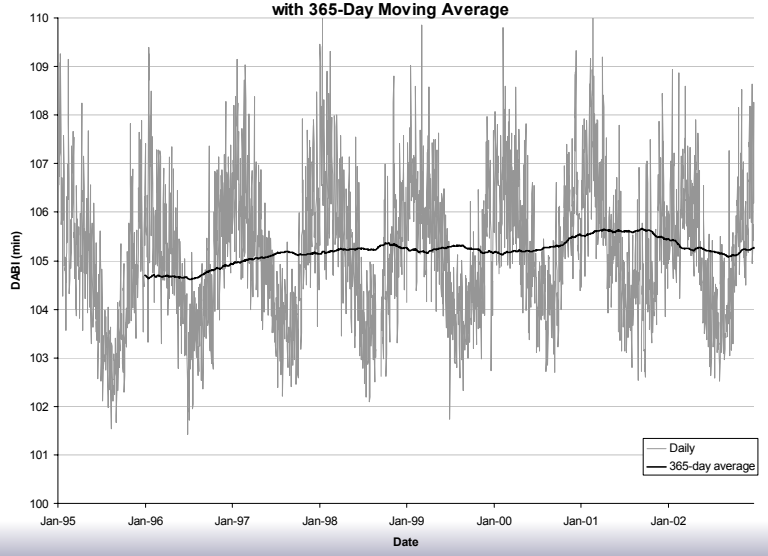
Daily Taxi-Out Index, 1995 to 2002

with 365-Day Moving Average



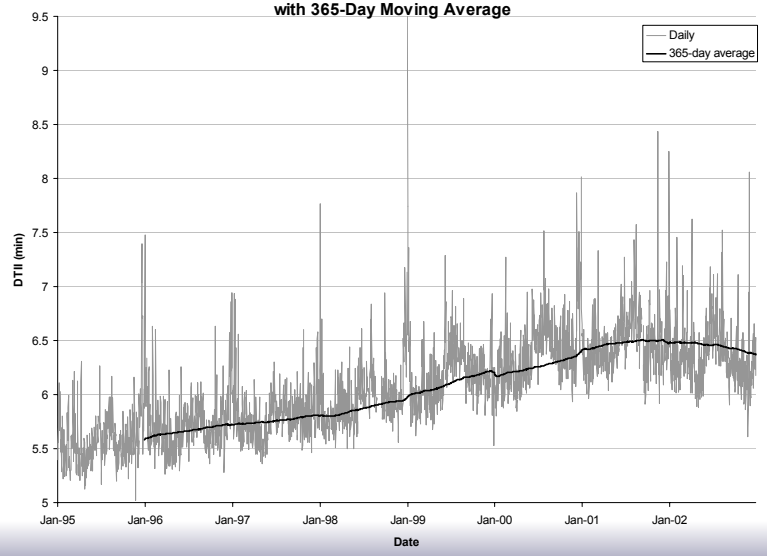
Daily Airborne Index, 1995 to 2002

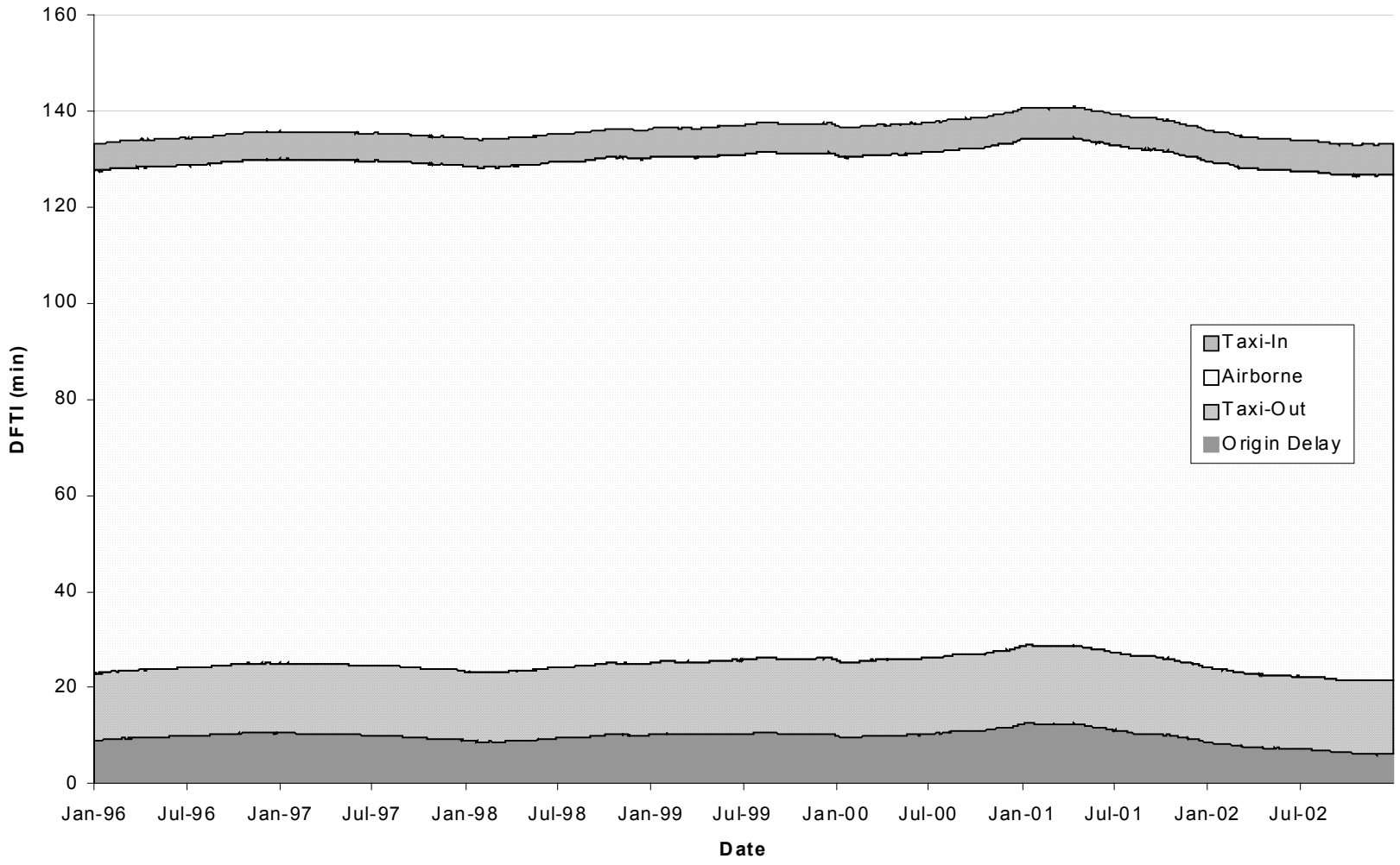
with 365-Day Moving Average



Daily Taxi-In Index, 1995 to 2002

with 365-Day Moving Average




365-Day Moving Average of DFTI and Components
1995 - 2002
DFTI (min)
160
140
120
100
80
60
40
20
0
Jan-96
Jul-96
Jan-97
Jul-97
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Date
Taxi-In
Airborne
Taxi-Out
Origin Delay