

Exploring multi-modalities in weather prediction using a univariate graph based on machine learning techniques

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A multi-disciplinary collaboration: Meteorology, Machine Learning, Visualization & Topological Data Analysis

Interpreting Ensemble Data

Ensemble data:
 N univariate time series

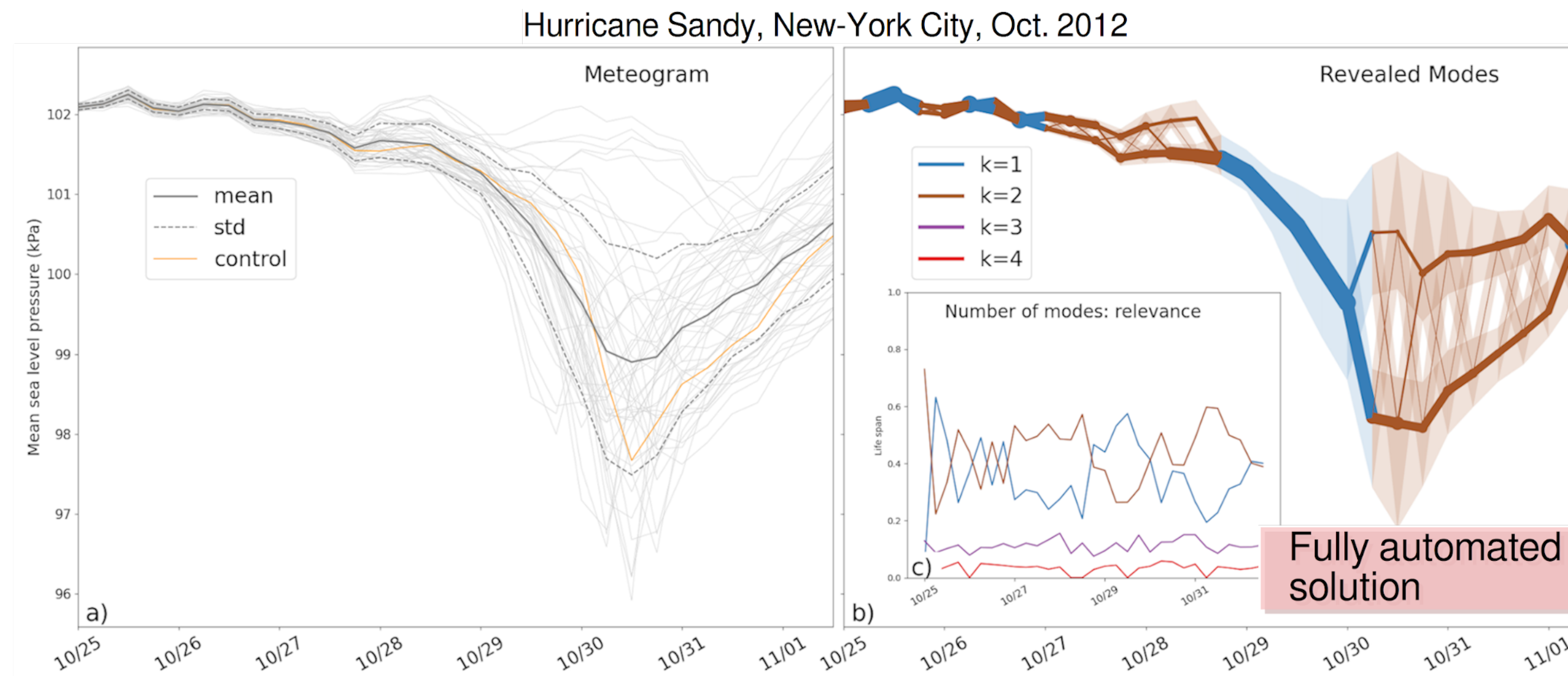
Multimodality:
Number of modes (i.e. likely outcomes) $k > 1$

Common method:

- **Mean** as expected value
- **standard deviation** as uncertainty

Problem:

- Assumes a unimodal Gaussian distribution,** which in case of multimodality:
- Gives misleading results
 - Discards crucial information



Our novel method

Constructing the graph

- 1) Cluster the data **assuming successively** $k=1, 2, 3, \dots, N$
- 2) Define a life span for each k based on a cluster score

Entire graph view:

Concurrently displays the clustering outcome for all k

- Opacity \leftrightarrow Life span (proxy for relevance)
- Color \leftrightarrow number of clusters k assumed

Tasks

- Estimate the number of modes k at each time step t
- Faithfully represent each potential mode

Most relevant components view

Shows the most the relevant interpretation of the distribution (**automatic or user-defined**)

