SOFIA UNIVERSITY ST. KLIMENT OHRIDSKI

Faculty of Physics

GRAPH BASED TRACKING OF THE MIXED LAYER HEIGHT IN THE RANGE CORRECTED SIGNAL OF CEILOMETER

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Motivation

- MLH:
  - Constrains the air pollution dispersion volume;
  - Quantify surface-atmosphere interaction intensity
- MLH retrieval:
  - Rawinsonde – coarse time resolution
  - **ALC** – ambiguity – layer attribution problem
  - Advanced instruments (e.g., DL, MWR) – too expensive

source: Vaisala

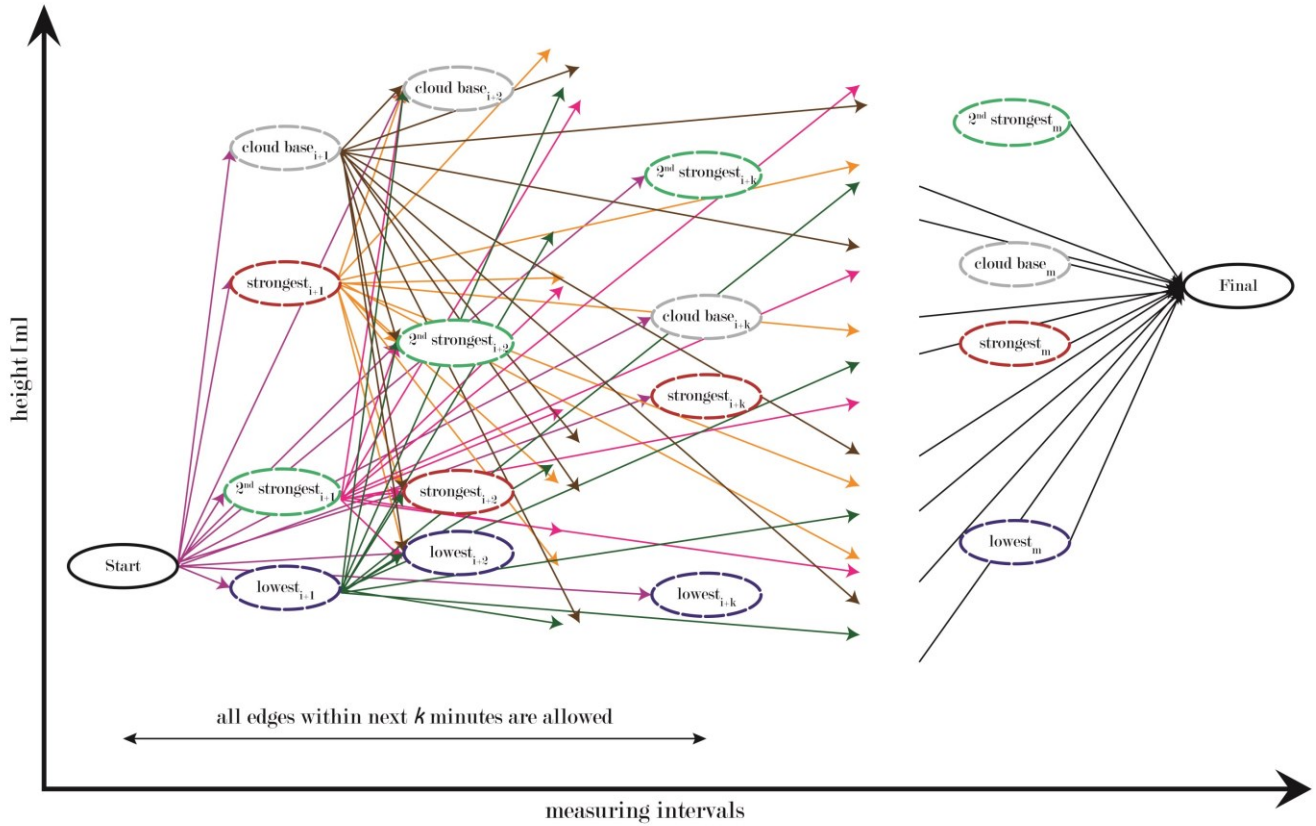
How to determine MLH from the ceilometer RCS?

- 1D algorithms (e.g. Haeffelin et al. 2012 as a review) :
  - Gradient based algorithms
  - Variance based algorithms
  - Wavelet covariance algorithm
- "2D" edges detection algorithms (e.g. STRAT see Morille et al. 2007)
- Graph-based tracking by shortest path in signal space (e.g. Poltera et al. 2017)

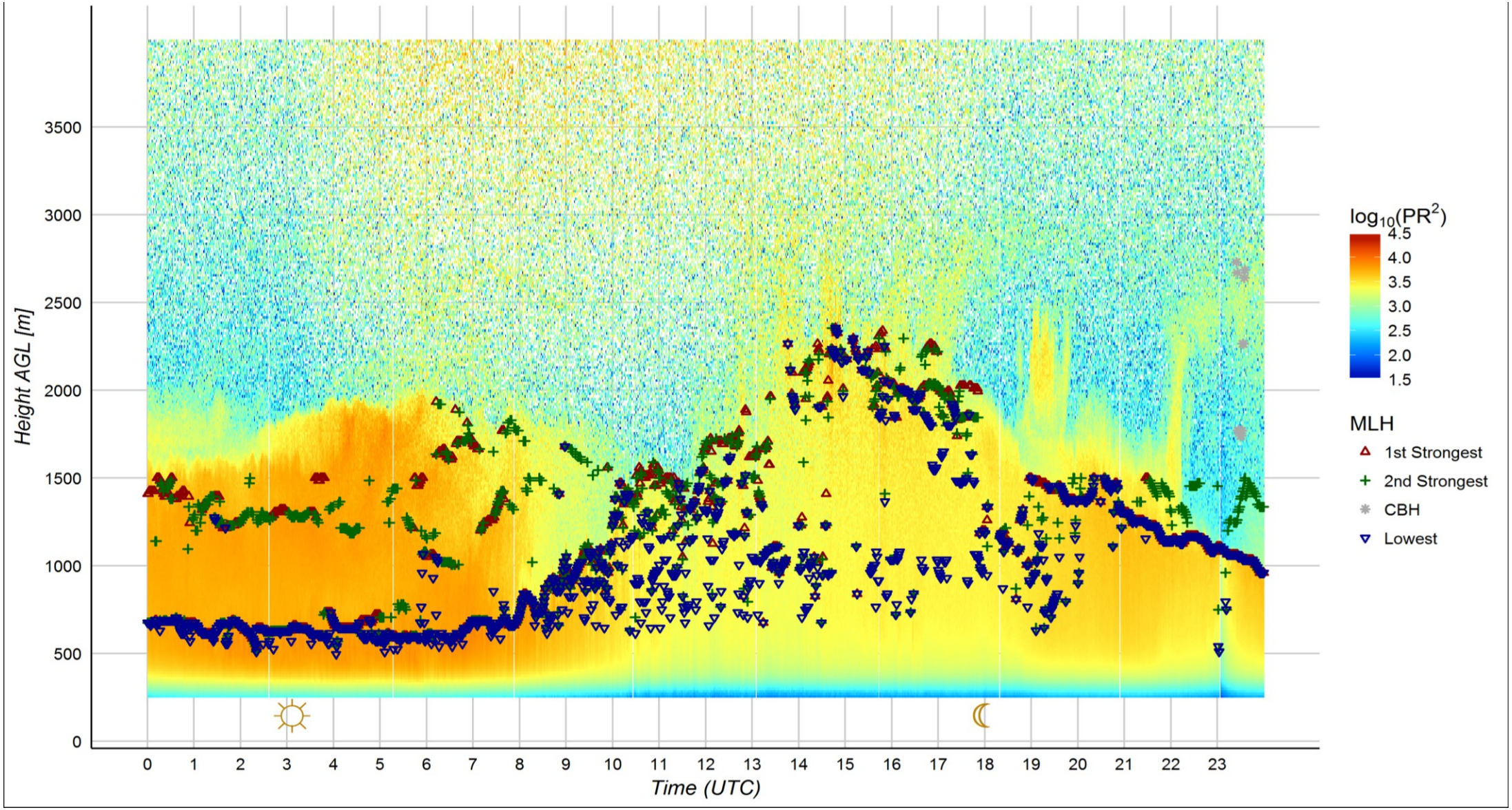
Aim - An improved MLH tracking through postprocessing of the retrieved by edge-detection algorithm MLH candidates

Methods

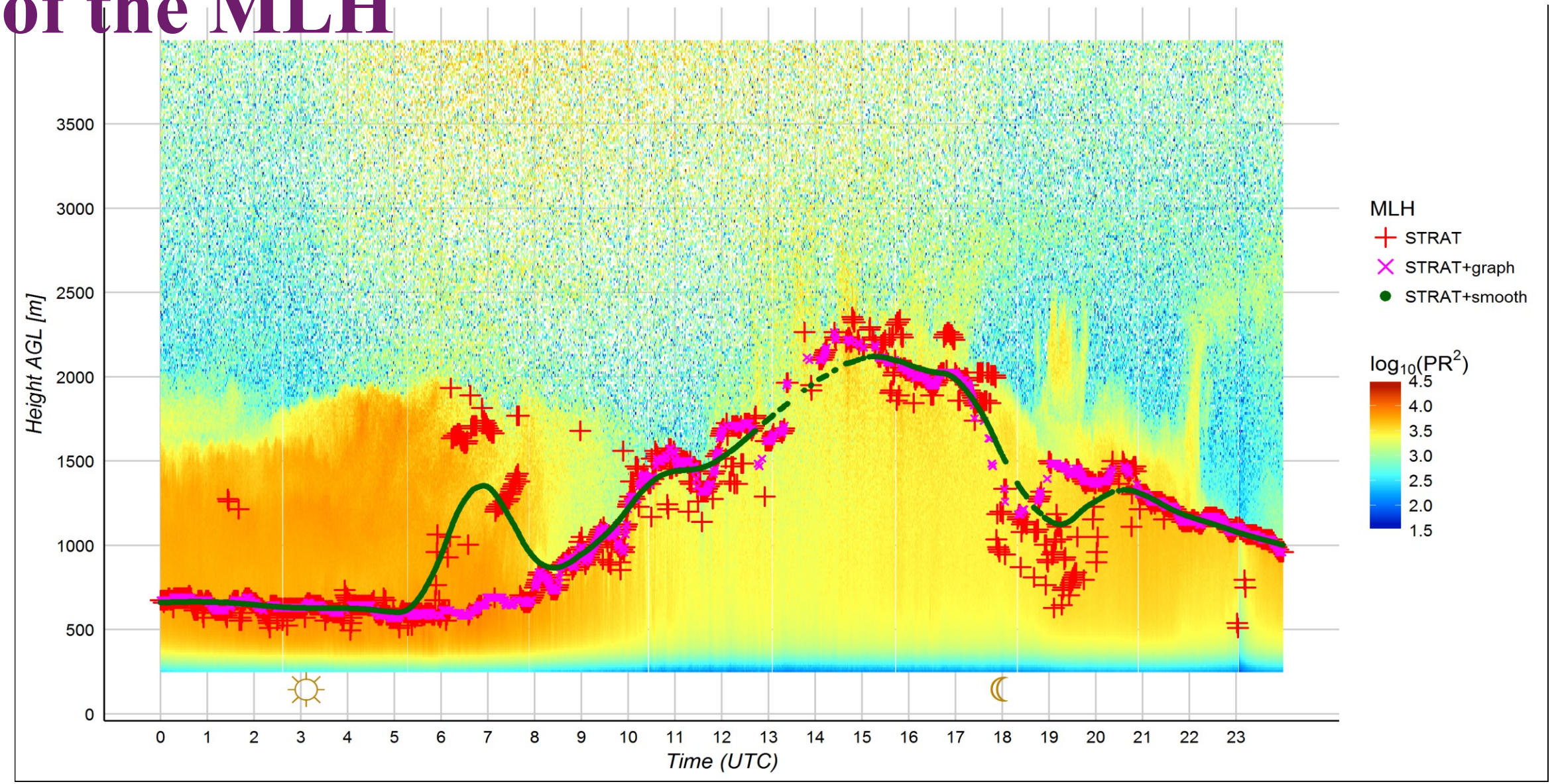
1. Run STRAT to get MLH candidates
2. Add CBH to MLH candidates and organize them in 3 different graphs (1-st from 0:00 to 8:00 UTC , 2-nd from 8:00 to 14:30 UTC and 3-rd from 14:30 to 24:00 UTC). All edges within 2, 1 and 2 hours are allowed in each graph with an extra weight of 5, 5 and 20m/min respectively
3. Dijkstra's shortest path algorithm is applied in real space on every graph.



Raw data, STRAT candidates & CBHs



Results – graph-based and loess-based tracking of the MLH



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