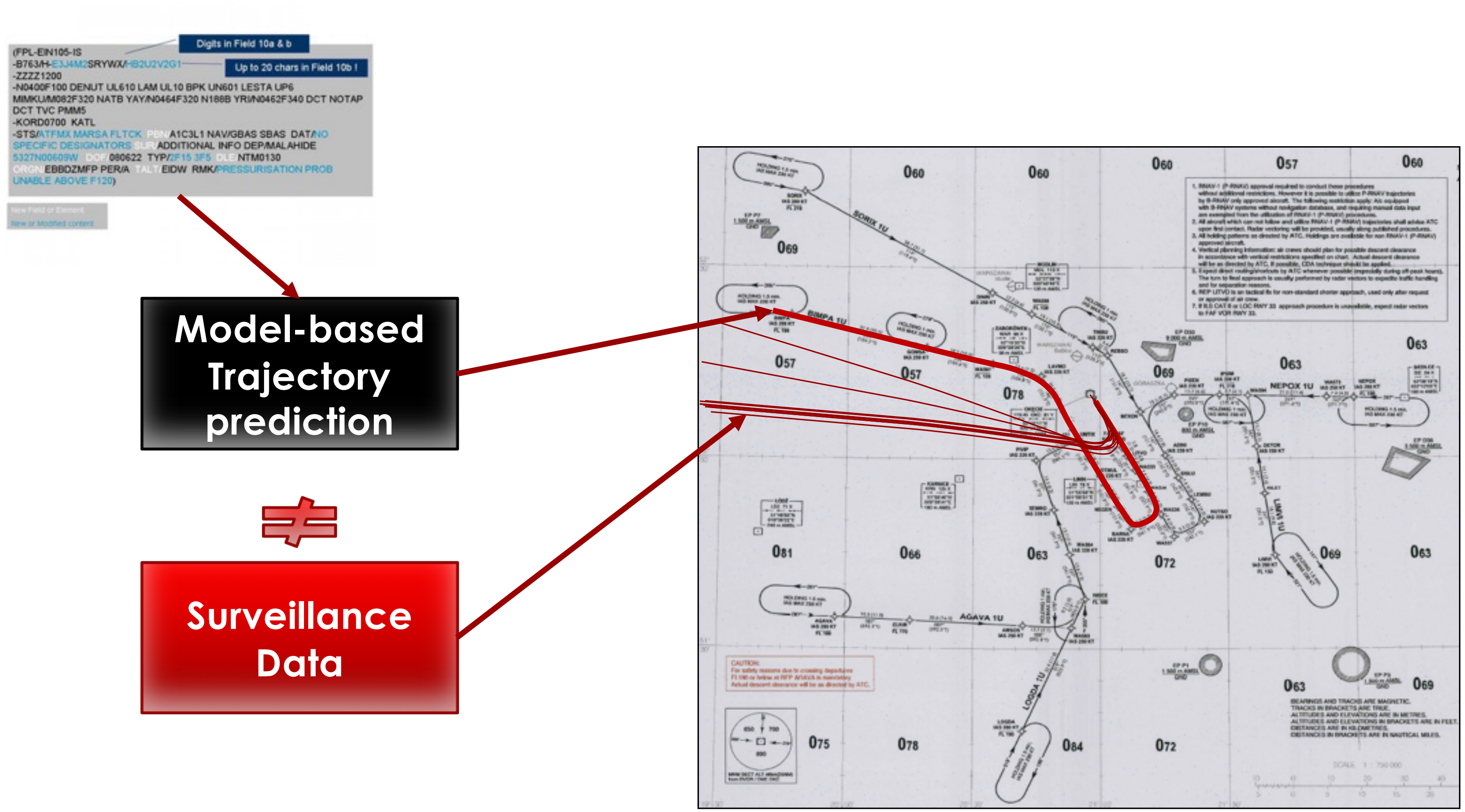
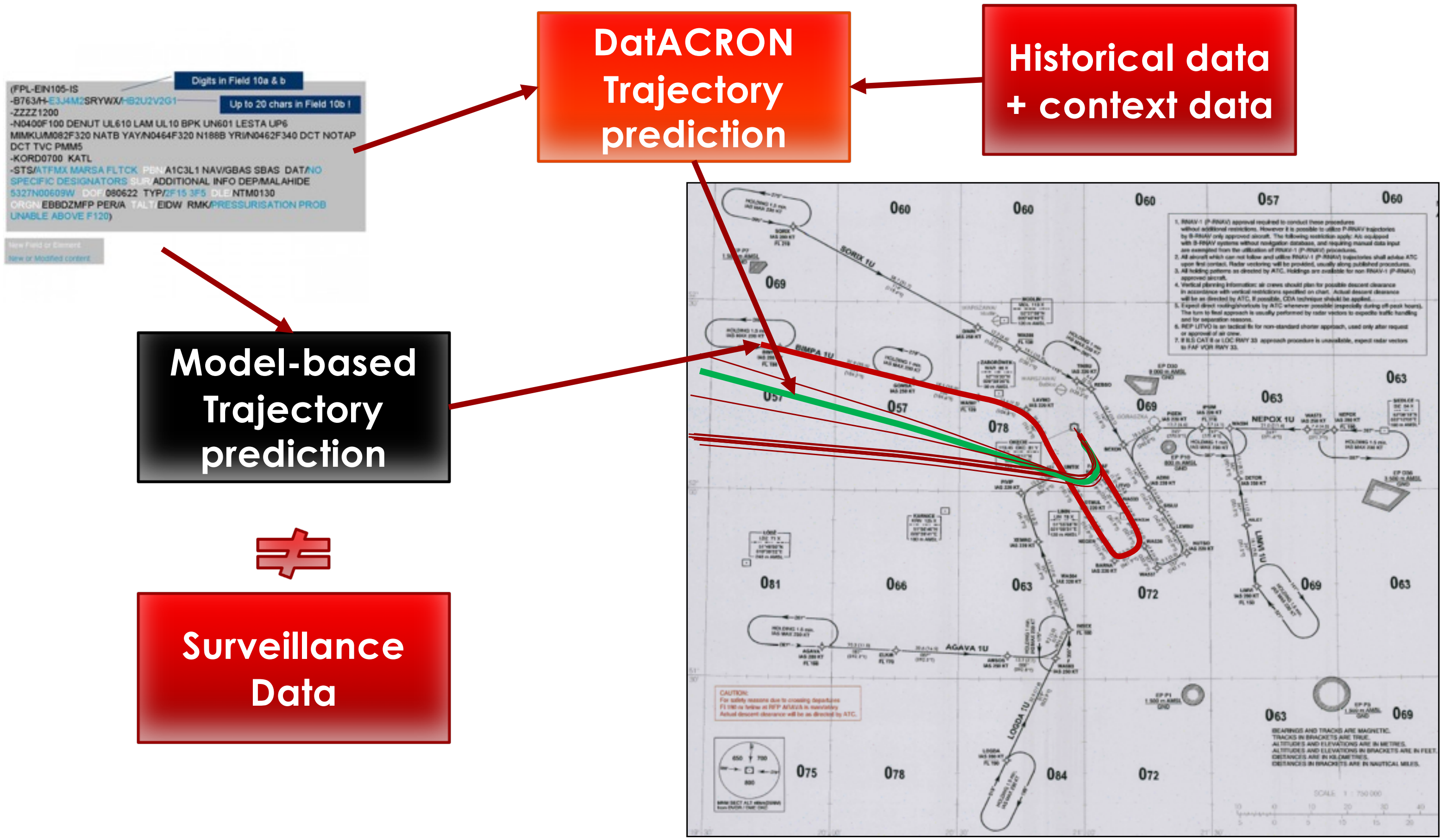
Trajectory prediction (model-based)



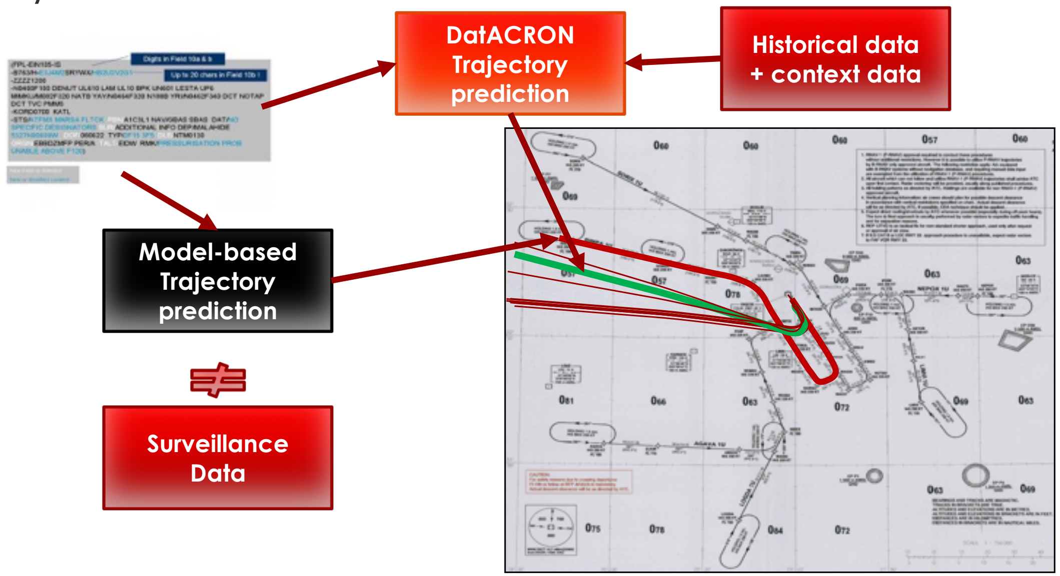
Trajectory prediction (data-driven)



Trajectory prediction (data-driven)

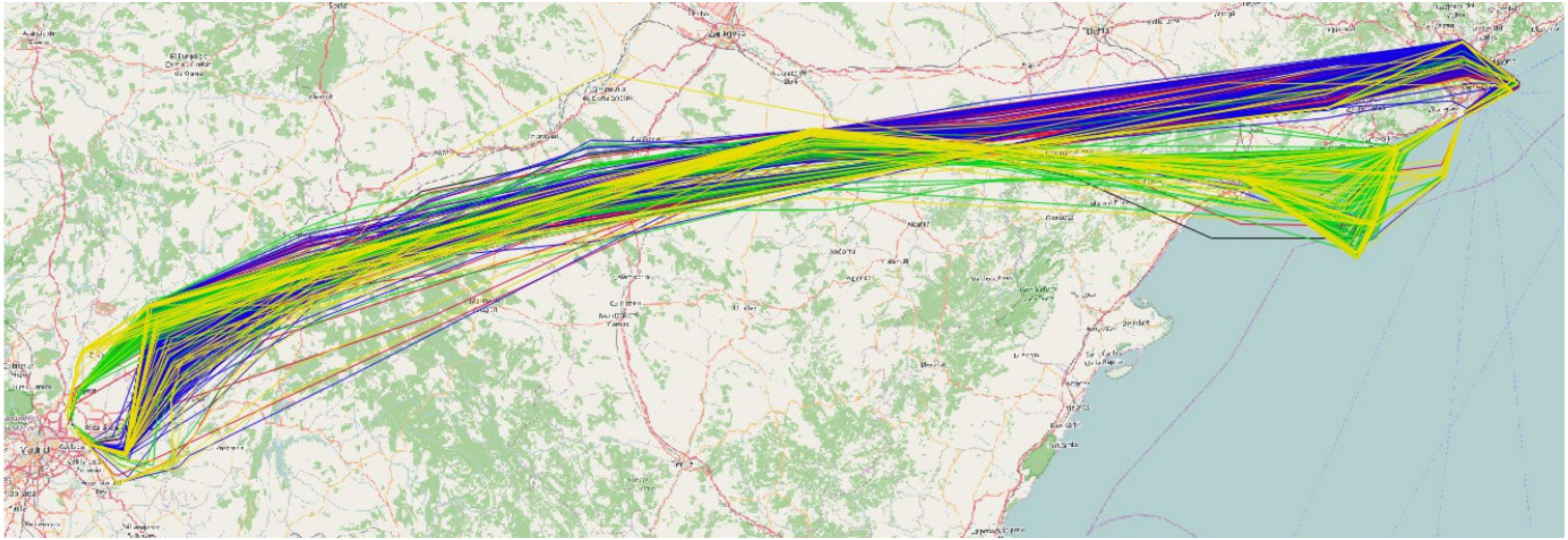
sequence of (lat-, lon-, alt-, t-) tuples

- Problem definition:
  pre-flight Trajectory Prediction (TP): Given a Flight Plan (FP), predict the actual trajectory of the corresponding flight, w.r.t. information that <u>really matters</u>
  - Historical data (actual flights and FPs)
  - Current and forecasted meteo,
  - Predicted air-space traffic,
  - etc.
- Offline problem – before takeoff



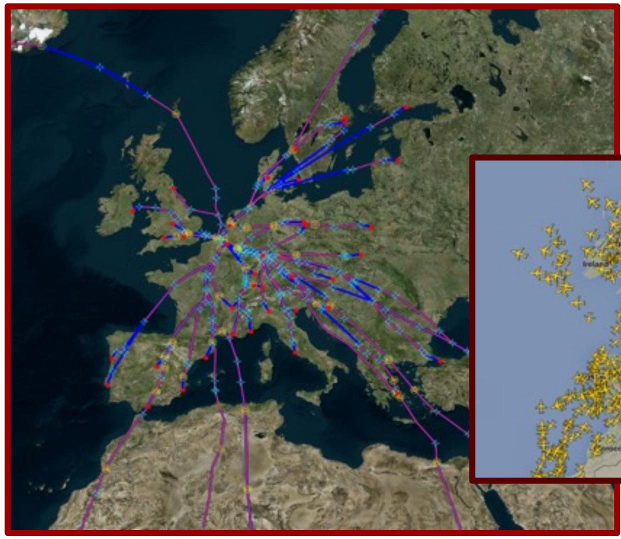
Experimental dataset

- Spain (Madrid-Barcelona flights), April 2016



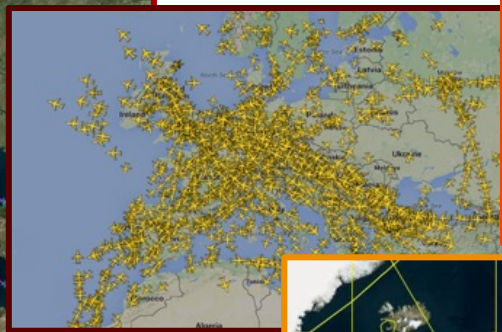
Handling big data

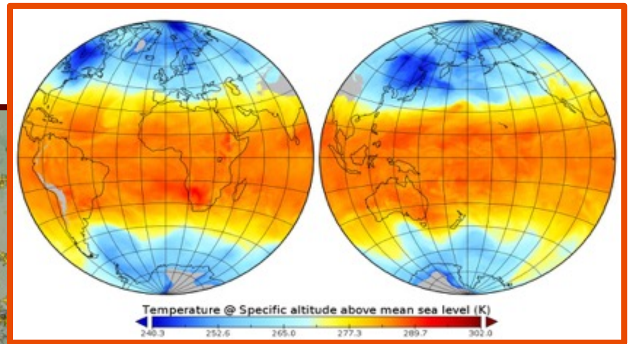
- DataSets:
  - Initial Flight Plans
  - Surveillance data
  - Weather live data and forecasts
  - Other context data



EBBR Outbound Fligh Plans for a 2 hour timeslot

ADS-B Surveillance traffic



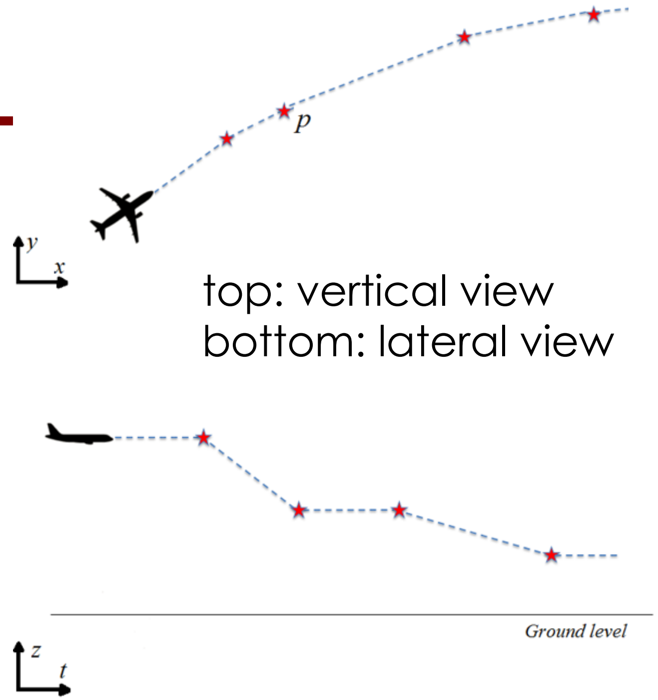


European Sector static information

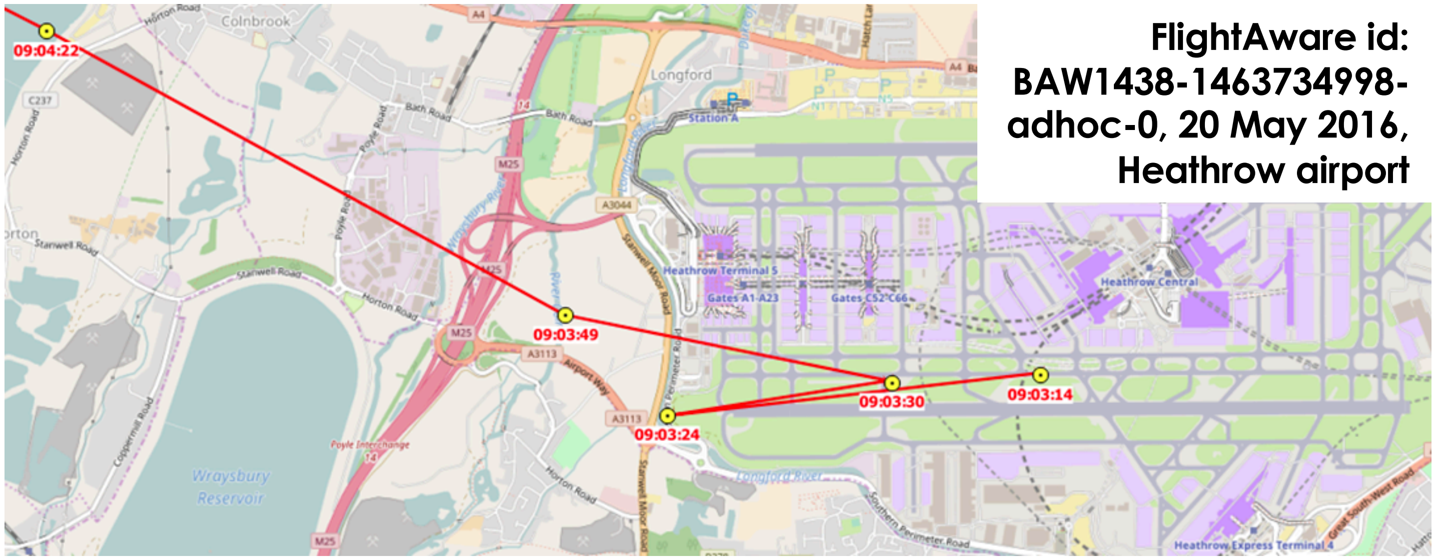
Handling big data (cont.)

- Challenges: **identify critical points**, detect and eliminate noise, fuse information from different sources, etc.

… all to be performed **online**!



top: vertical view
bottom: lateral view

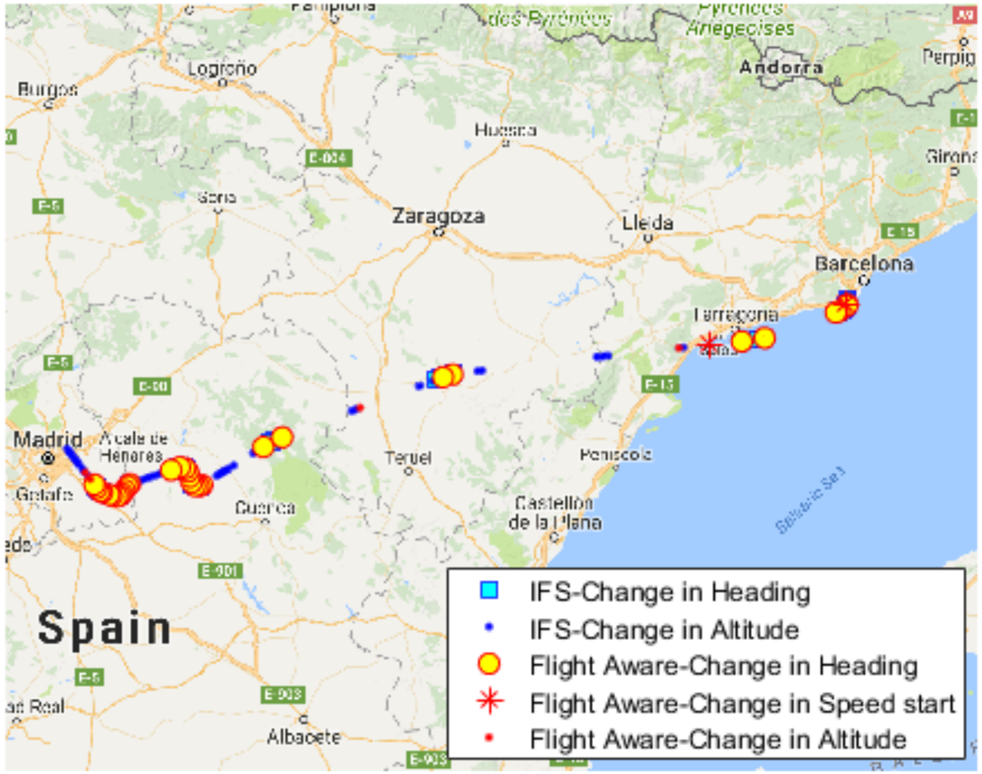


FlightAware id: BAW1438-1463734998-adhoc-0, 20 May 2016, Heathrow airport

Handling big data (cont.)

Original track (Flight id: IBE1925)

Synopsis (Flight id: IBE1925)



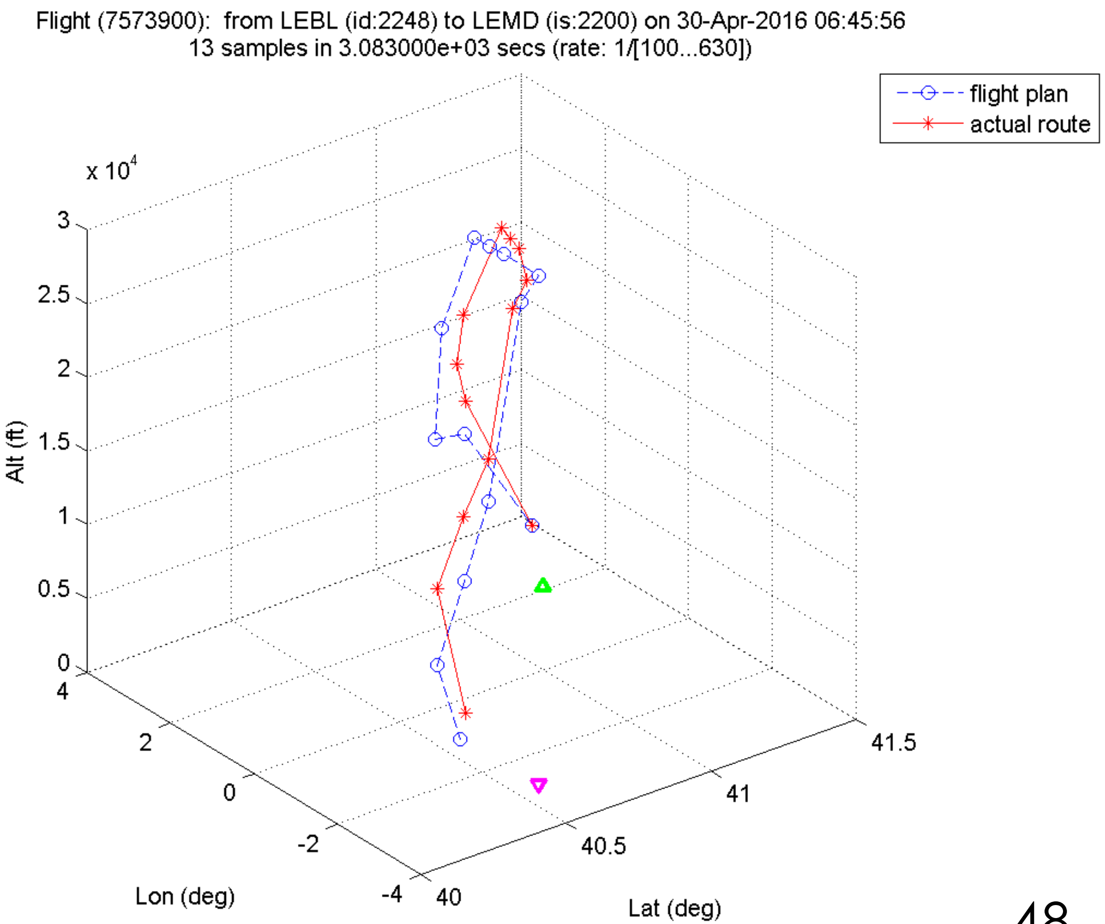
Data-driven trajectory prediction

(Georgiou et al. 2019)

Method sketch:

<u>Input</u>: Flight plans, actual routes, local weather, aircraft type, etc.

1. Past enriched trajectories are **Clustered**; medoids of clusters ('representatives') are also produced
2. A **Predictive Model** (PM) is built for each cluster
3. For each new flight plan FP, the **k-closest matches** (PMs) are found
4. <u>Output</u>: top-*k* PMs w.r.t. query FP



Data-driven trajectory prediction (cont.)

(Georgiou et al. 2019)

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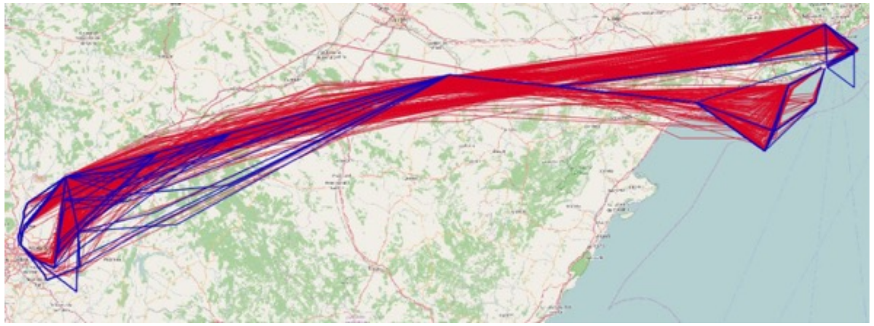

Data-driven trajectory prediction (cont.)

(Georgiou et al. 2019)

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