Jitterbug: A new framework for jitter-based congestion inference

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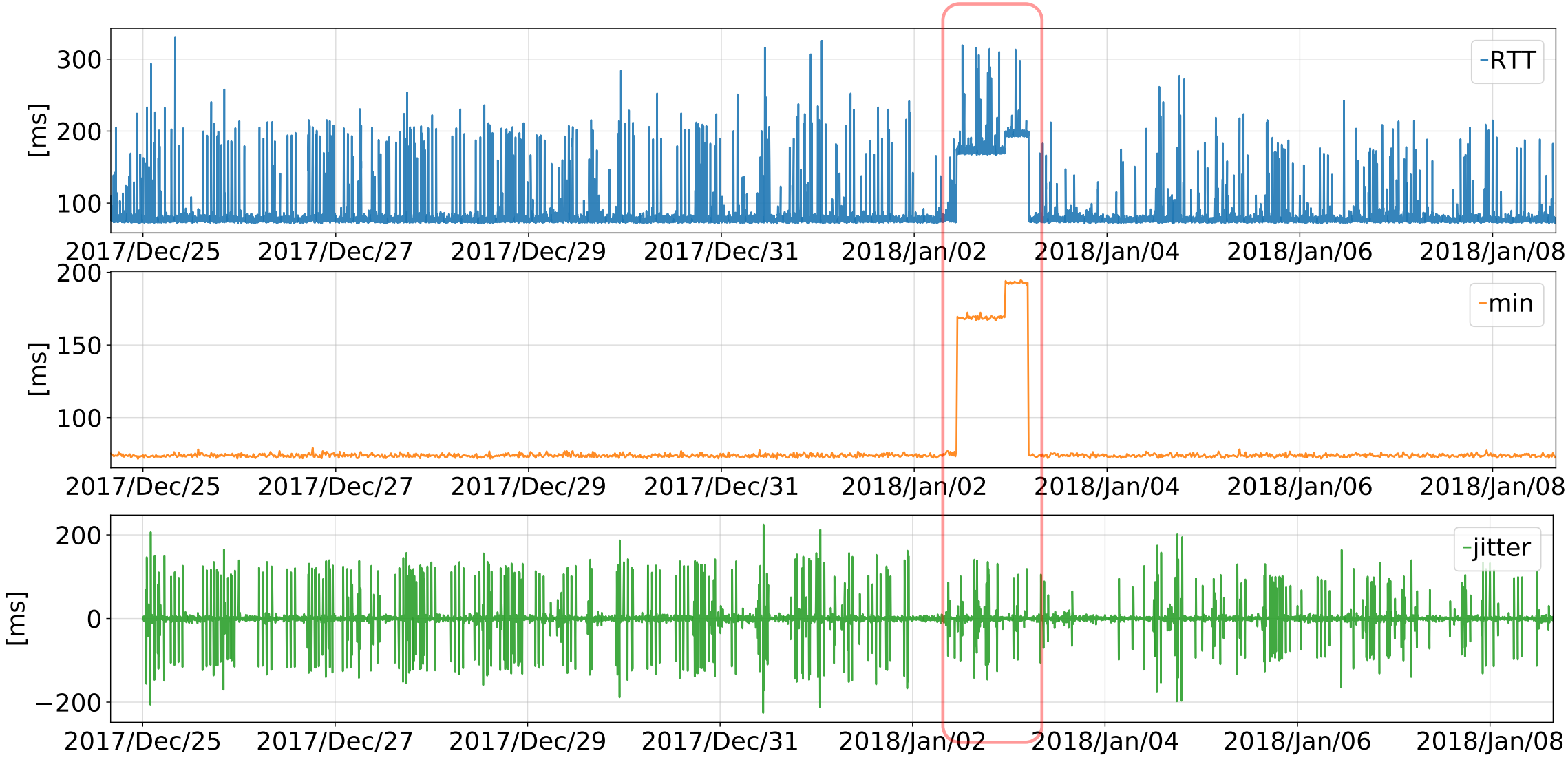
Inferring network congestion is still challenging!

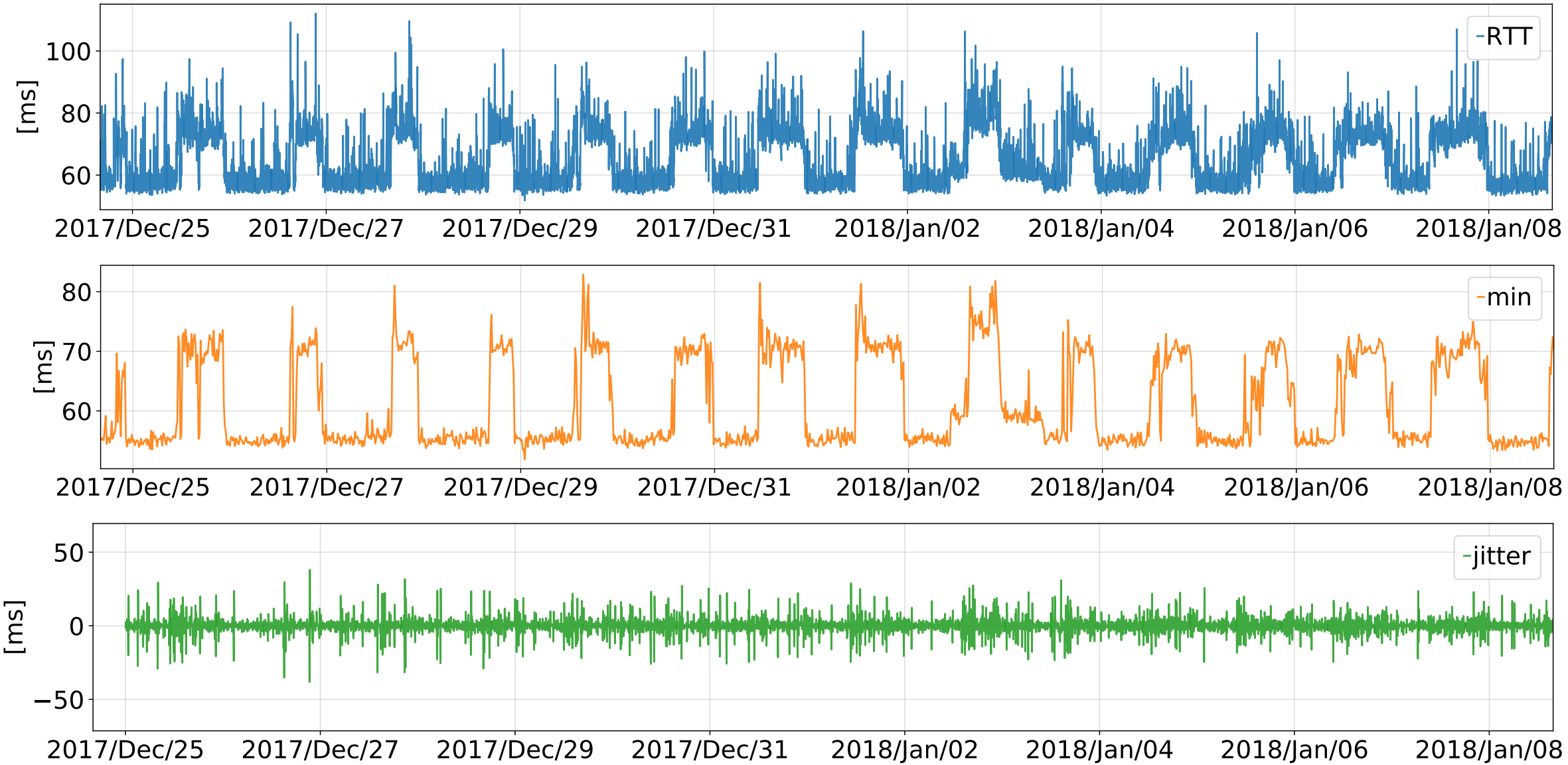
- RTT time series are useful to detect network events (e.g., congestion)
- The challenge is to distinguish congestion events from the rest
- Autocorrelation-based methods infer recurrent congestion events
- No method to detect one-off congestion events
- *Our paper examines characteristics of RTT signals to identify both recurrent and one-off events*

RTT signals of recurrent congestion events

RTT signals of non-congestion events

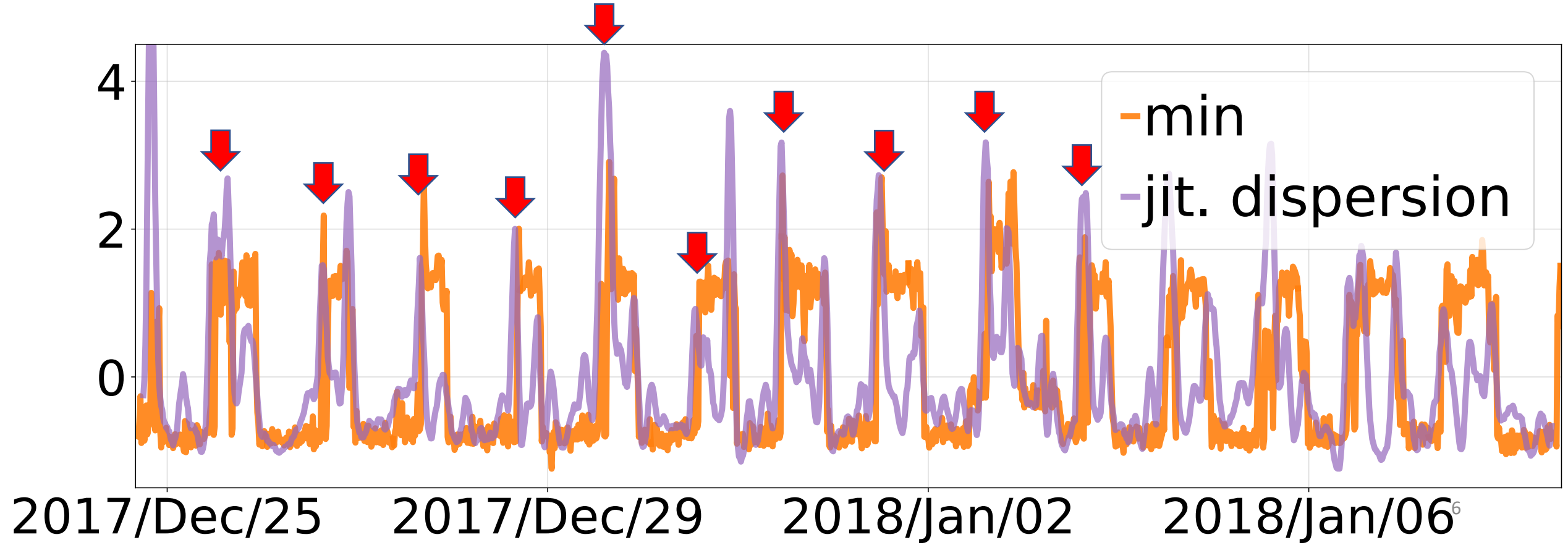


RTT signals of recurrent congestion events

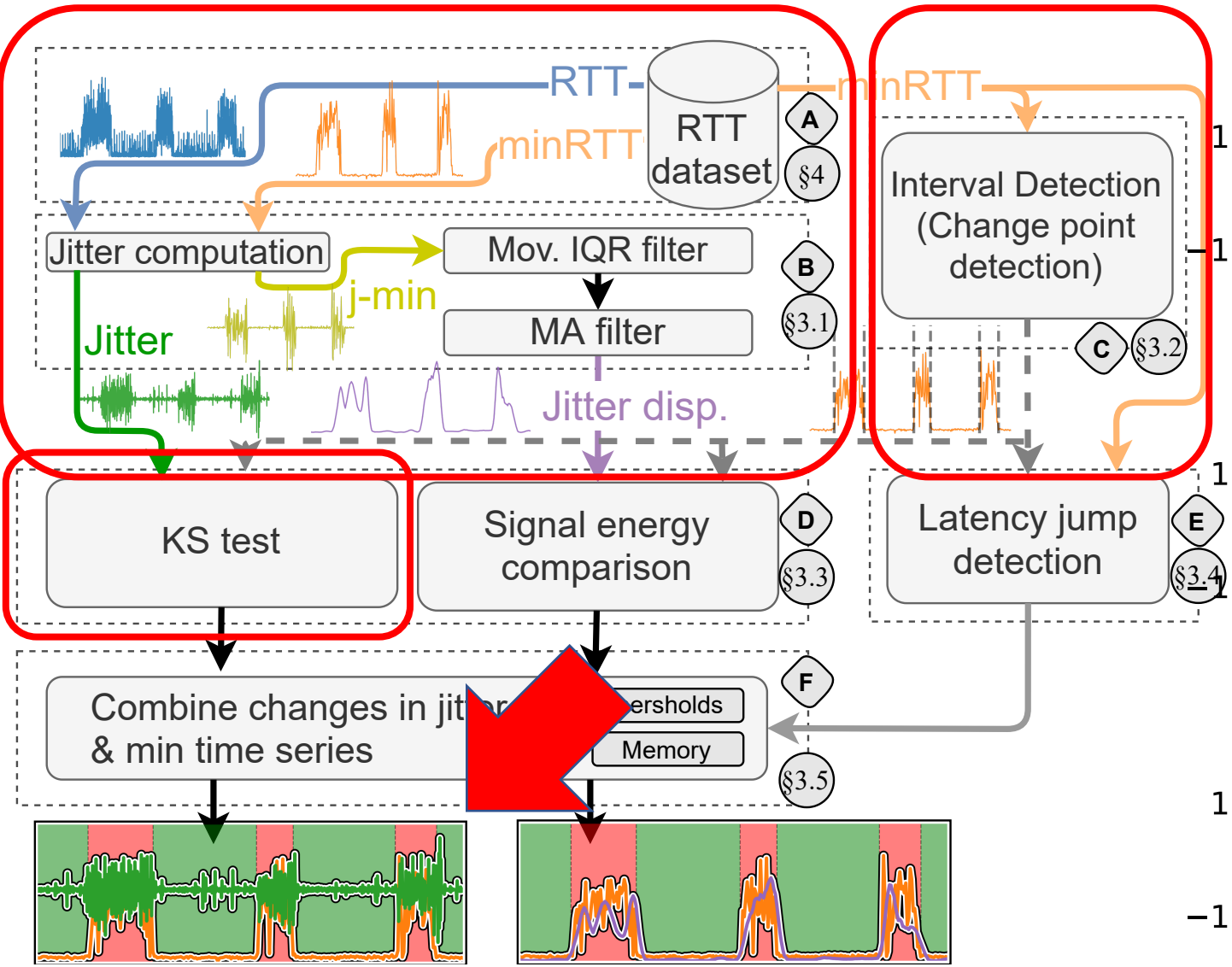


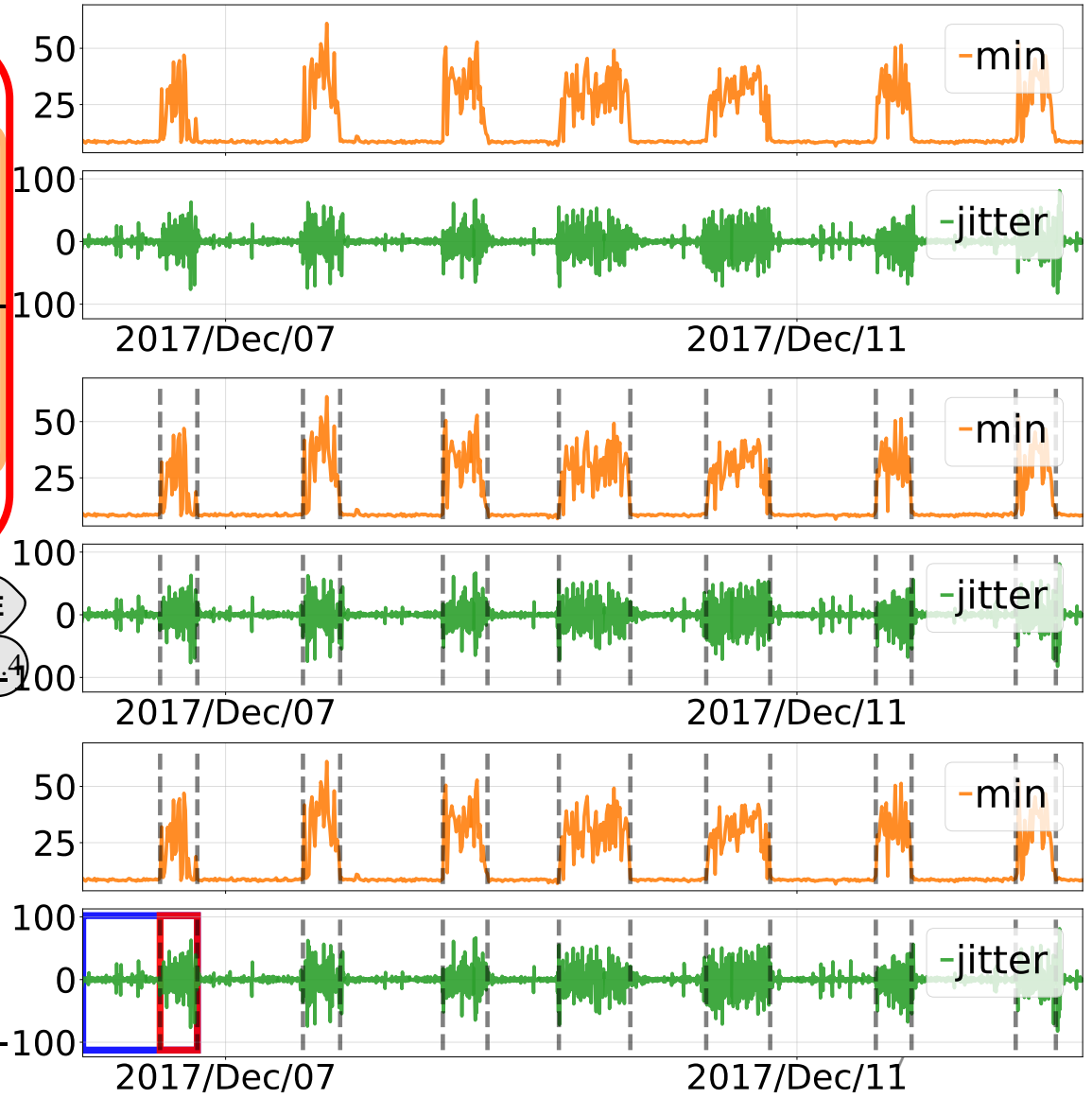
Jitter dispersion

Jitter dispersion:= moving IQR(jitter(minRTT)$_{(n, n+k)}$)

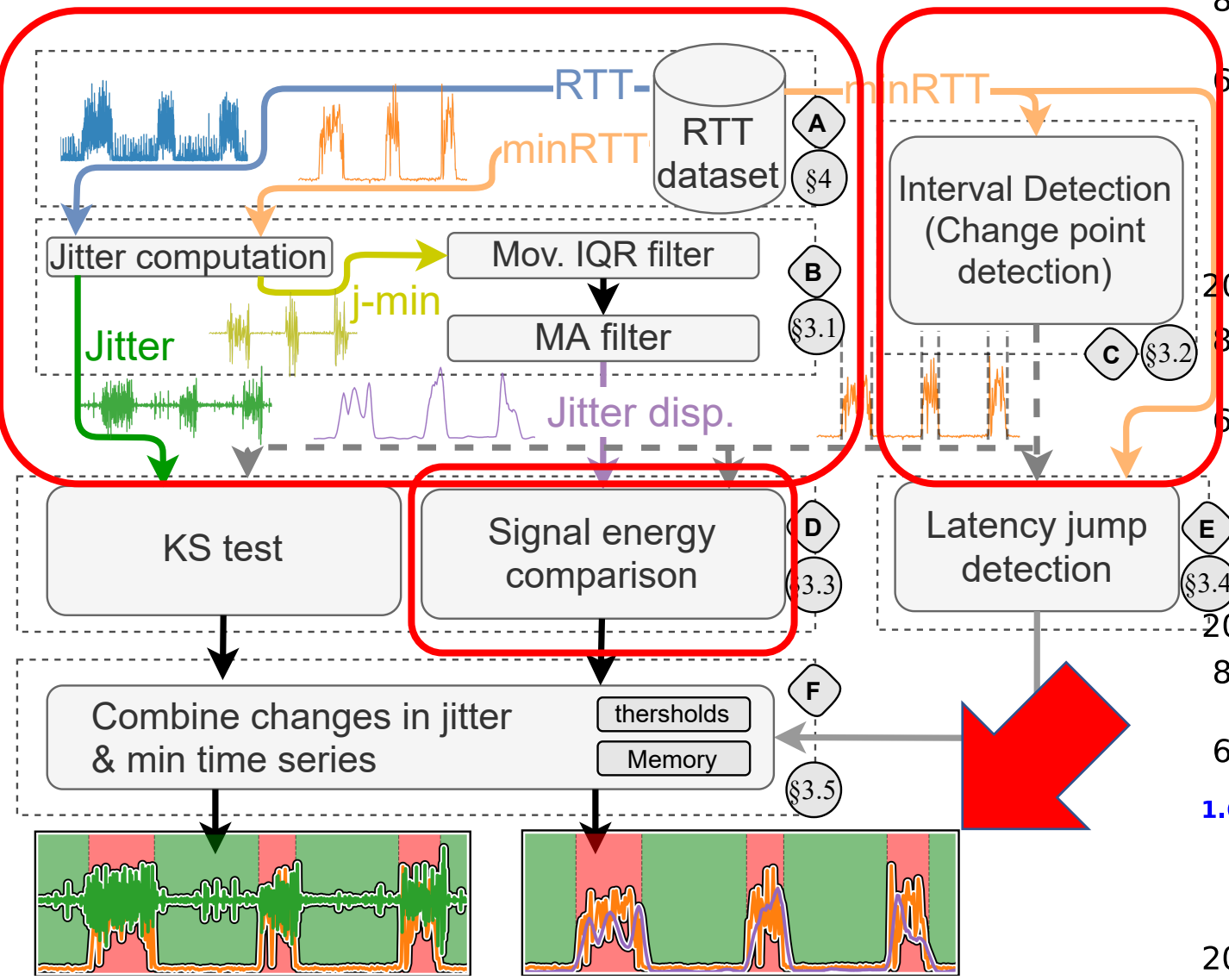


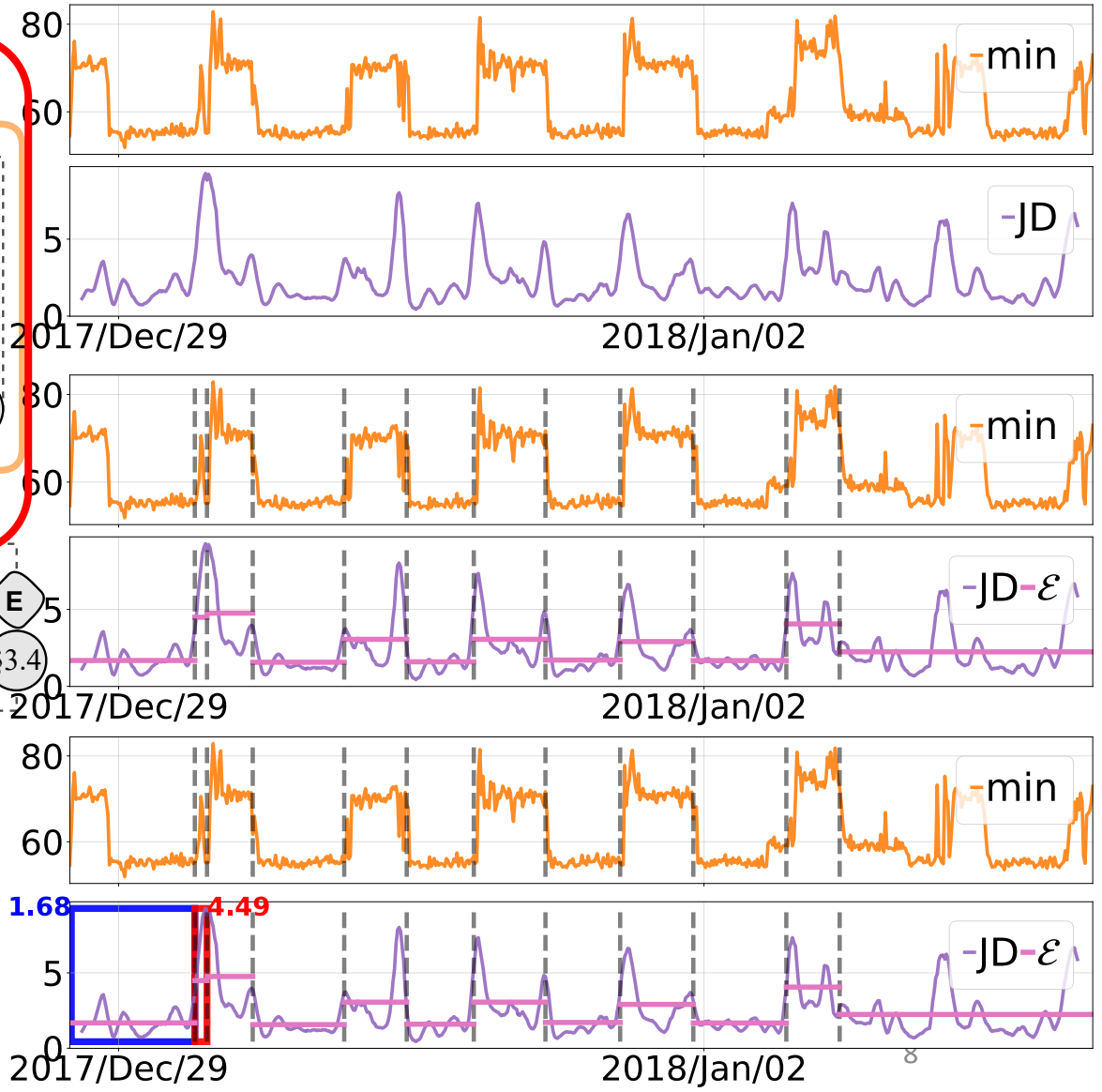
Jitterbug framework



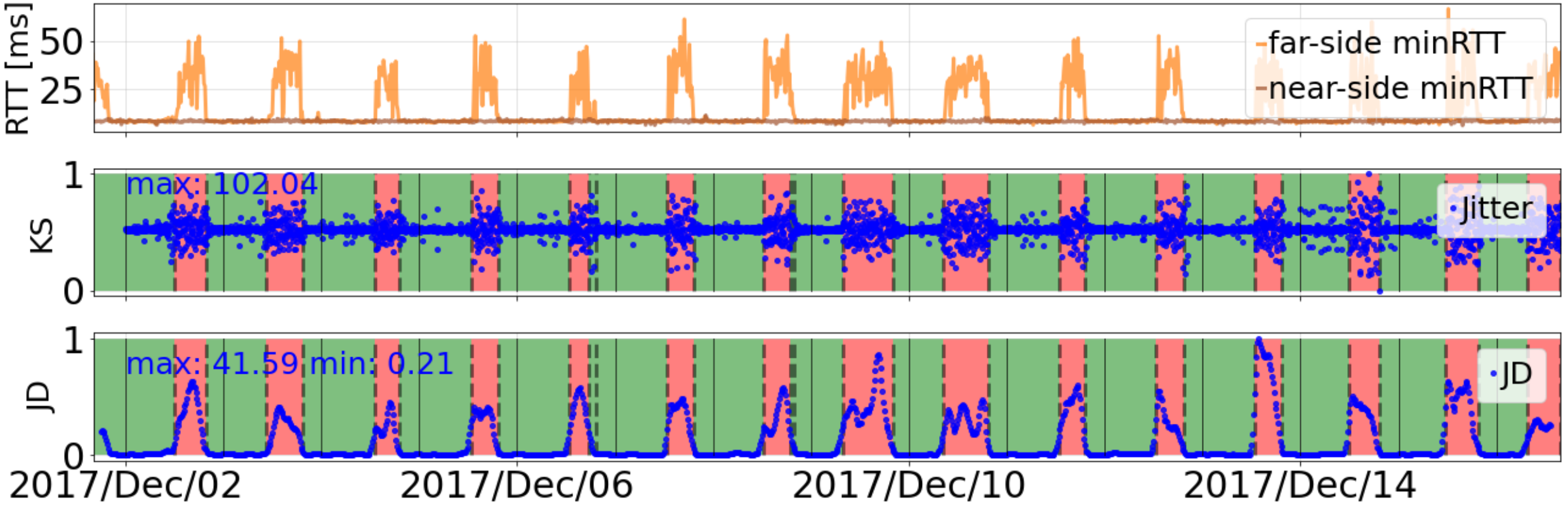


Jitterbug framework

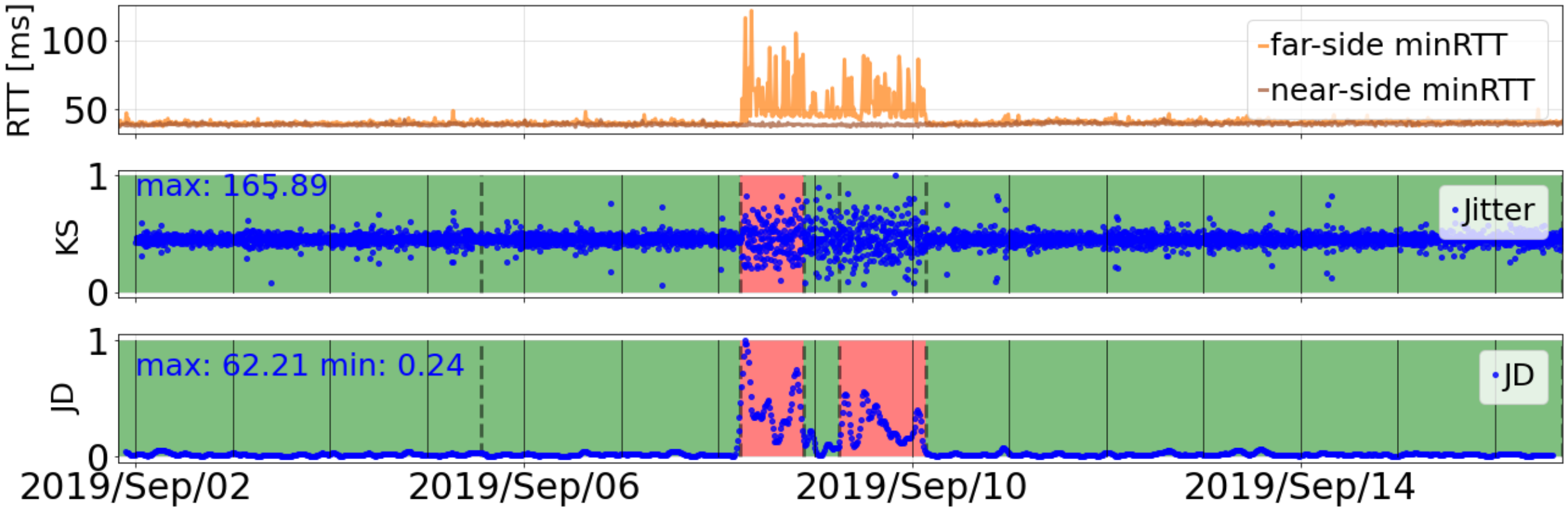




Jitterbug congestion inference



Jitterbug congestion inference



Evaluation

- Change point detection algorithms (BCP vs HMM)
  - Similar results but complementary for corner cases
- Congestion inference methods (KS vs JD)
  - Similar results
  - Trade-off : JD slightly better but KS is a more simplistic approach
- Cross validation
  - Mostly agree with autocorrelation-based methods
  - Limitations on validation of one-off cases

Contributions & Future work

Contributions

- A new approach to the congestion inference problem based on jitter
- Jitter signals allowed us to distinguish congestion events in RTT time series
- We propose a new framework to infer congestion using jitter information
- Jitter allowed us to detect both one-off and recurrent congestion

Future work

- Impact of QUIC rollout in congestion signatures
- Optimization of change point detection algorithms

Thanks!

https://github.com/estcarisimo/jitterbug