Panel Questions

Dr. Gennady Andrienko
Fraunhofer Institute IAIS
http://geoanalytics.net

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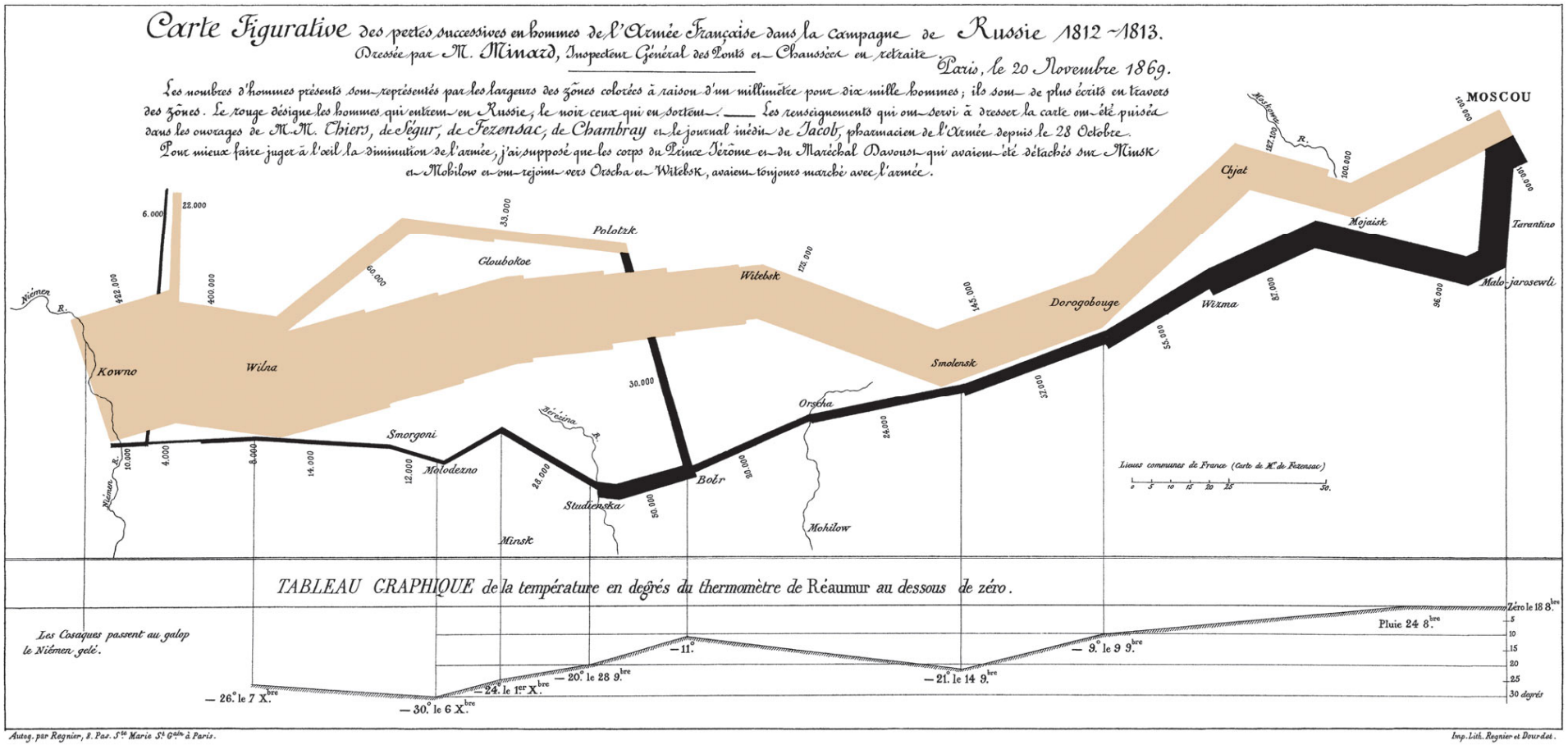
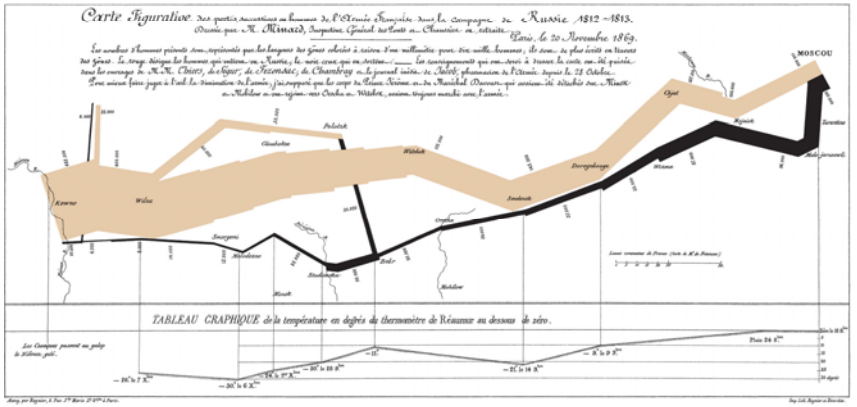
My favorite visualization



- Charles Minard's flow map of Napoleon's March (published in 1869)

My favorite visualization: why?

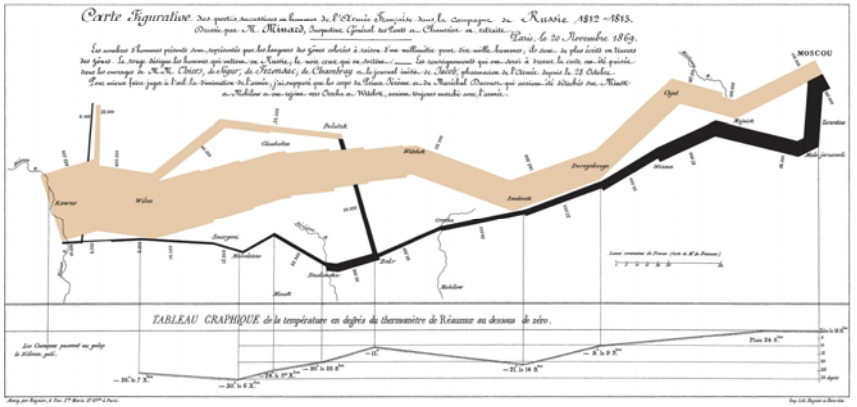


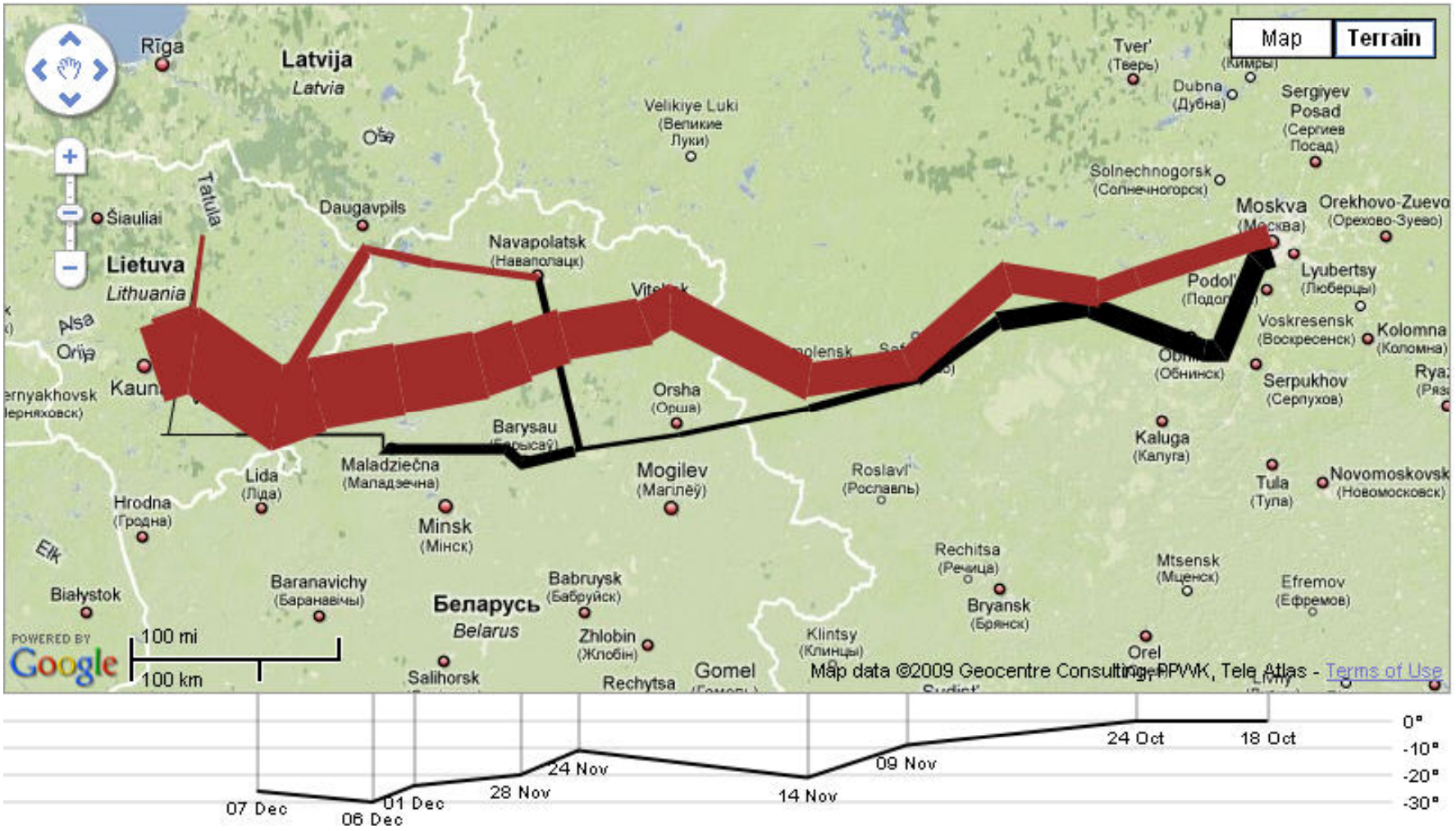
- Space & time
- Data in context
- Linking of multiple attributes

- Combination of traditional easily understandable techniques

What is missing?

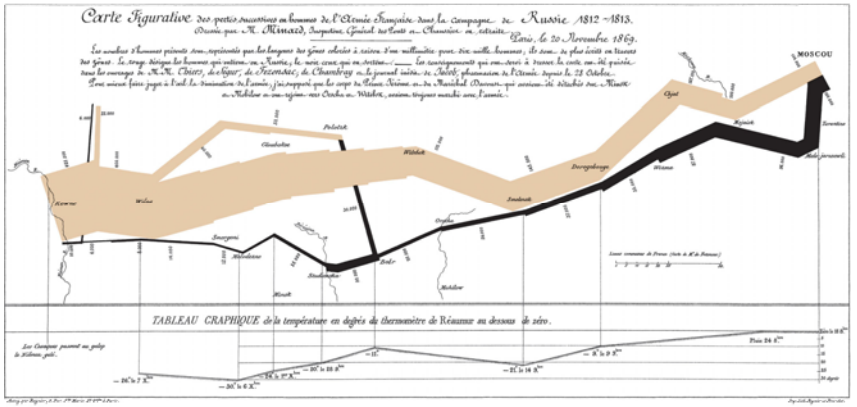
- This graphics was designed for communication
- Partial spatial context





- Source: http://vis.stanford.edu/protovis/ex/napoleon.html

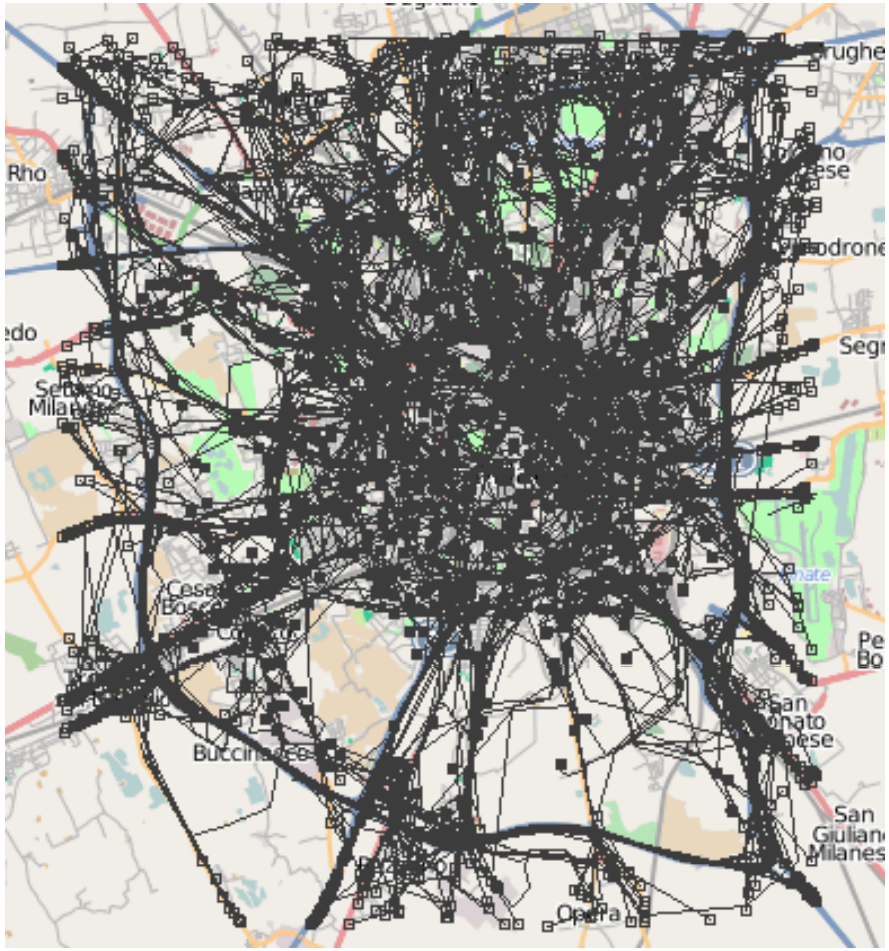
Limitations



- Movement data are already aggregated
- Important places are known
- Contextual attribute(s) are pre-selected
- No interactivity & dynamics
- Scalability issues

Example: cars in Milano

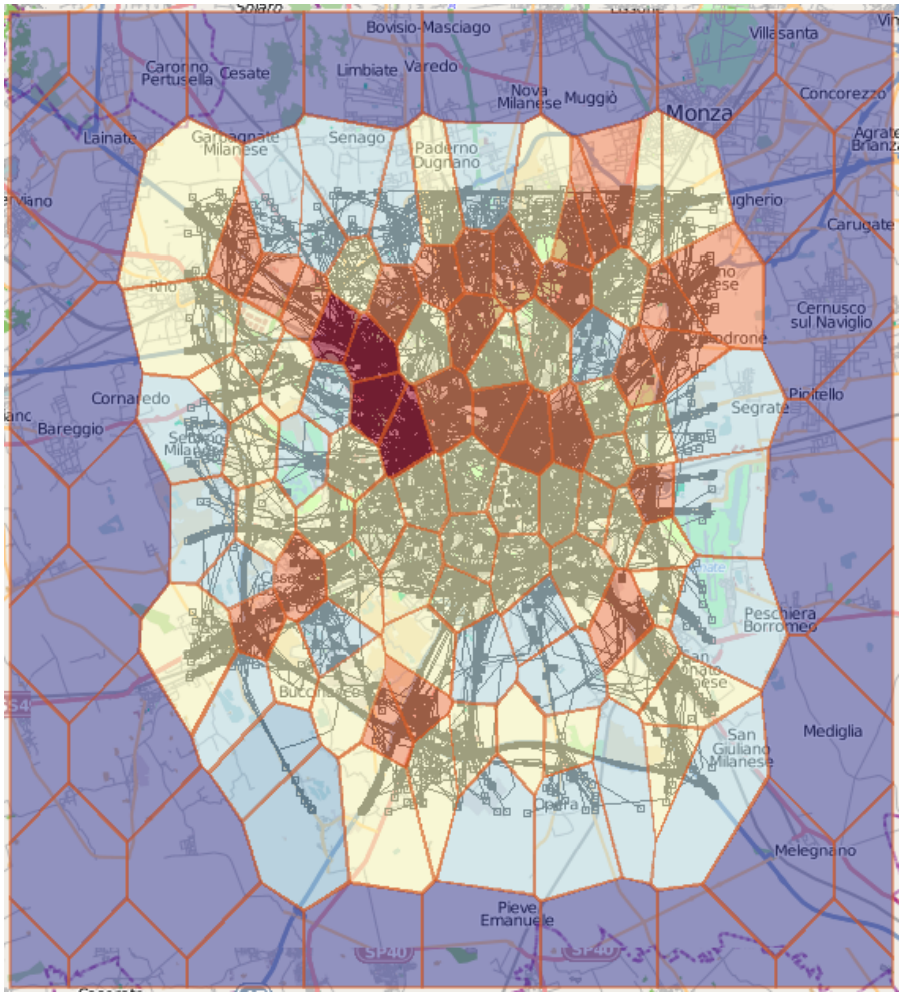
- 1,131 trajectories during one morning

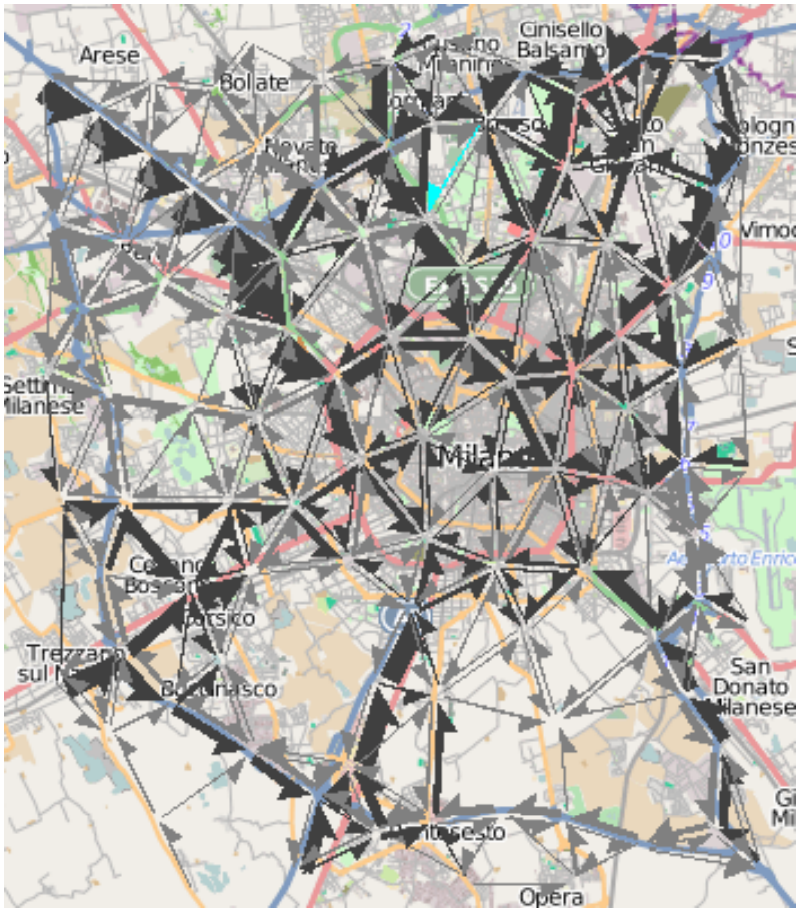


Goals:

1. Find typical routes
2. Estimate flows
3. Analyze dynamics
4. Detect spatial and temporal patterns

Generalization and Summarization

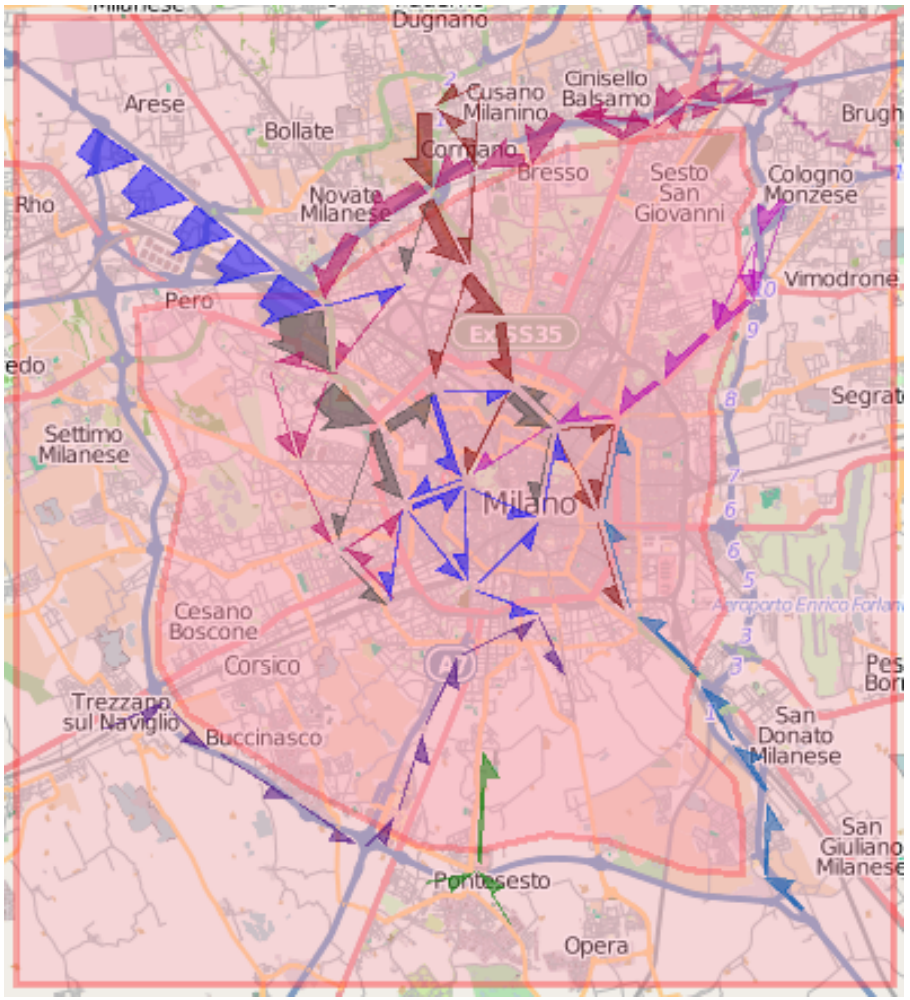


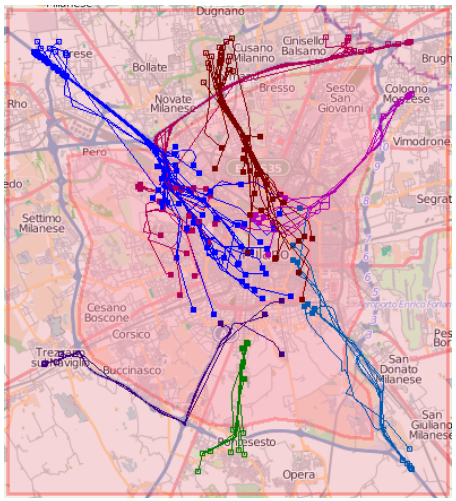


- Tessellation is data-driven!

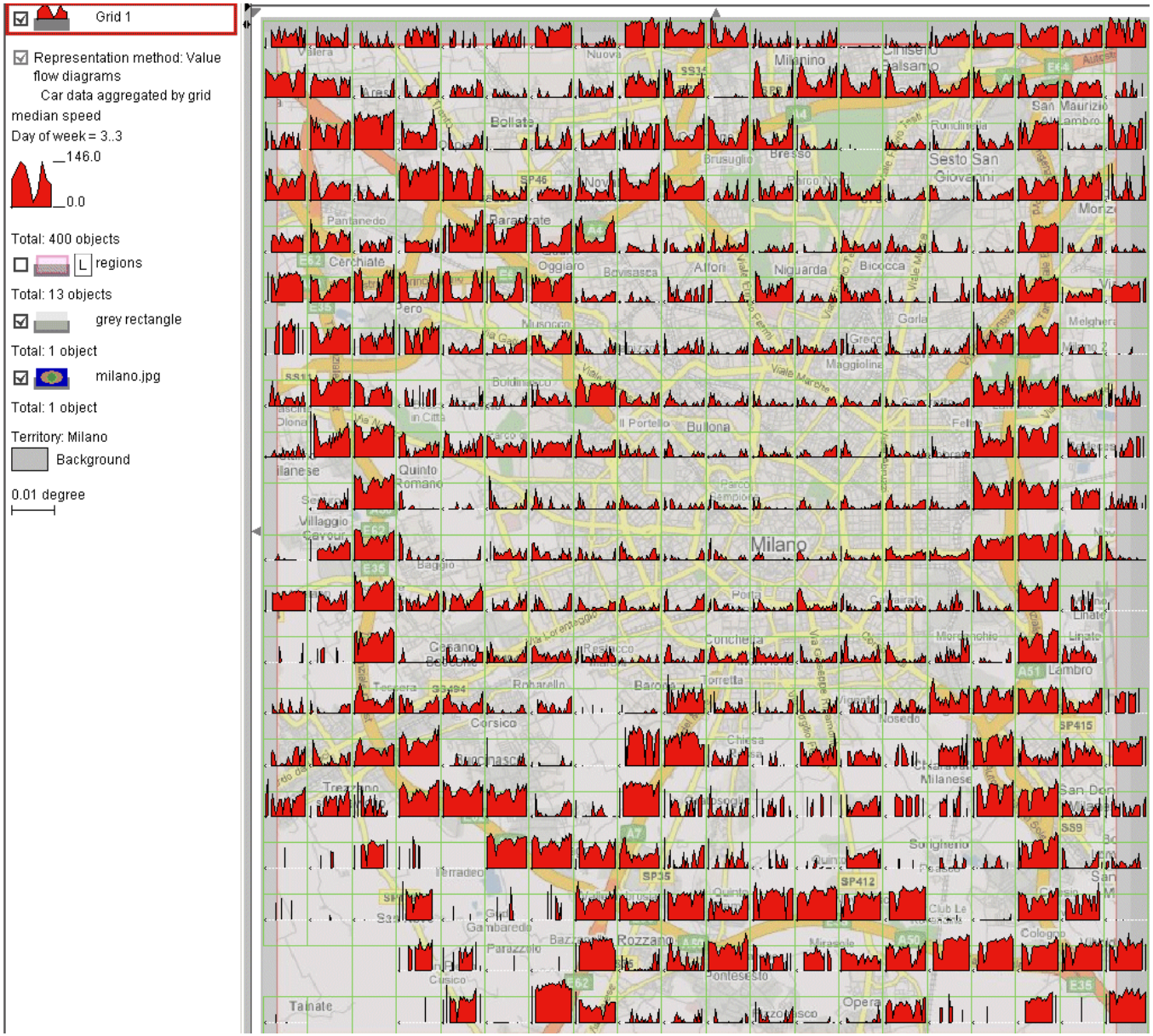
Clustering by similarity + Filtering

- Interactive filtering of clusters of interest
- Interactive filtering by attributes (time, duration, speed…)

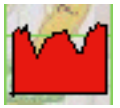




Aggregation

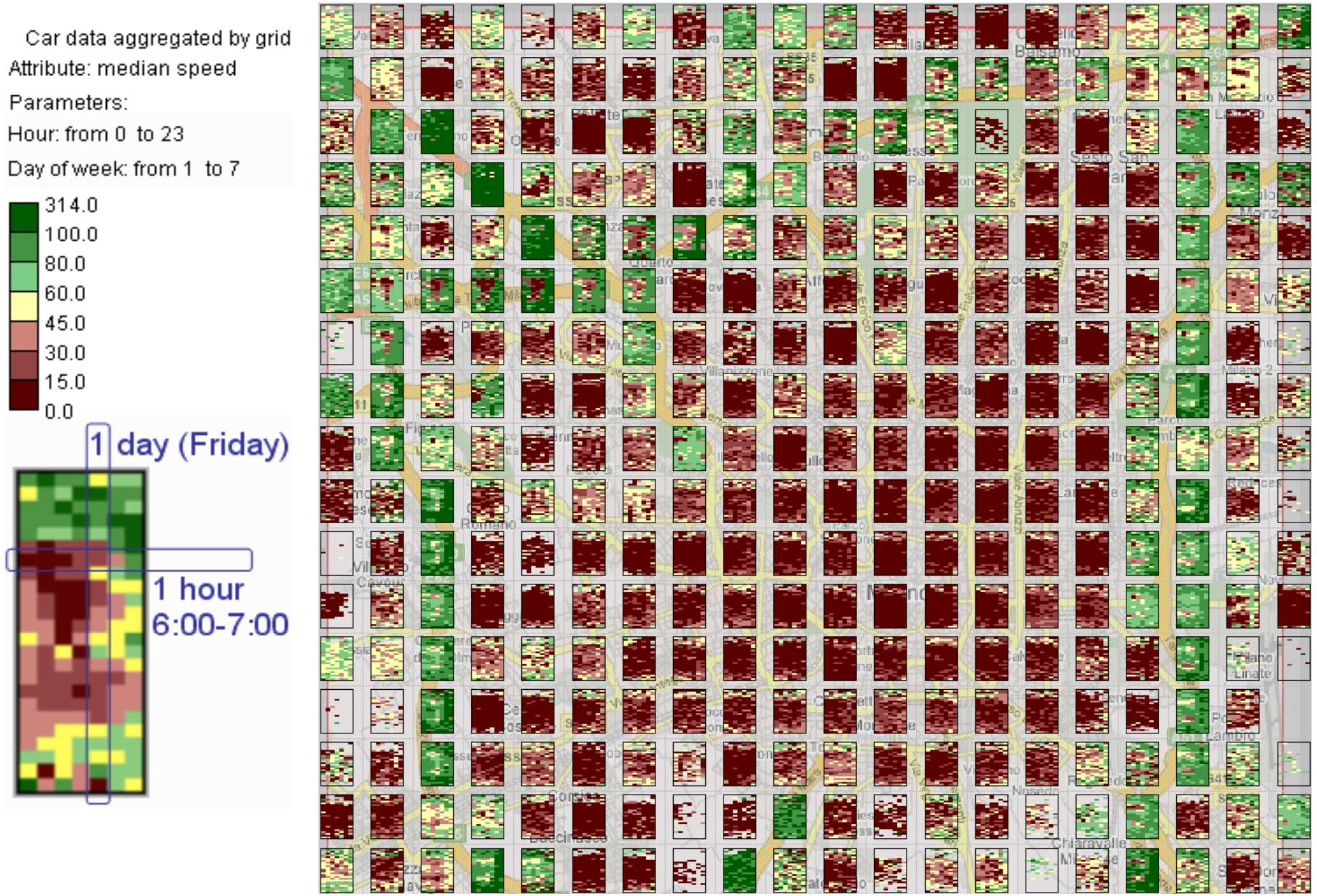


day: Wednesday

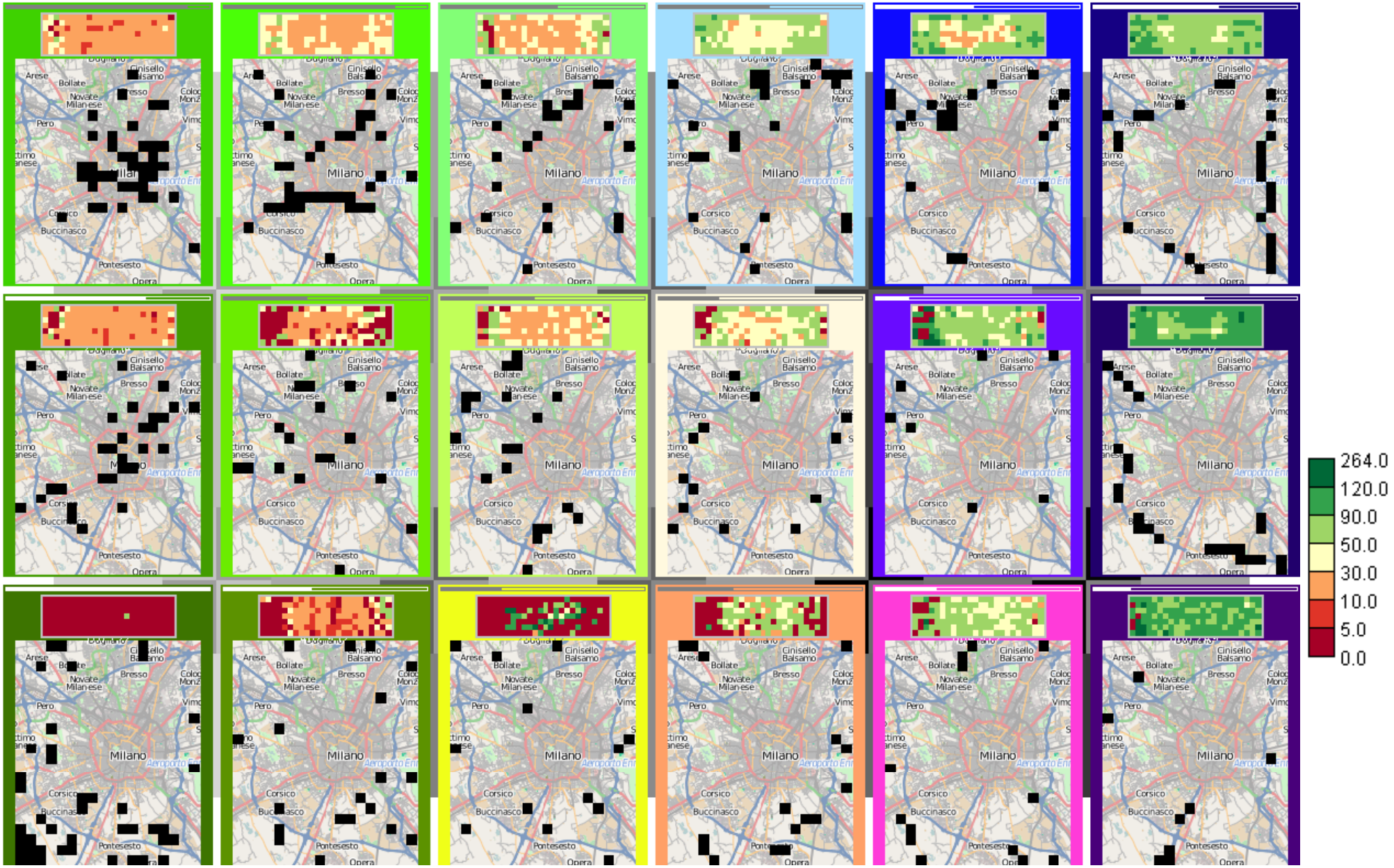


A frequent temporal pattern: significant drop of the speed in the morning and afternoon rush hours

Aggregation



Grouping places by similar dynamics



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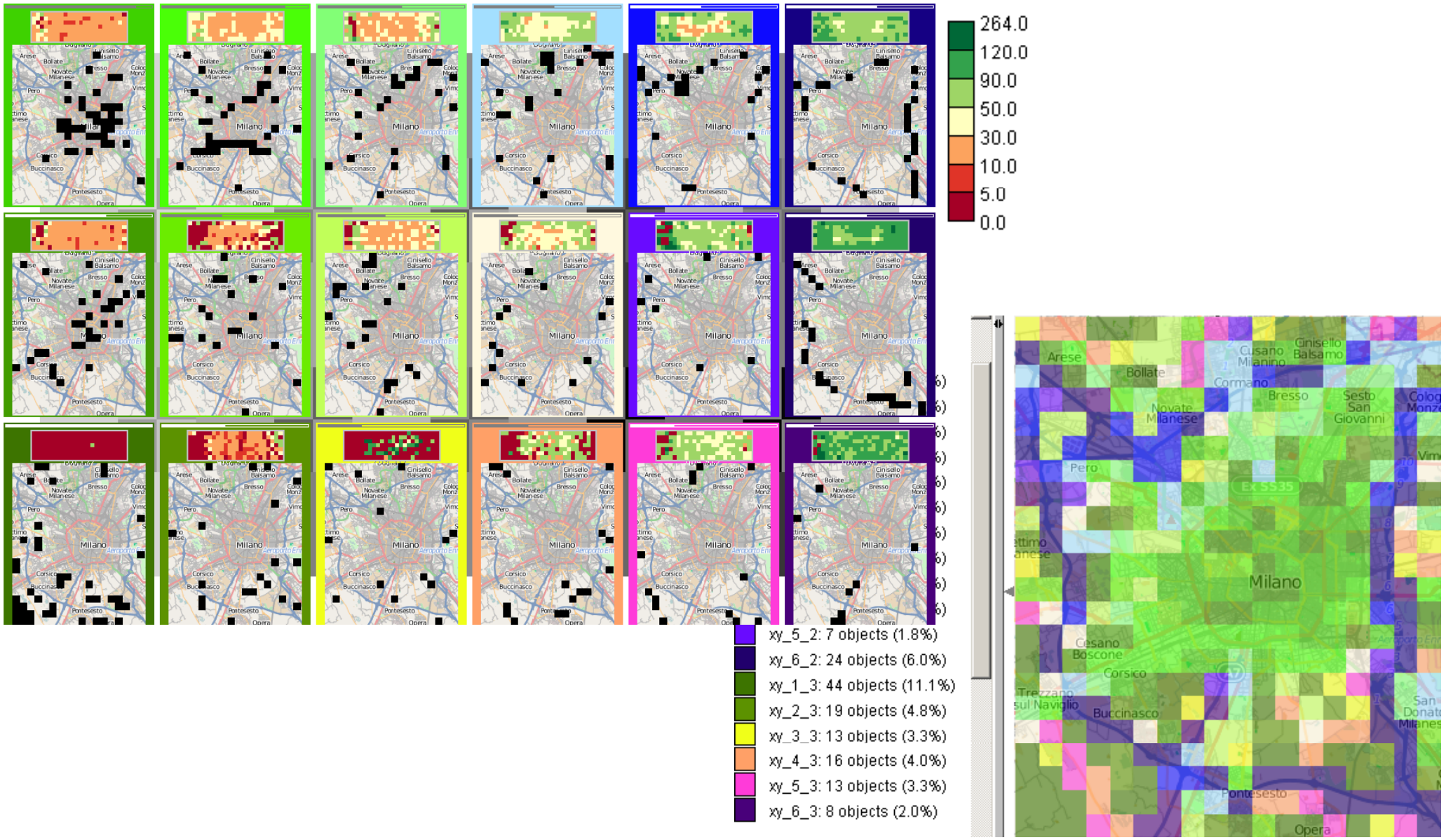
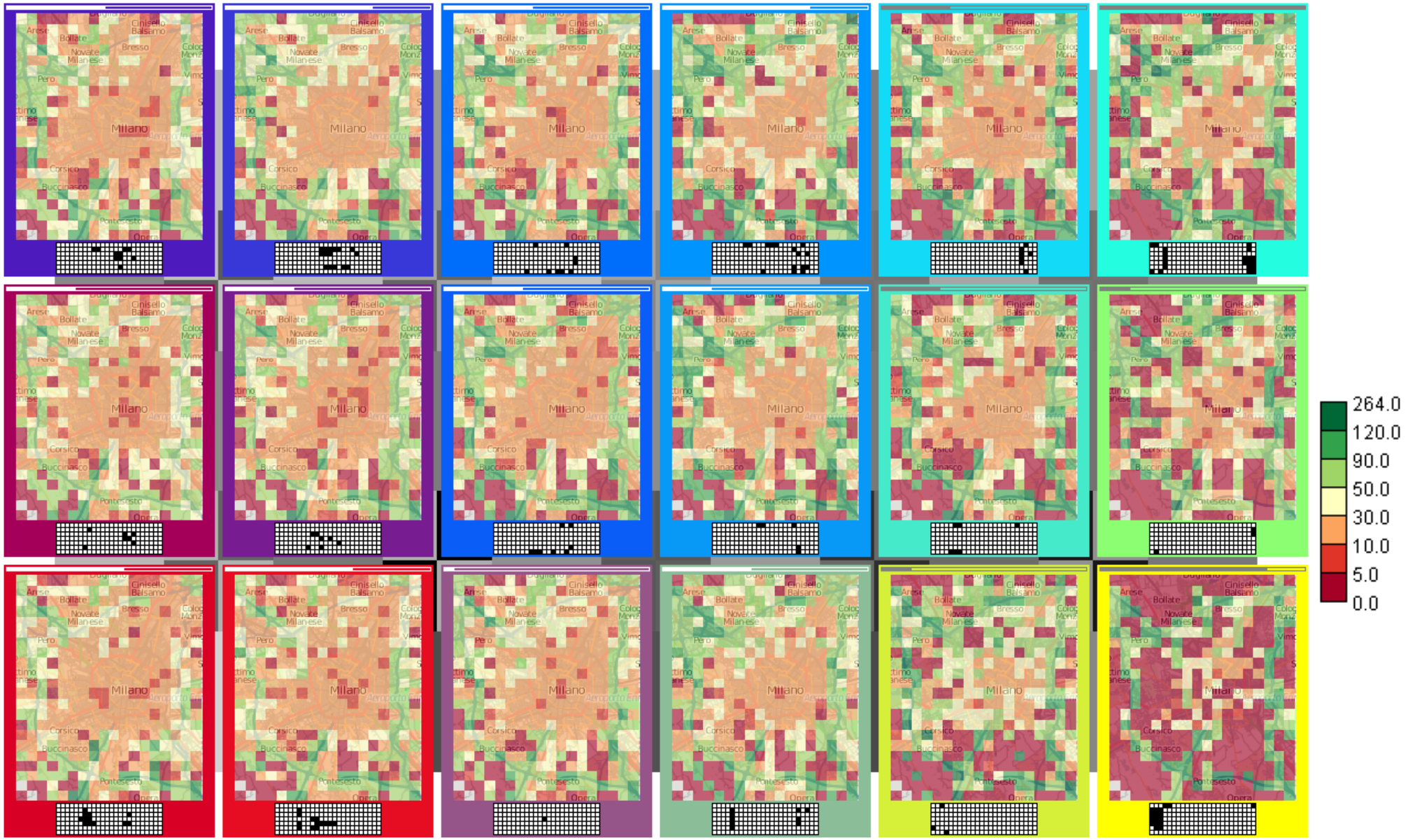


Grouping time intervals



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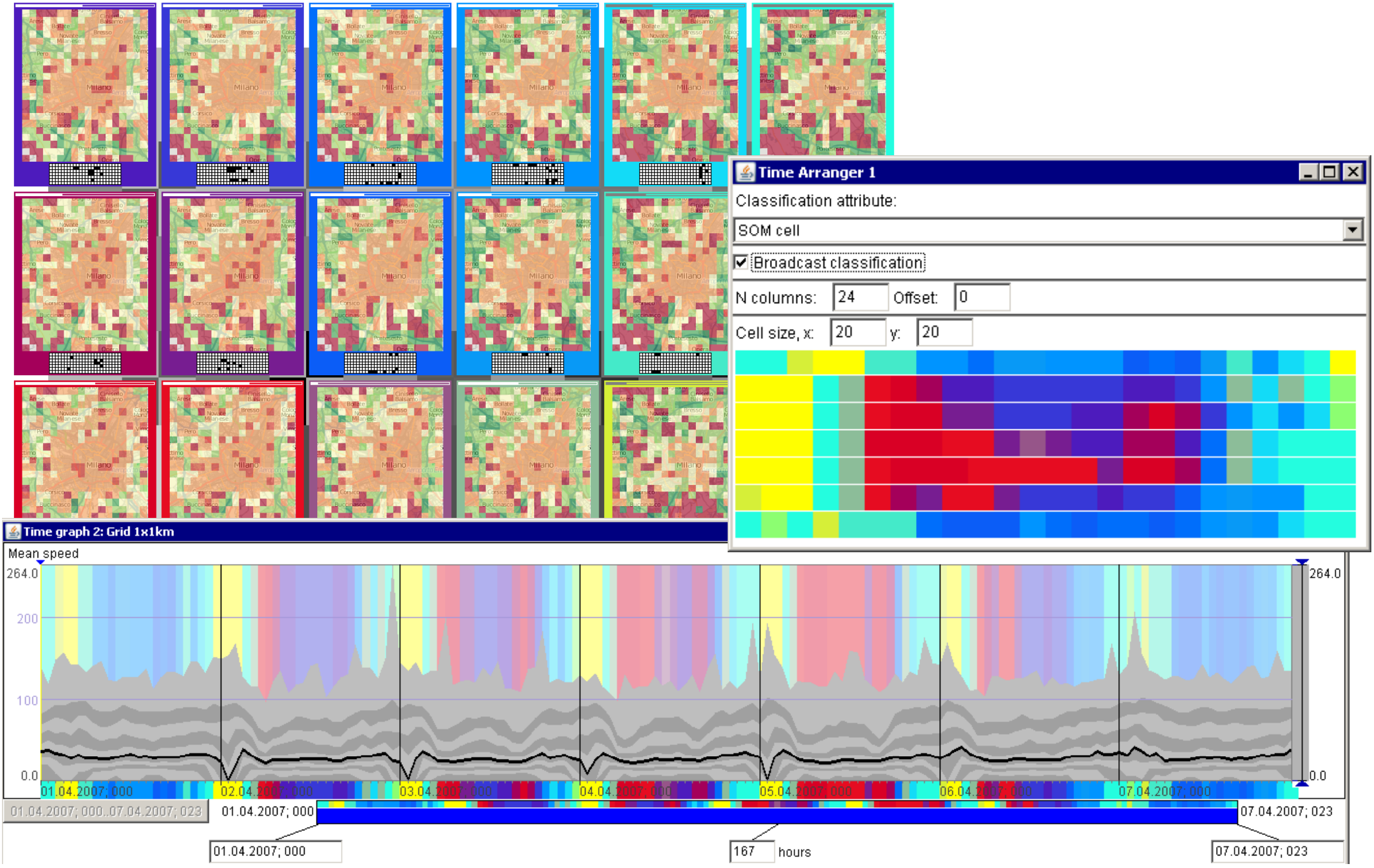


Innovation?

- Usefulness & usability
  - Useful Interactive Visualization
  - Usable Interactive Visualization

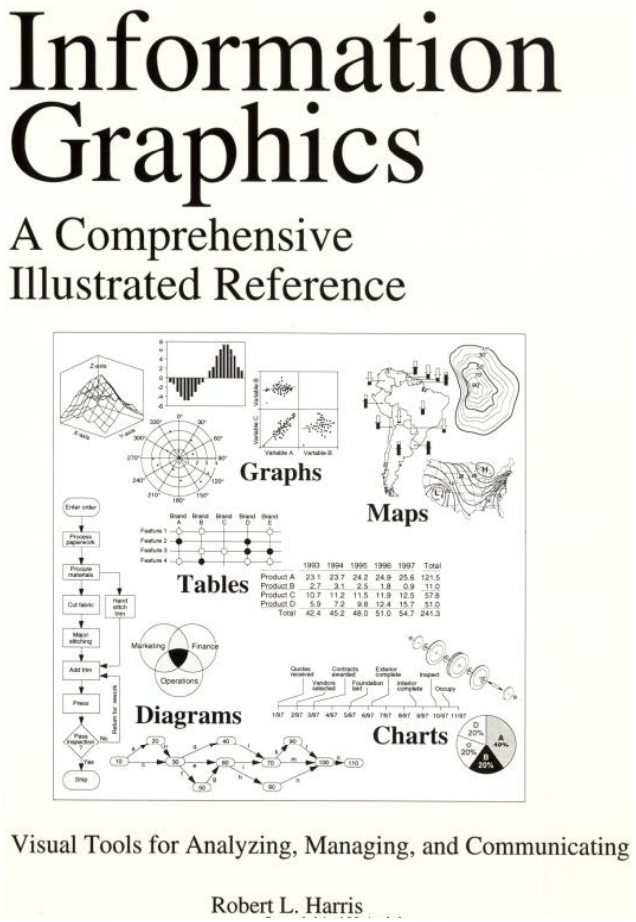
Useful Interactive Visualization

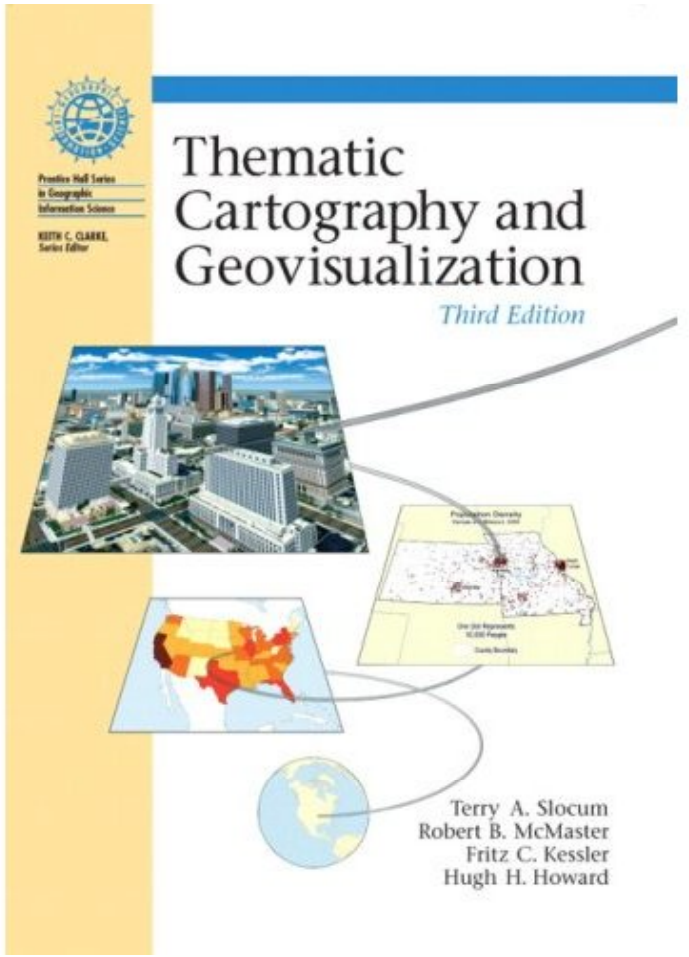
Required tools for experts for analyzing large complex data:

- Algorithms for data abstraction, generalization, and summarization
- Data transformations deeply integrated with visualization
  - NSF FODAVA program
- Interactive filtering and linking between displays, flexible work with multiple attributes and time
- Intelligent handling of scale in space and time
- Synthetic displays that support seeing data in context
- Integration of visualization and analytical processing
  - Computations for confirming visually-driven hypothesis generation
  - Visualization for interpreting computationally detected patterns
- Scaleable approaches

Useable Interactive Visualization

- Do we really need innovative visualizations?
- Or, may be, we should rather upgrade and integrate visualizations people used to work with?





Evaluation?

- KDD approach: data sets with ground truth
- VAST Challenges:
  (+) ground truth
  (-) synthetic data