Multi-layered data in Air Traffic Management

13th June 2017, EASA, Cologne

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Deep Blue

- **Human Factors** and **Safety**
  - Strong link between research and consultancy
- **Highest success rate in EU** for SESAR Exploratory Research
- Supporting **safety data monitoring and analysis** in ATM

Objectives

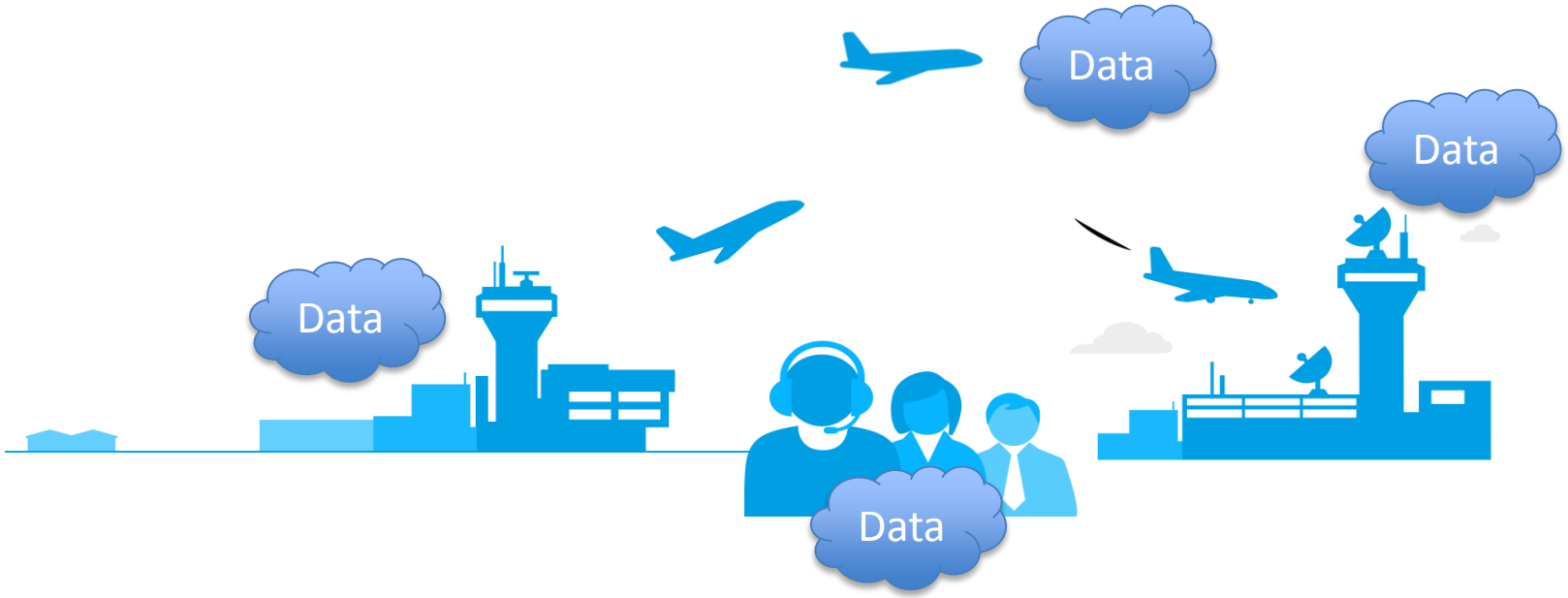
1. Introducing the concept of **ATM data layers**

2. Presenting the **approach** adopted for the analysis of these data

3. Showing the value of adding the **human performance data layer**

Heterogeneous data everywhere

- Different **sources**
- Different **production rate**
- Different **resolution (time and space)**



Examples of data layers in ATM

Looking at traffic layer

TRAFFIC

Production: continuous
Source: ECTL DDR2 repository
Resolution: 2 min
What: flight plans and flown trajectories in ECAC area

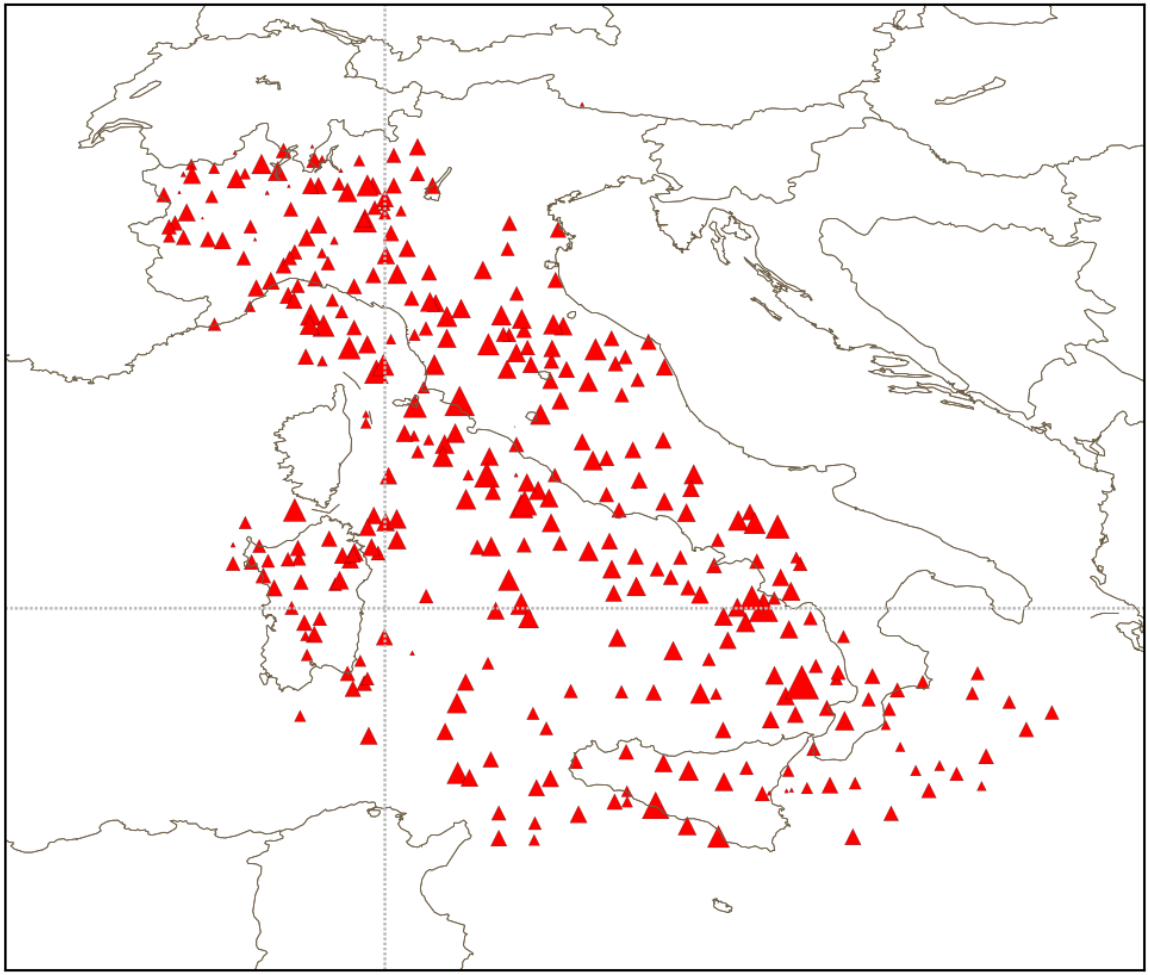
Classic:

- Sector occupancy
- Delay
- …

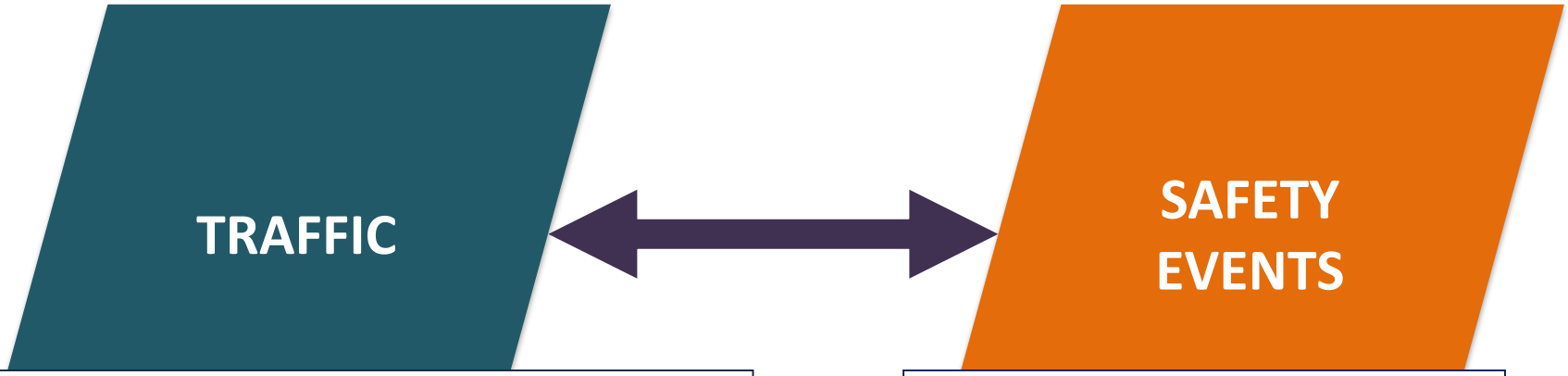
Non-classic:

- Altitude deviation

A map of altitude deviations hotspots



Correlating layers: traffic and safety

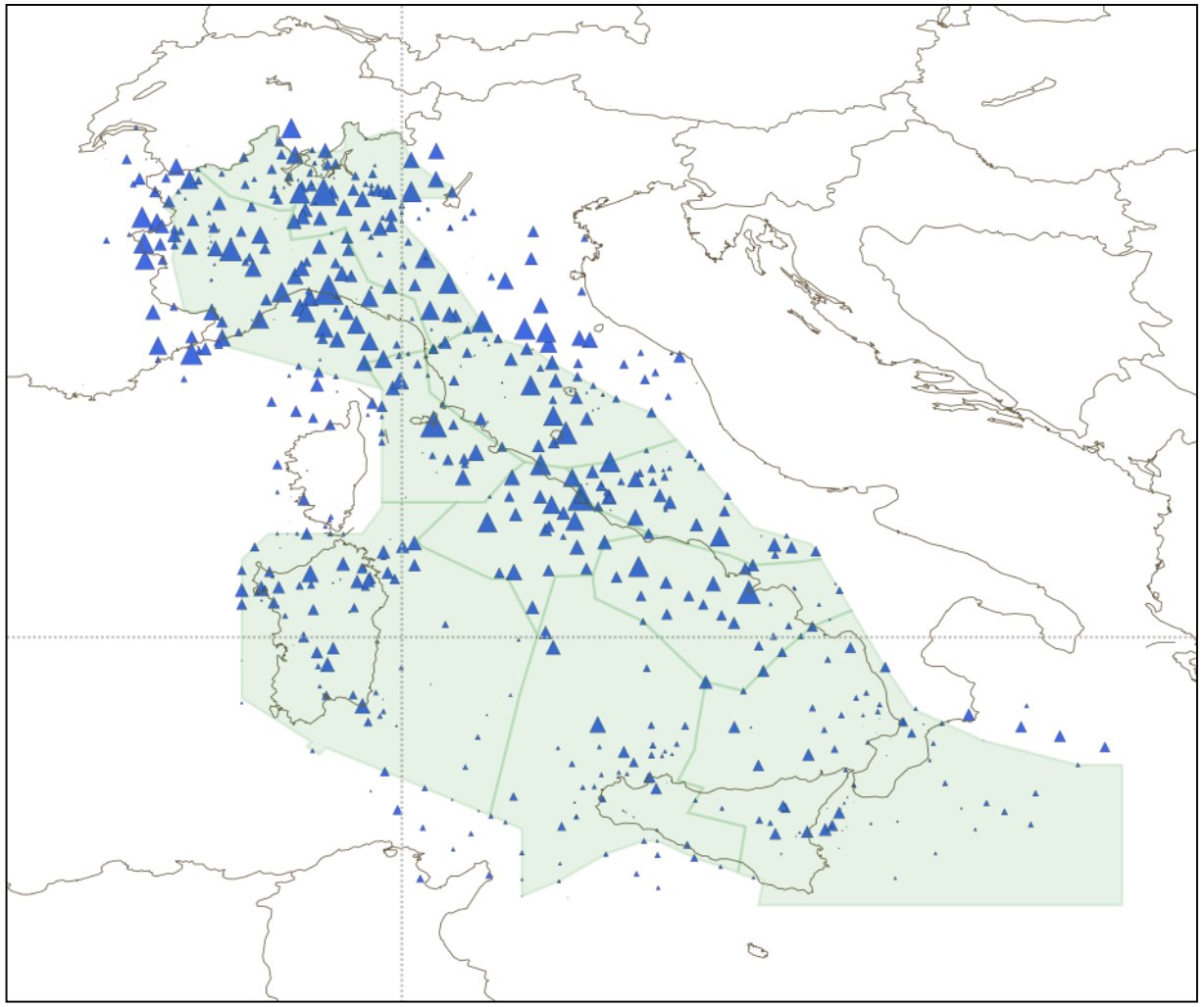


Source: ECTL DDR2 repository
Production: continuous
Resolution: 2 min
What: flight plans and flown trajectories

Source: ECTL ASMT tool
Production: variable
Resolution: 5 s
What: STCA and SMI

Traffic load over Italian navigation points

The bigger the point the higher the traffic load



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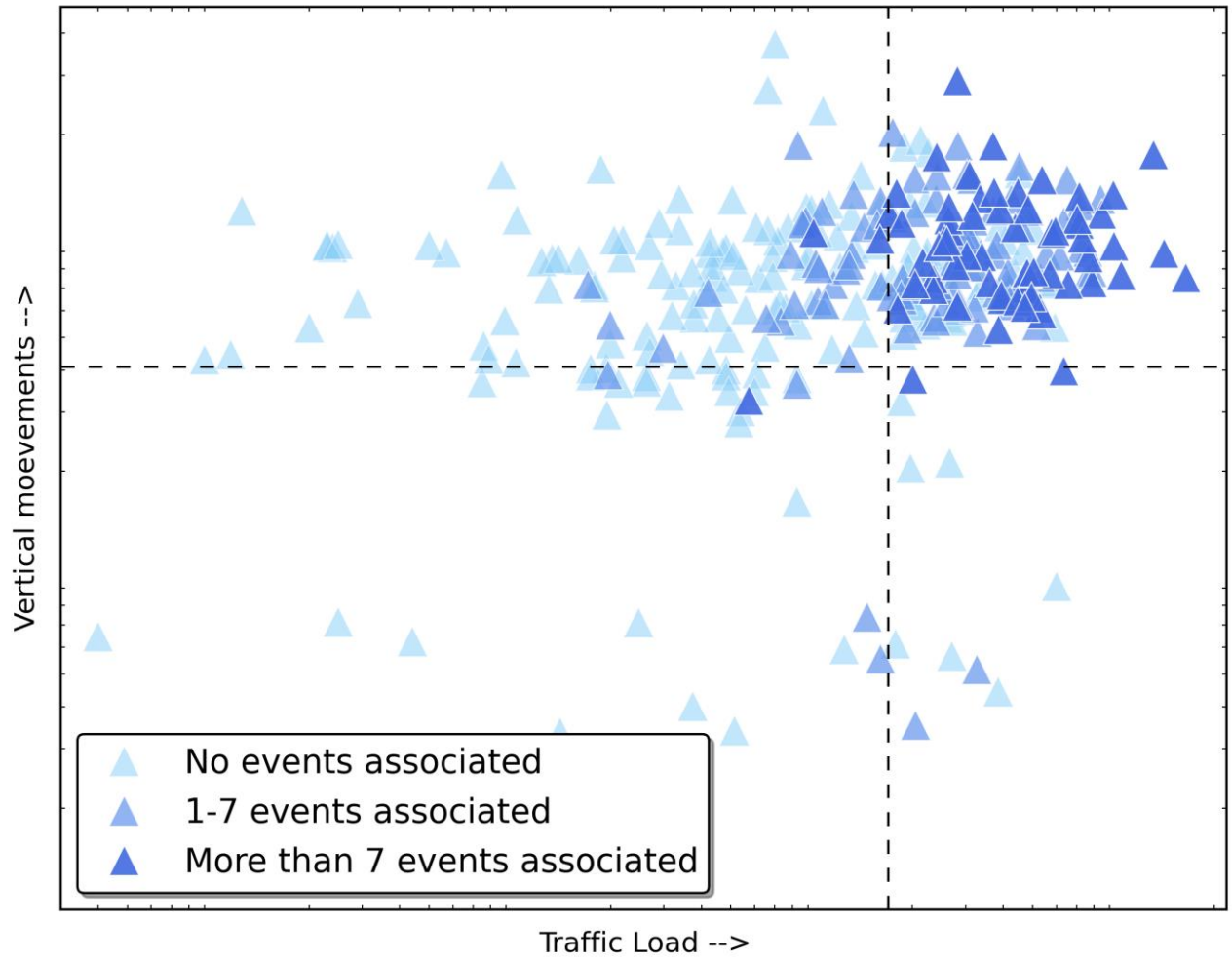
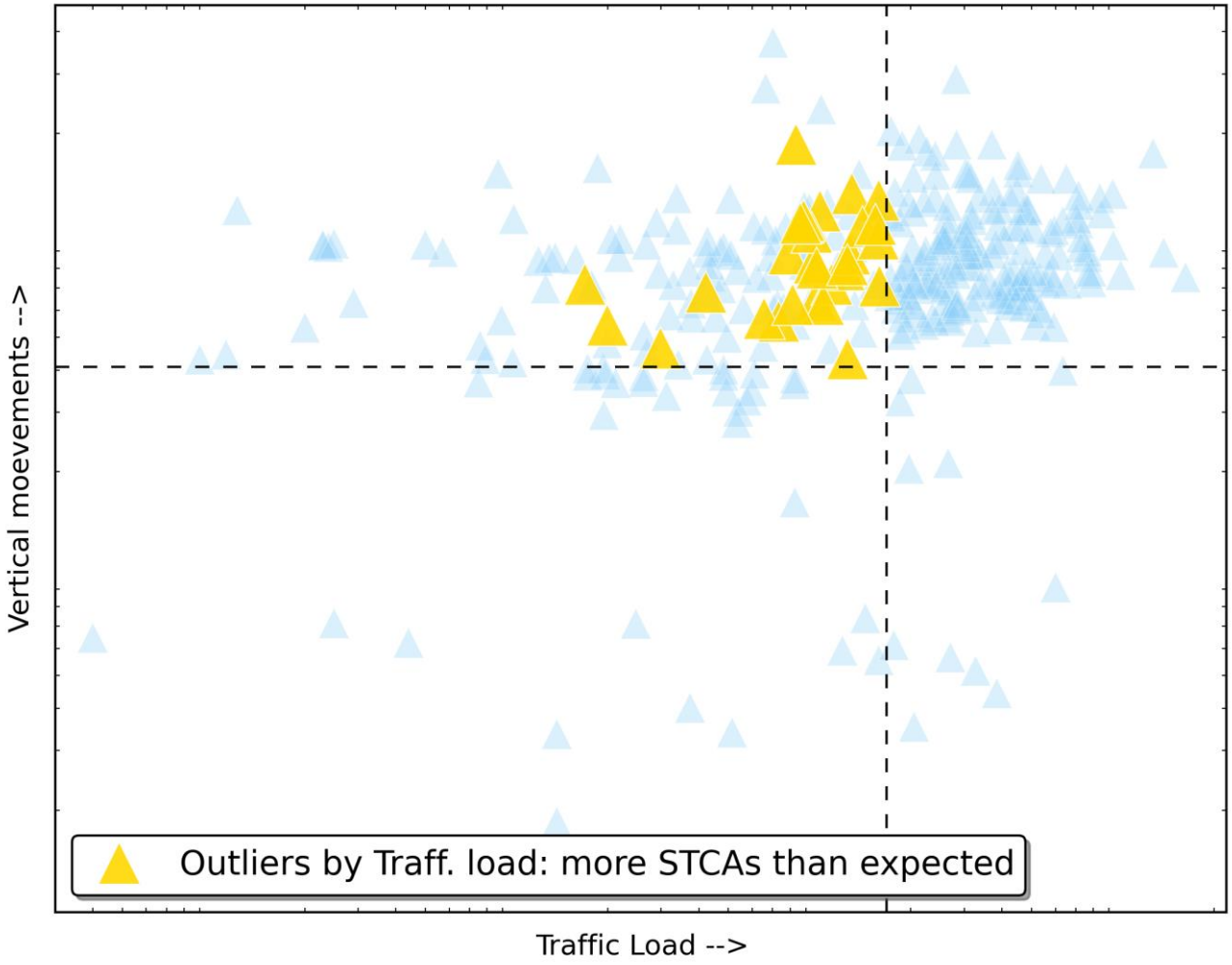
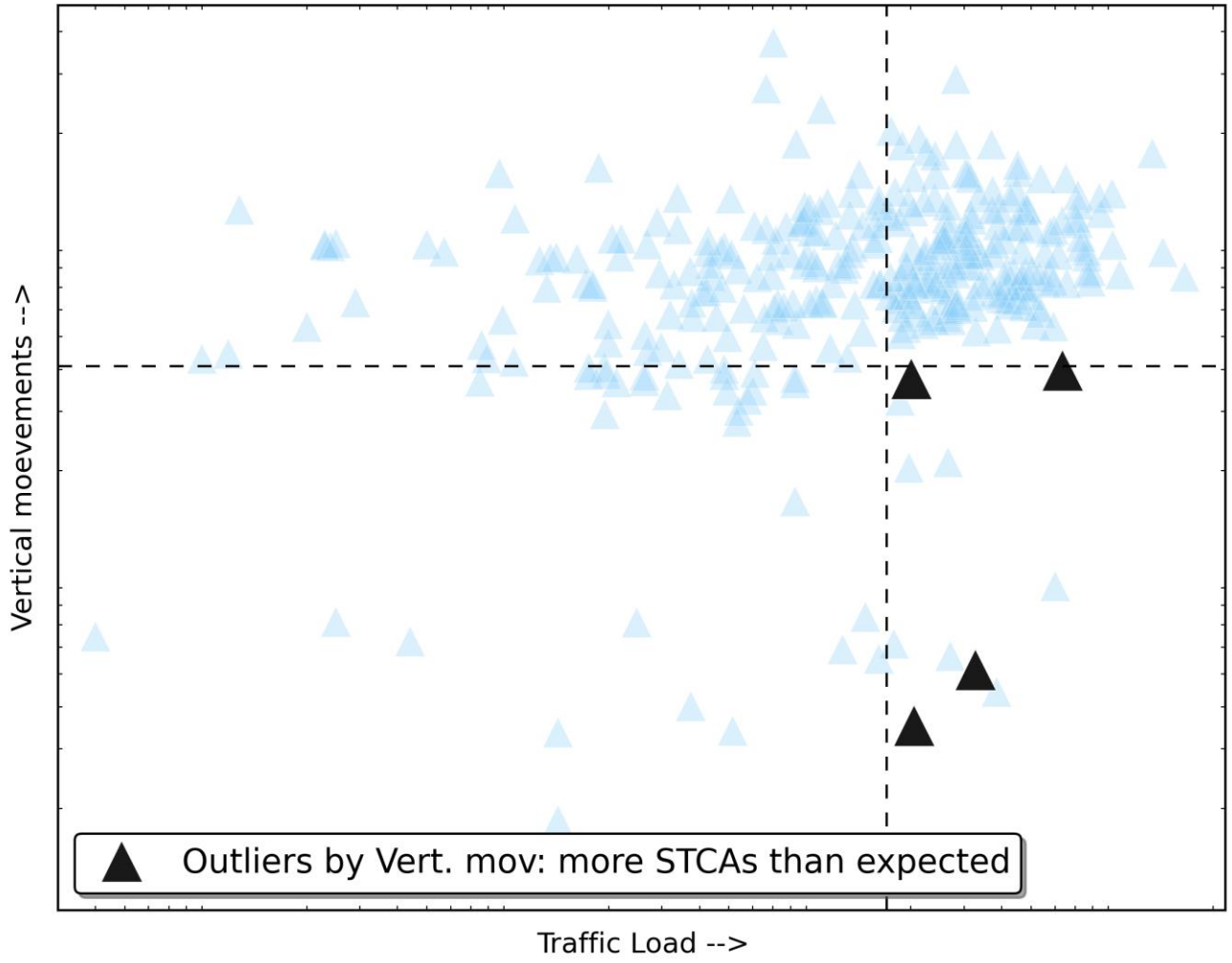
Traffic load, complexity and STCA



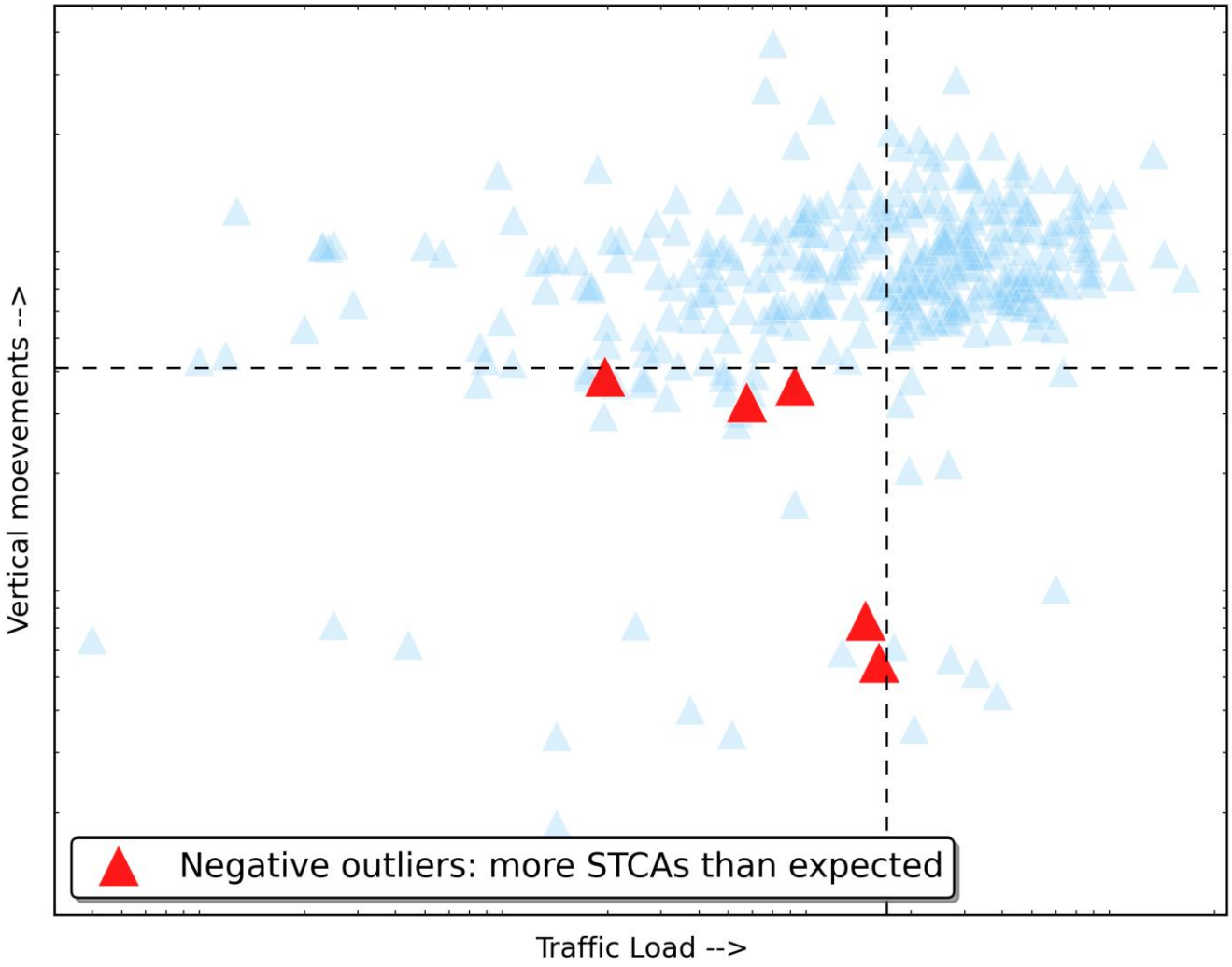
Negative outliers: traffic load



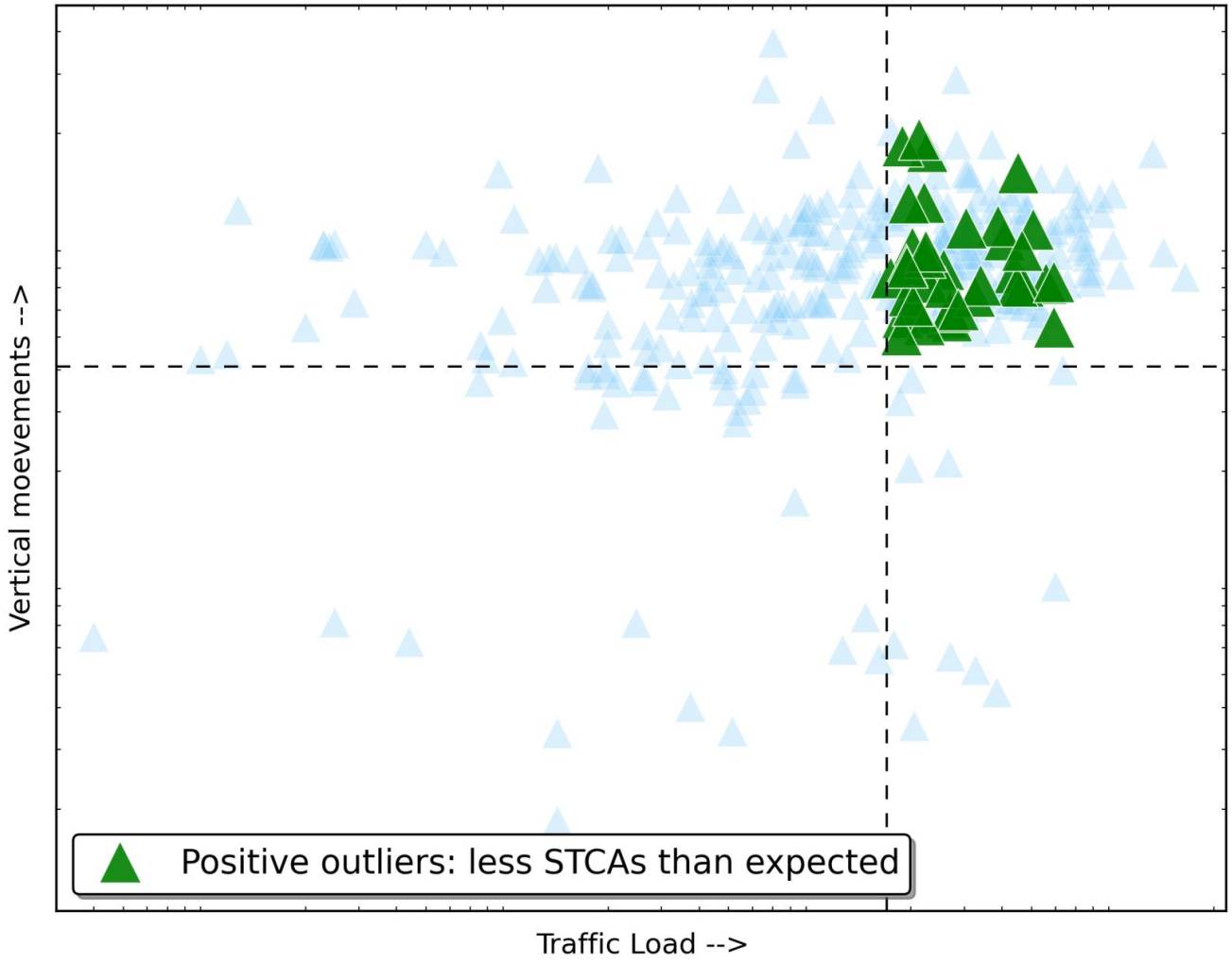
Negative outliers: vertical movement



Negative outliers: both dimensions



Positive outliers

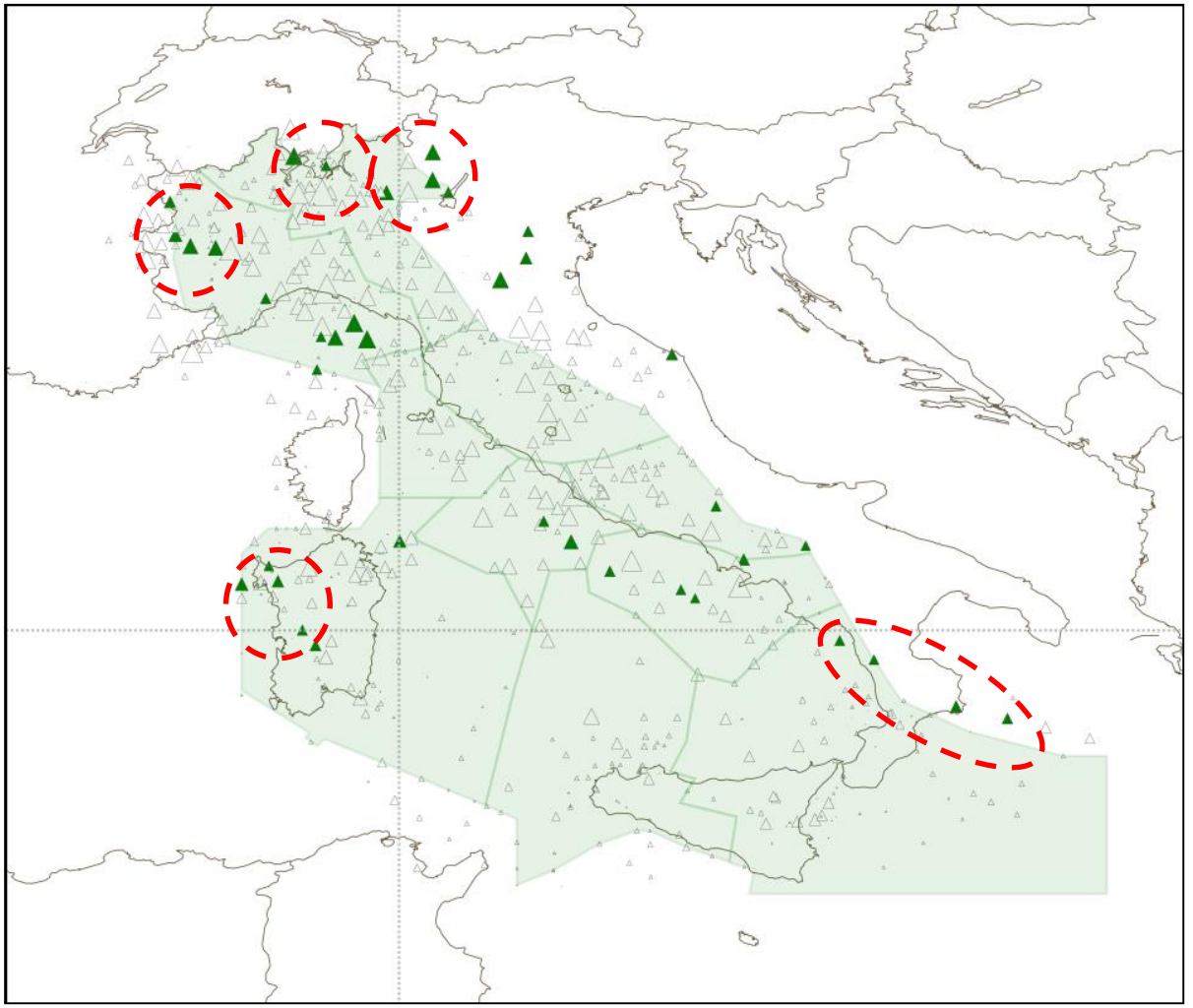


Positive outliers: localisation

Are there points with a high traffic load but with a lower-than-average number of safety events associated?

What are the drivers behind?

Specific procedures used to avoid conflicts in FIR transition areas



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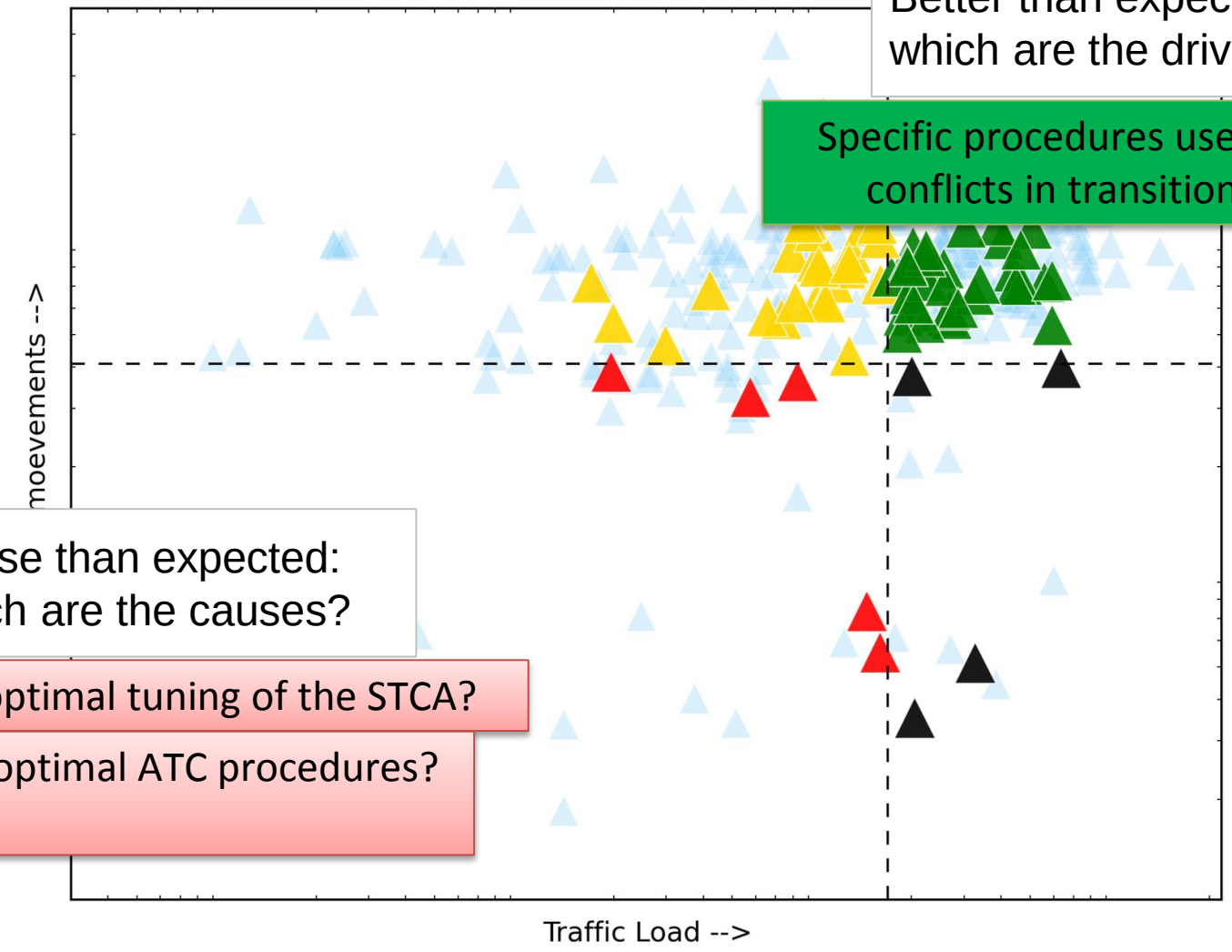
…and negative outliers



Better than expected: which are the drivers?

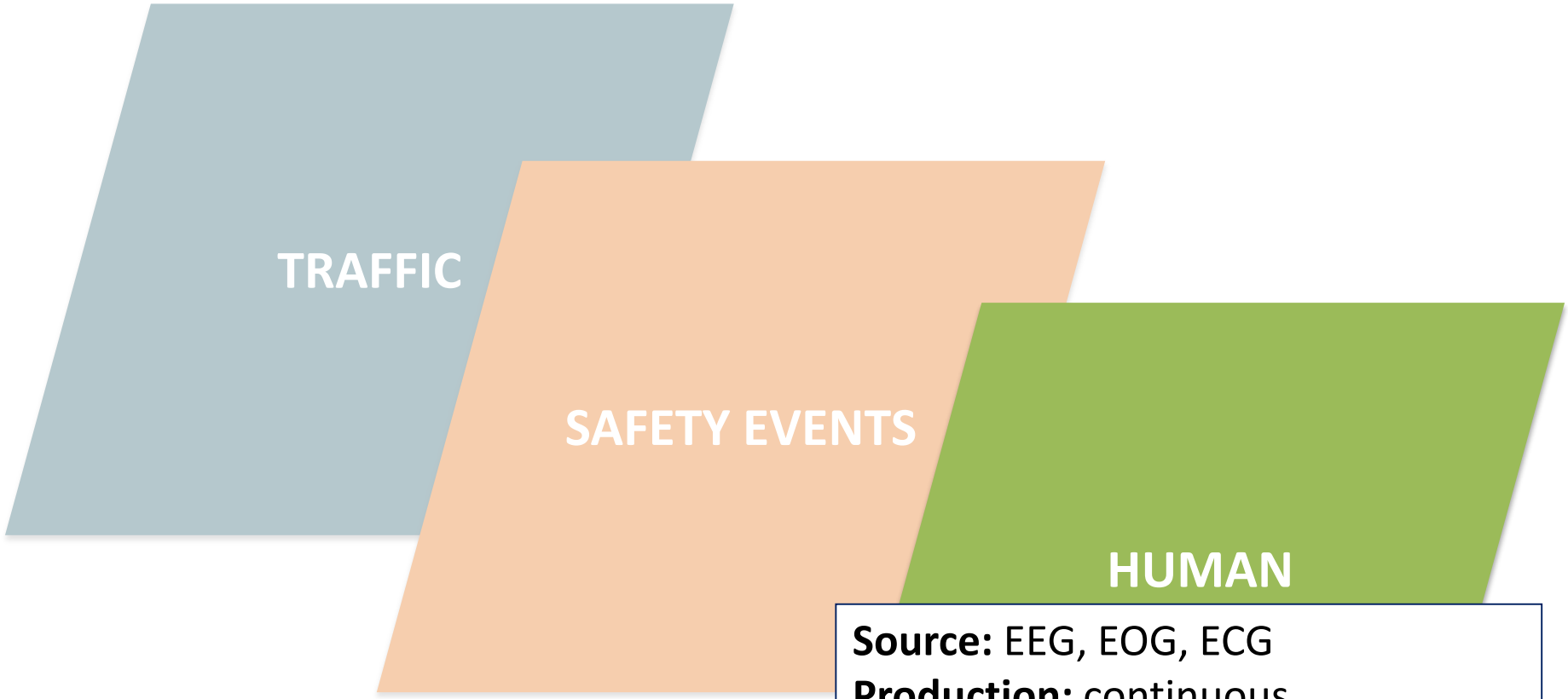
Specific procedures used to avoid conflicts in transition areas?

Worse than expected: which are the causes?

A non-optimal tuning of the STCA?

Non-optimal ATC procedures?

The human layer



Source: EEG, EOG, ECG
Production: continuous
Resolution: 125ms
What: brainwaves, eye fixation, heart rate and heart variability

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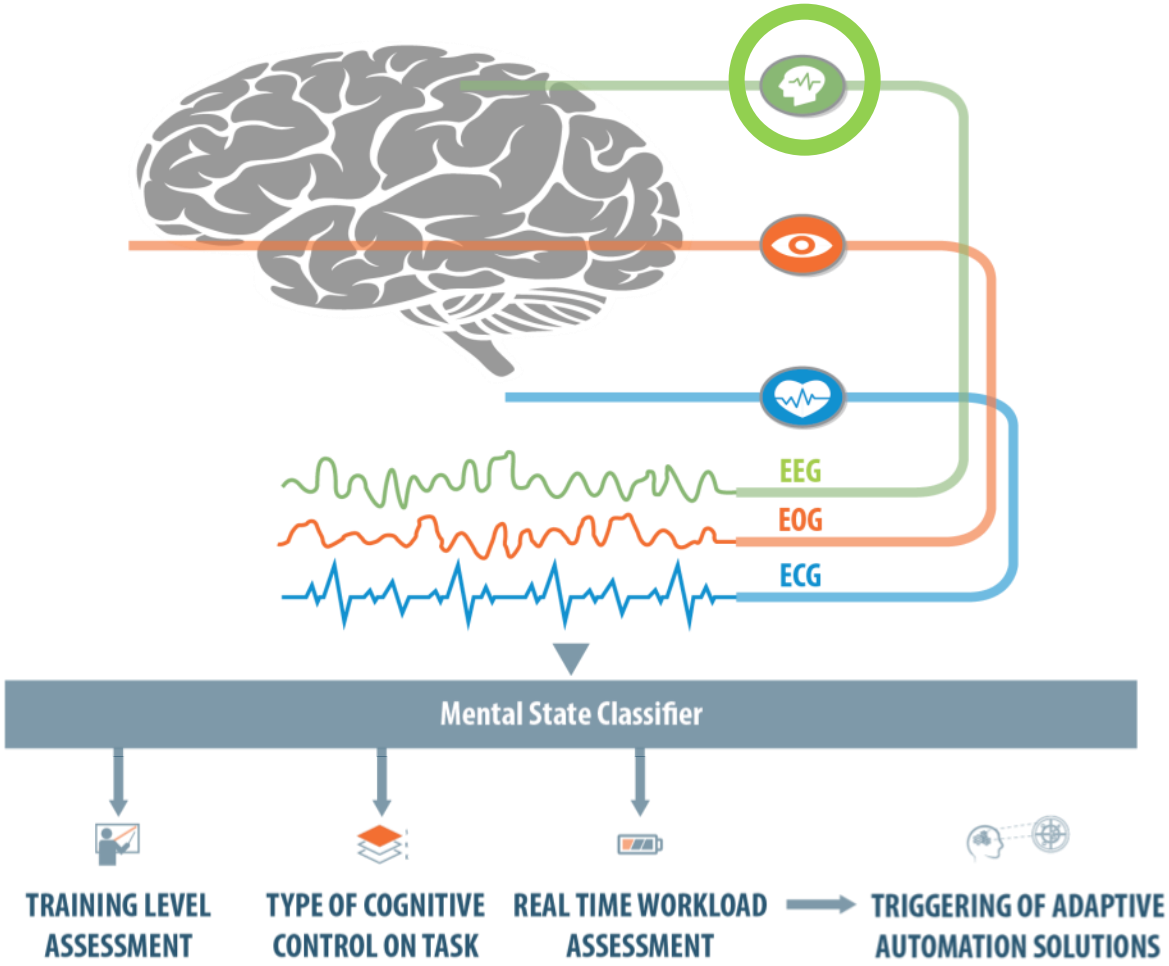
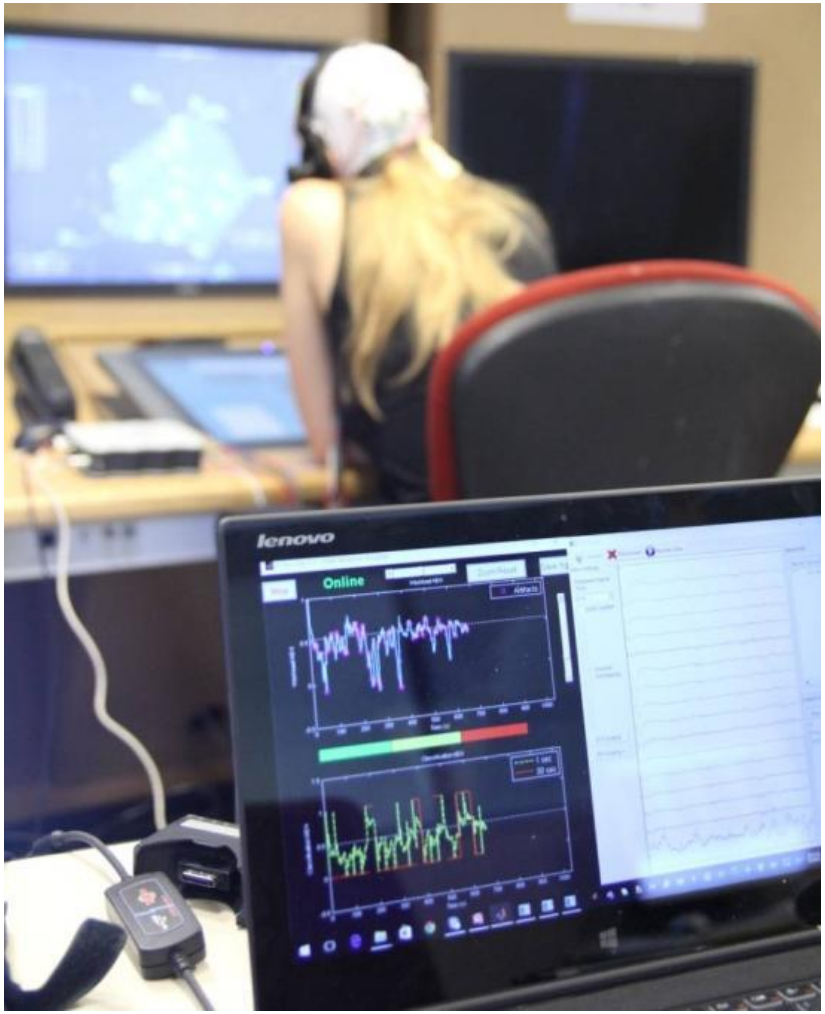
Neurometrics indicators for ATM (NINA)





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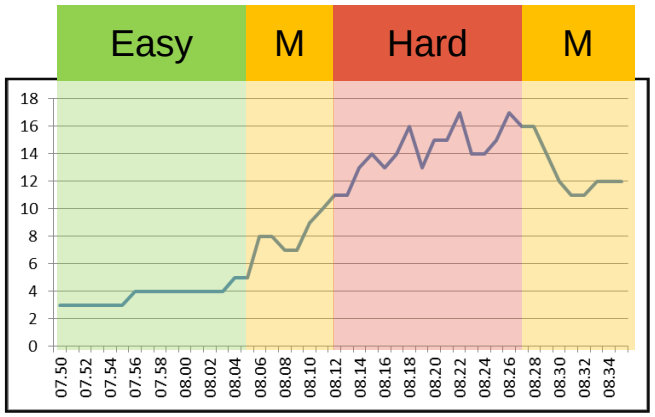
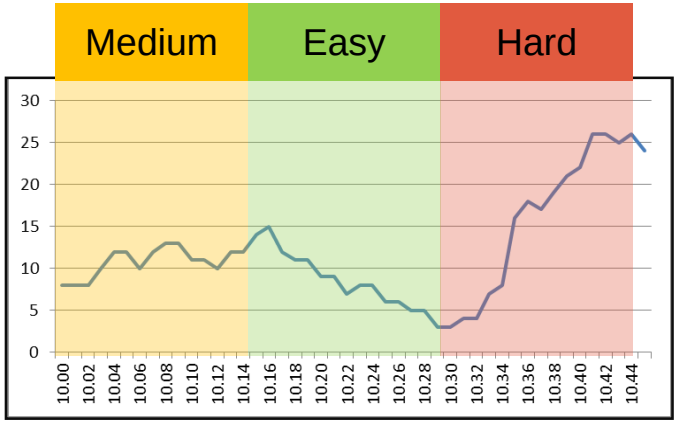
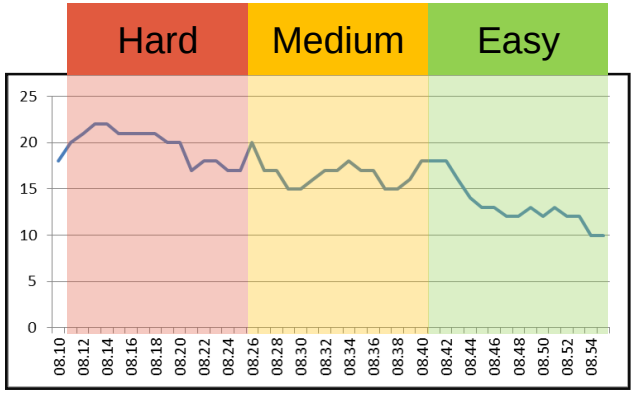
Complexity metrics and mental workload



Scenario1



Scenario 2



Scenario 3

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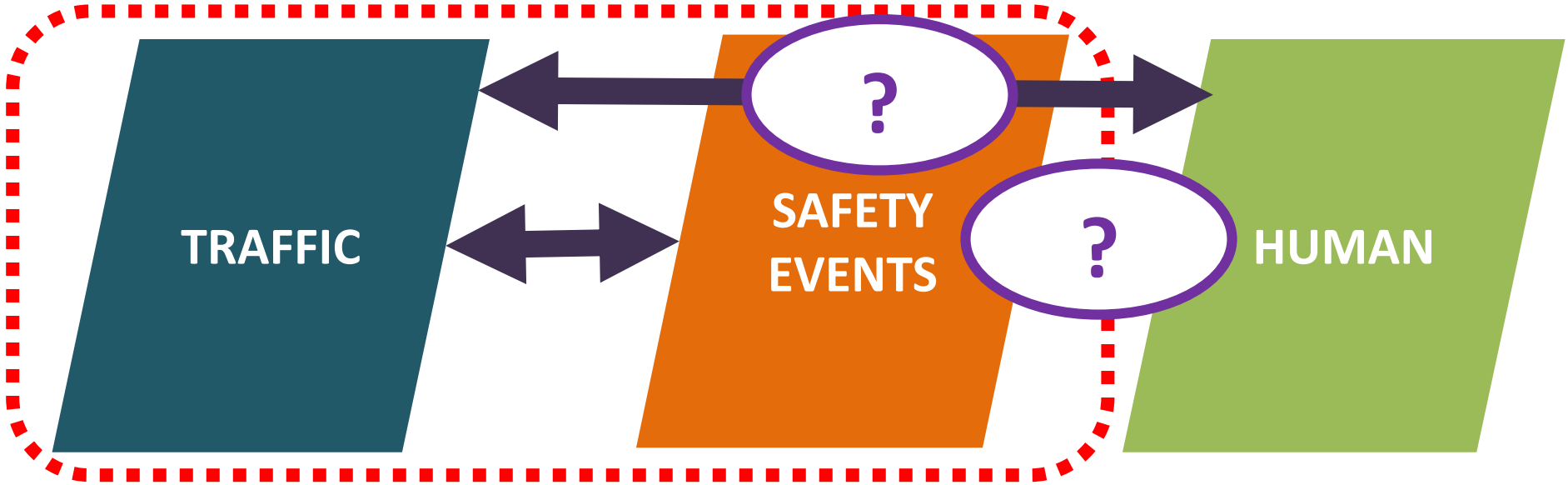
The human layer



- How does **workload** correlate with **capacity**?
- How does **workload** correlate with **safety**?
- What workload **outliers** can tell us?


Thanks a lot for the attention!