



KU LEUVEN

Grey-Box Building Models for Model Order Reduction and Control

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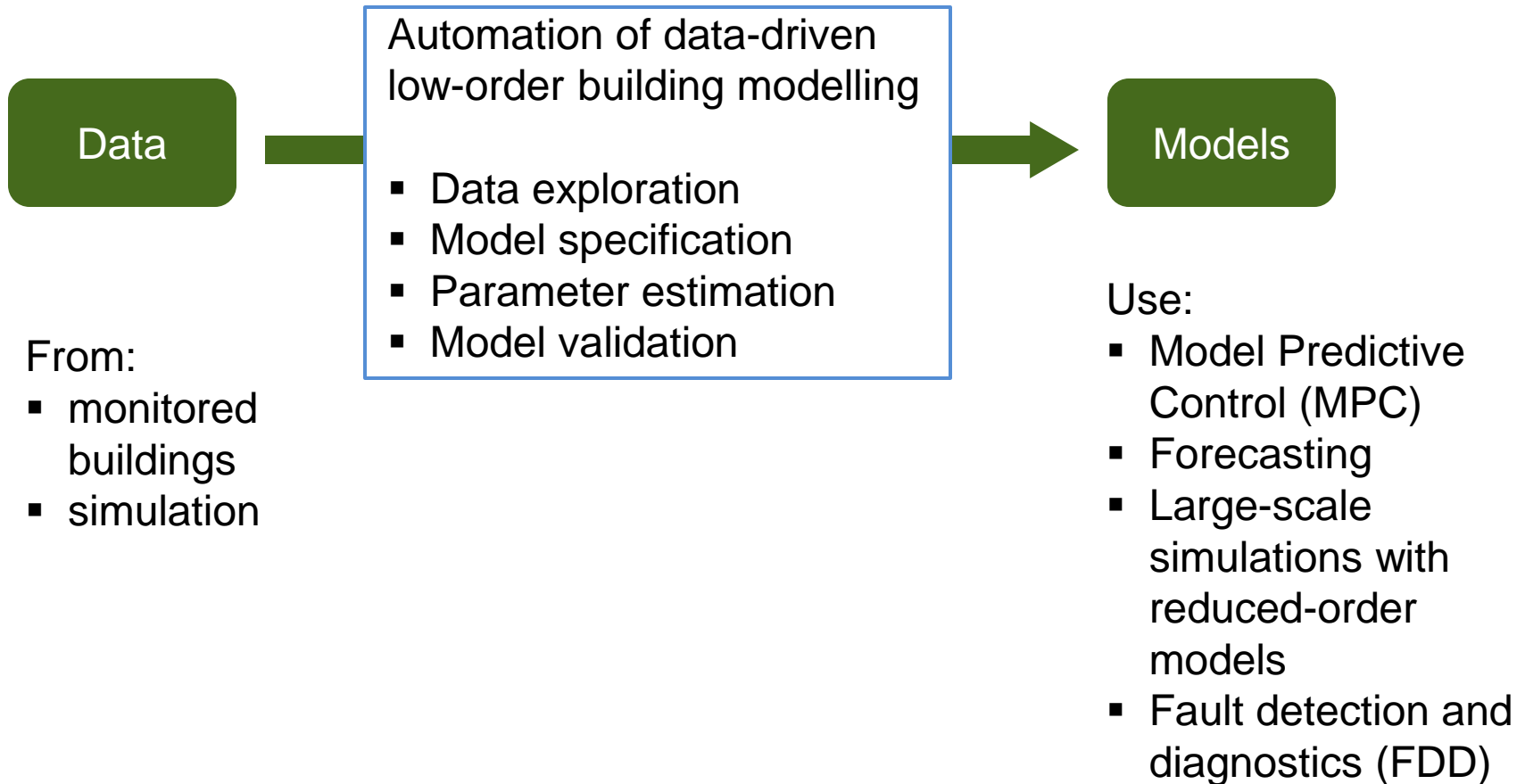
Johan Åkesson, *Lund University*

Lieve Helsen, *KU Leuven*

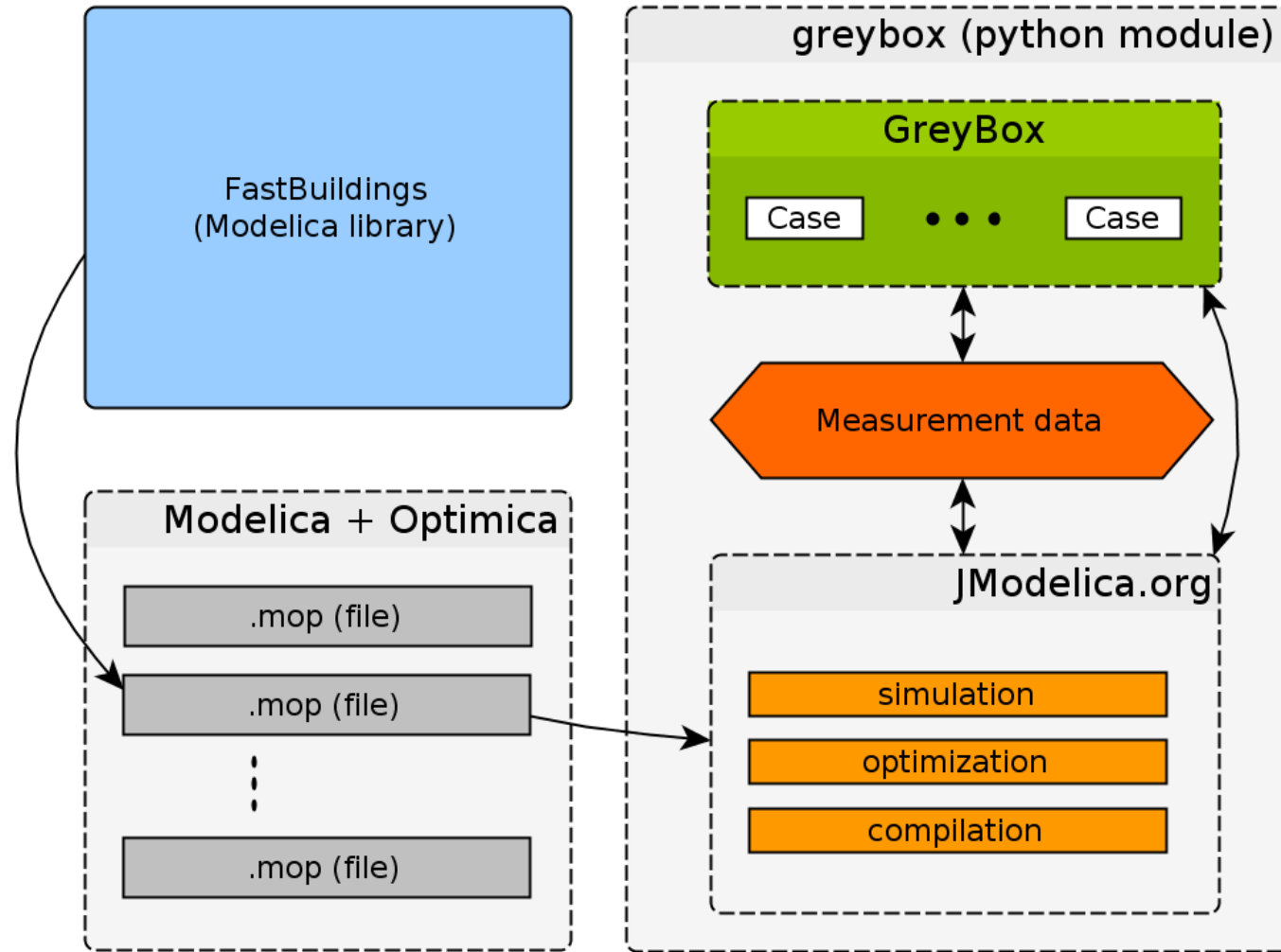
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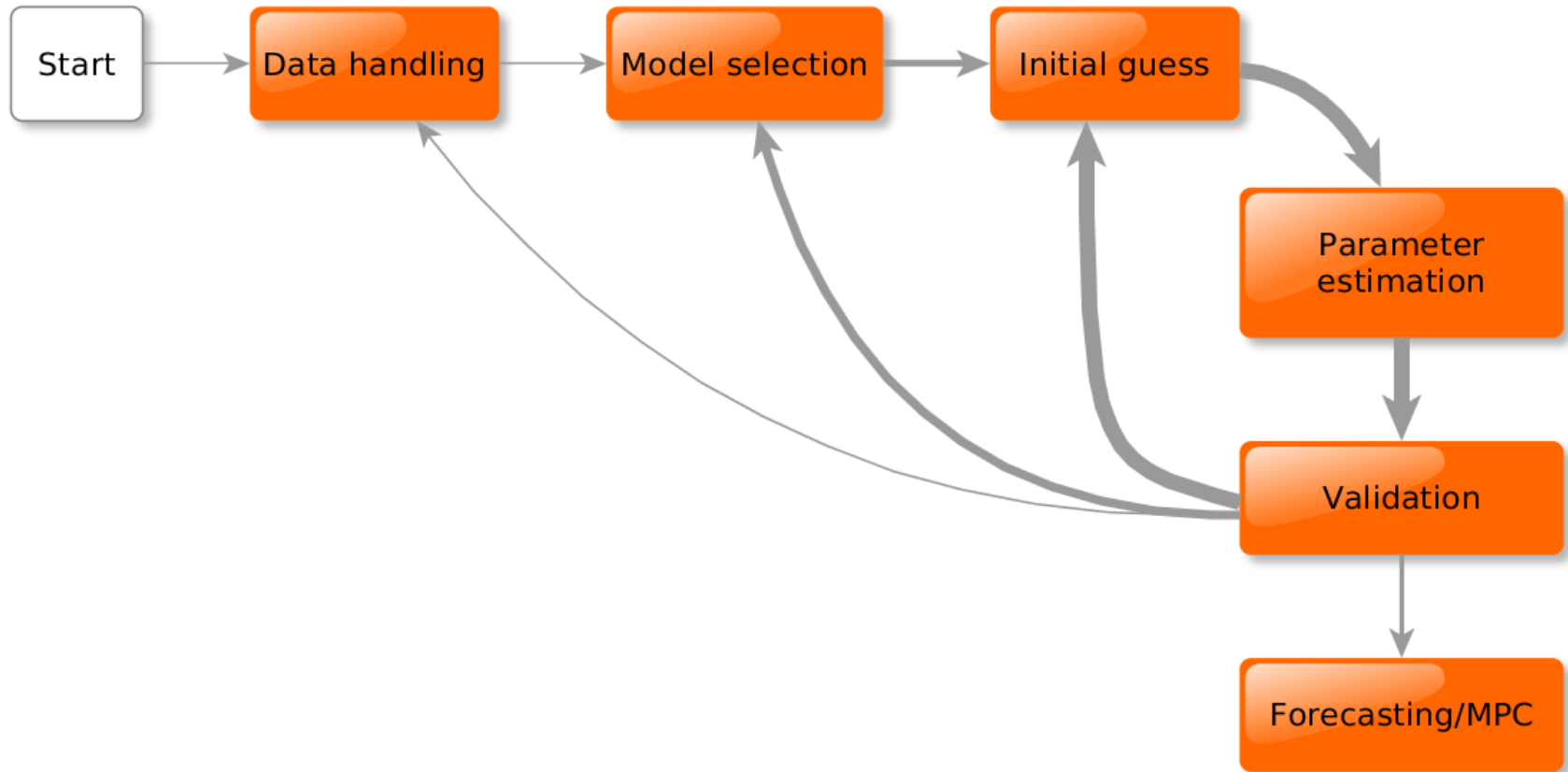
From data to models



Grey-box buildings toolbox



Toolbox functionality and work flow

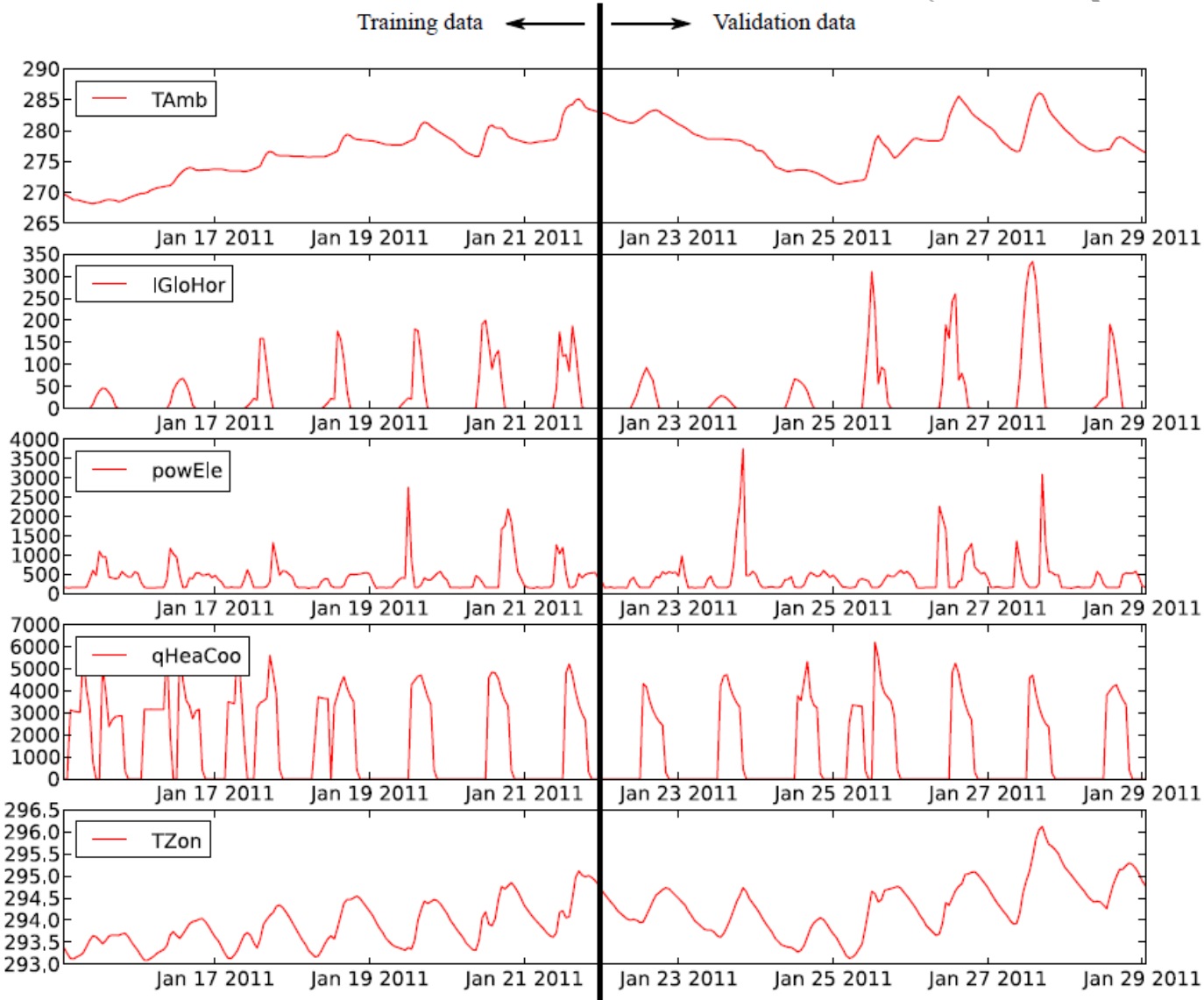
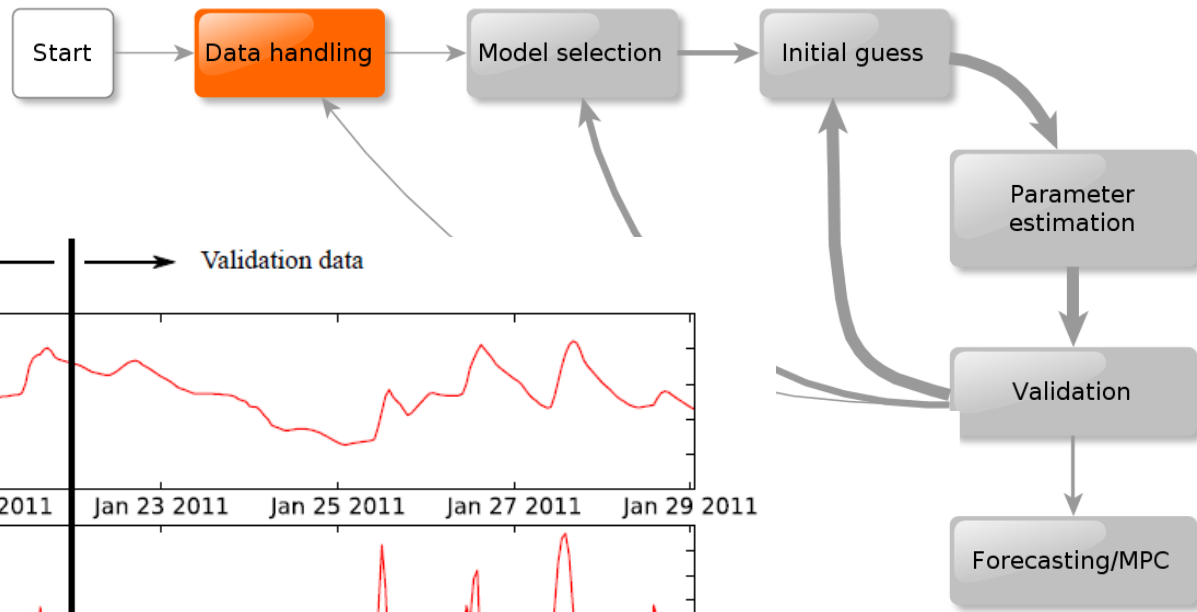


Case studies:

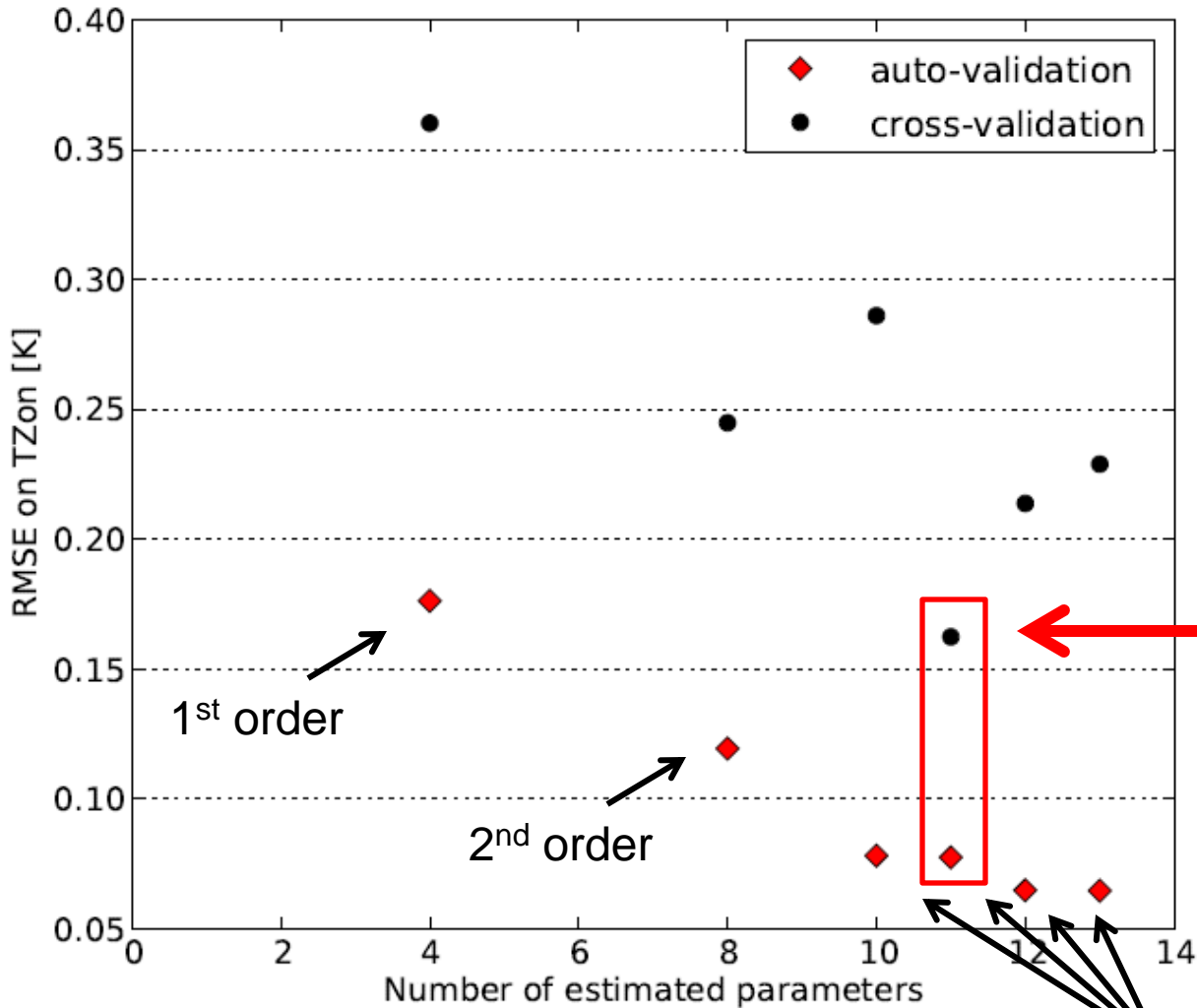
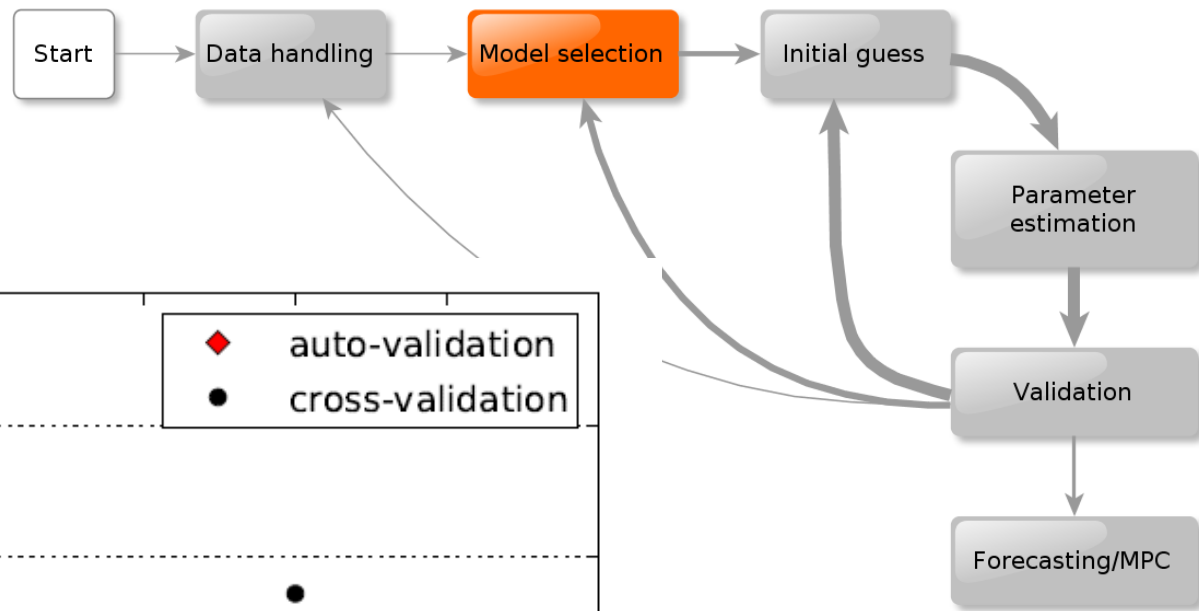
1. simulated dwelling
2. monitored office building



Data handling



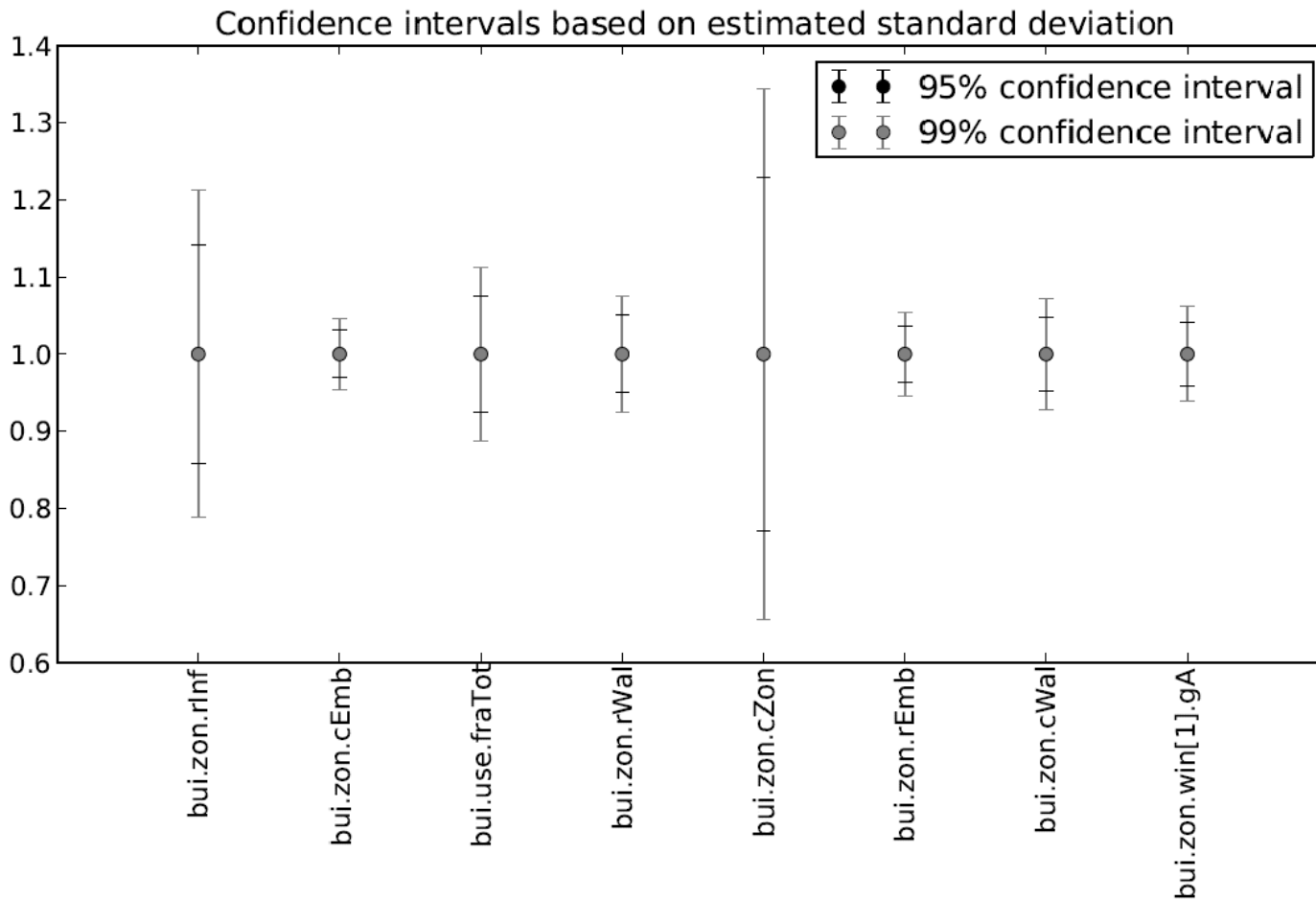
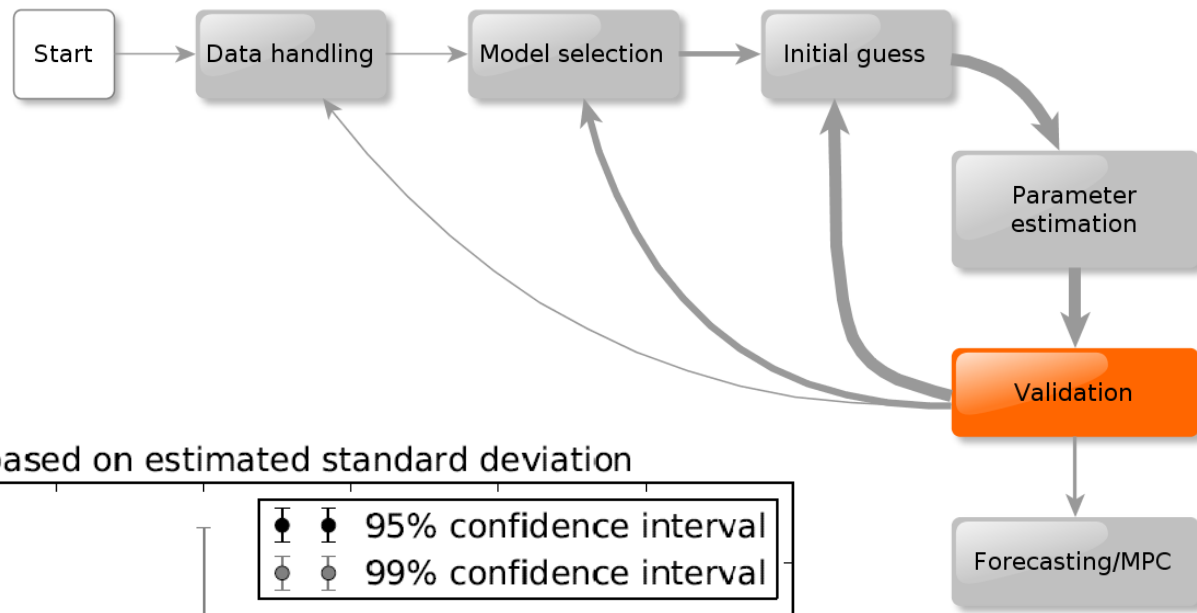
Model selection



Best model

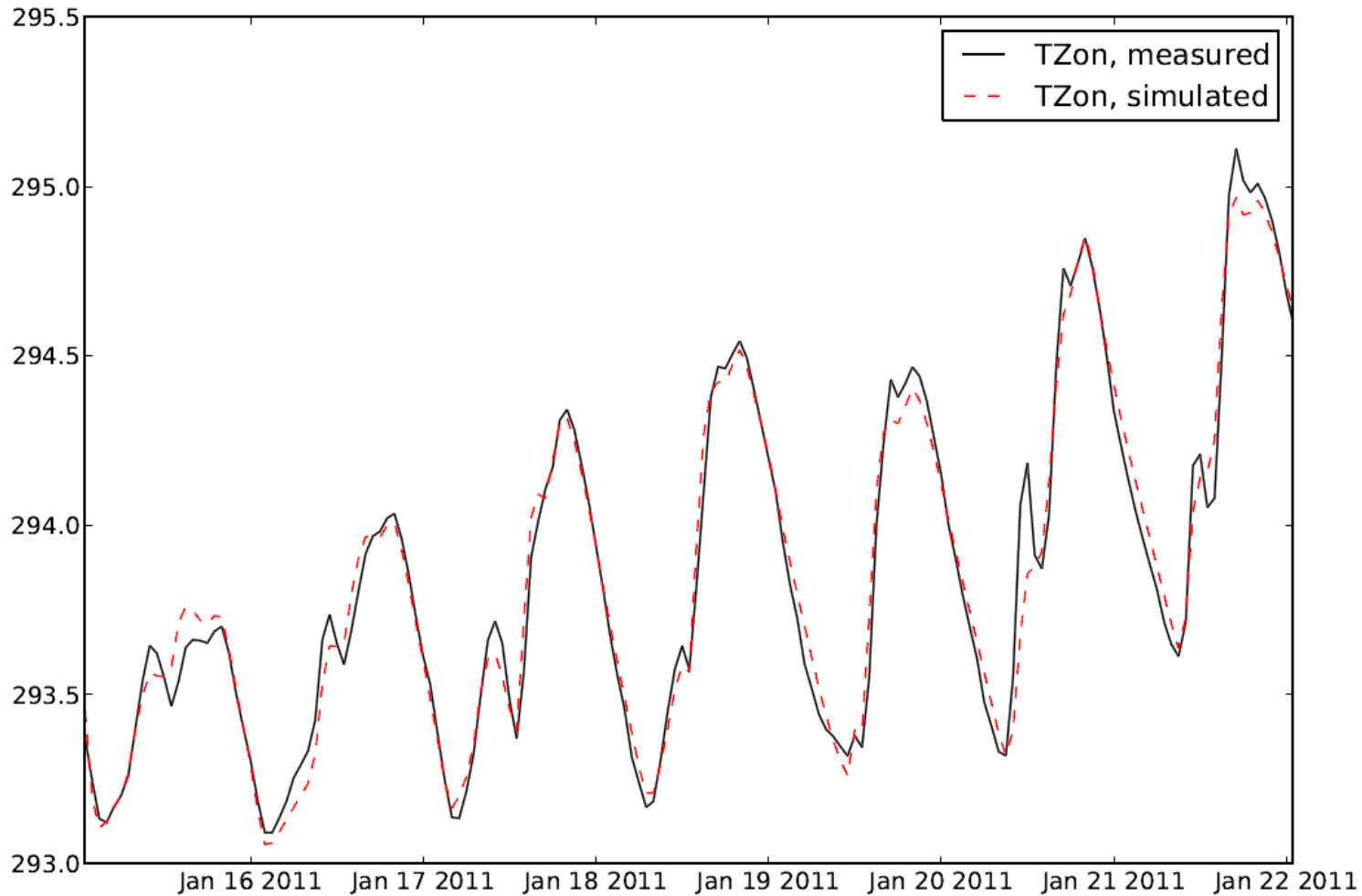
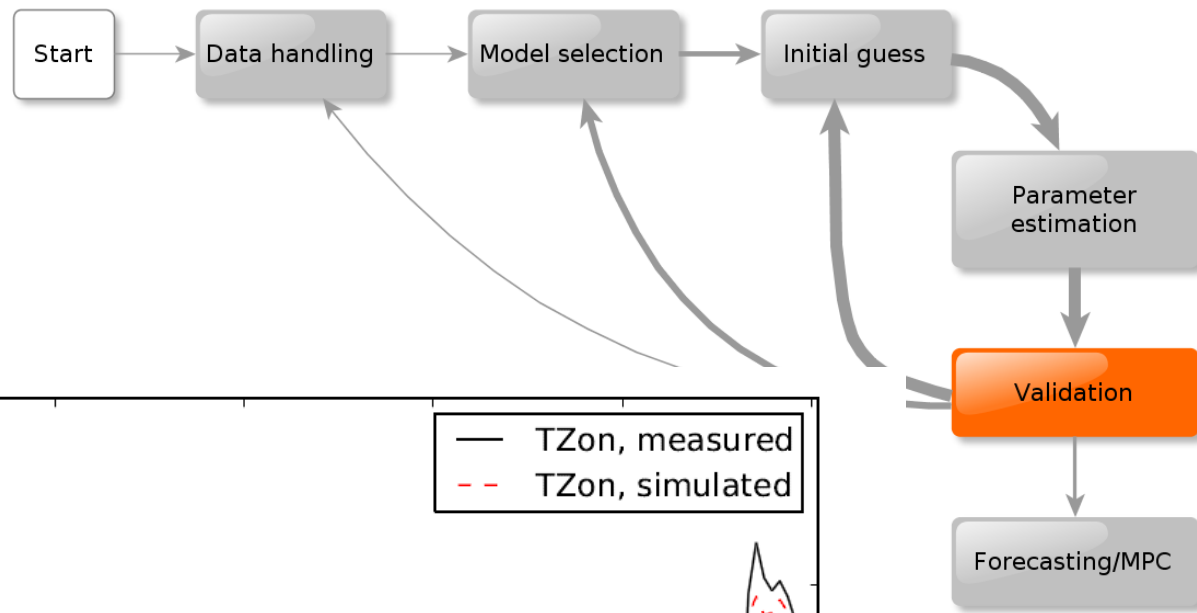
3rd order

Validation



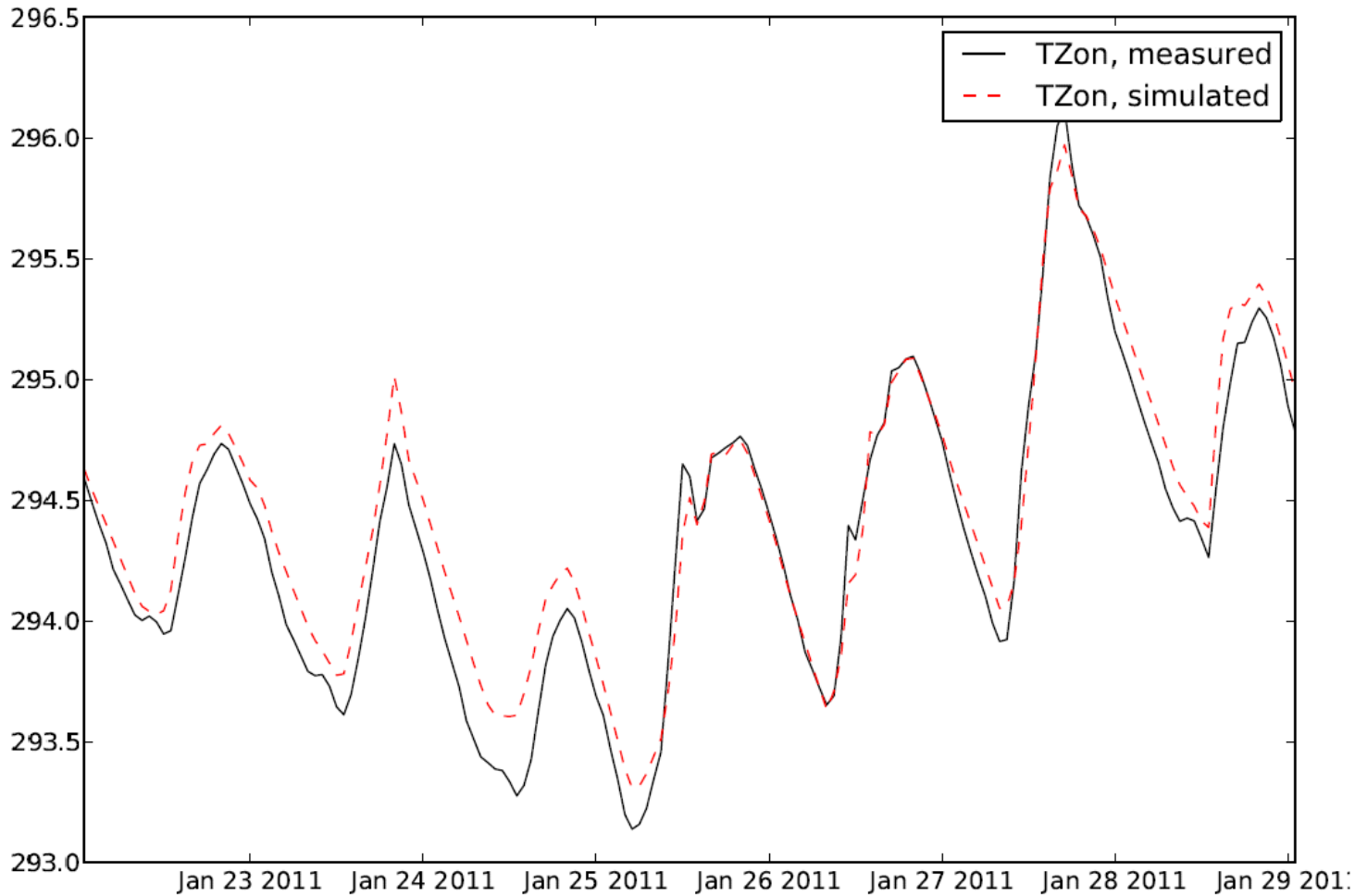
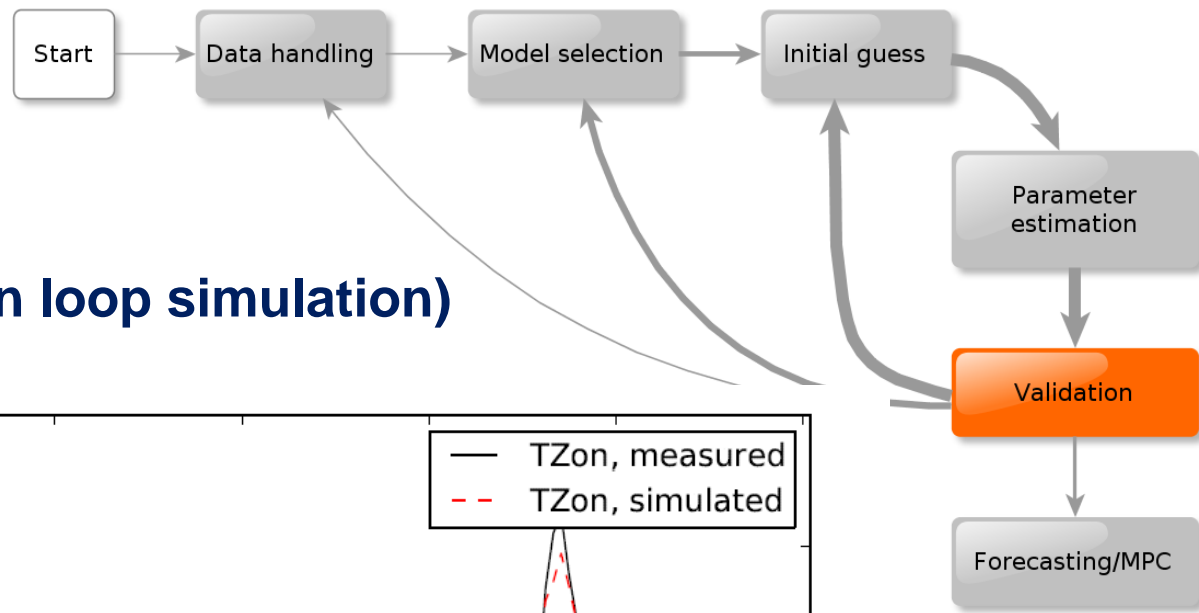
Validation

Auto-validation

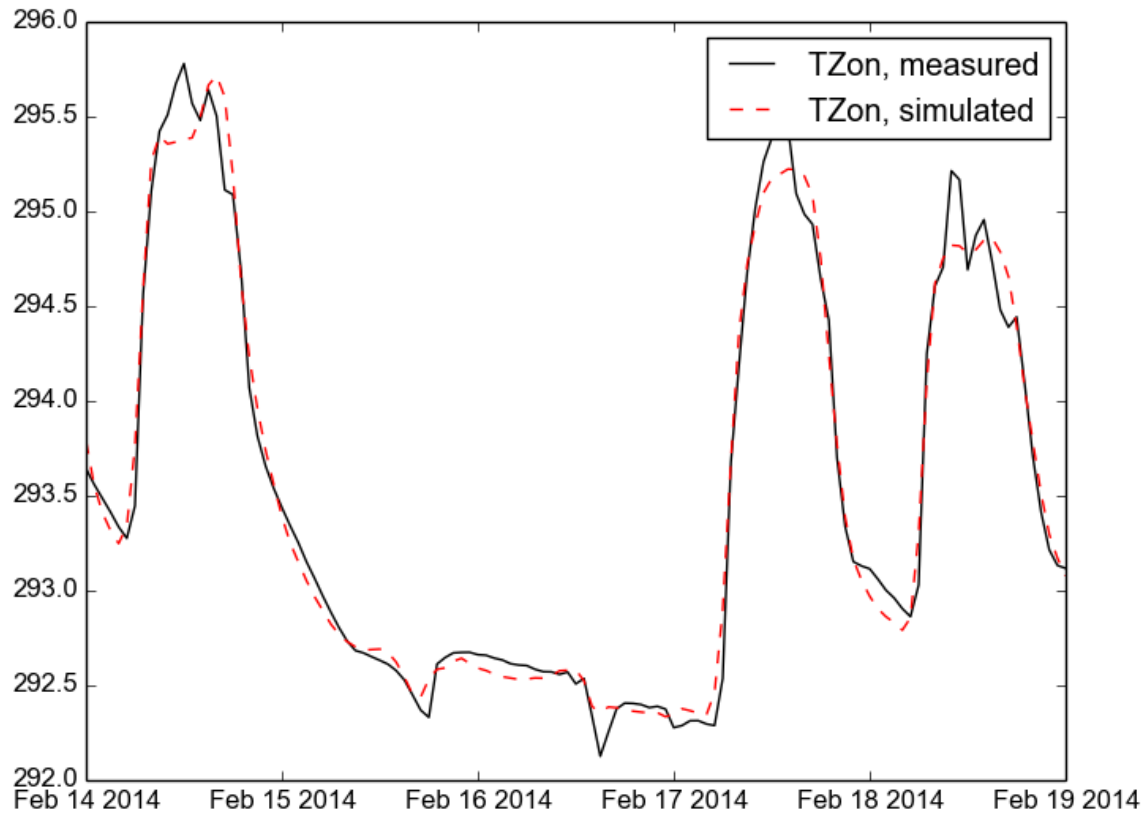


Validation

Cross-validation (= open loop simulation)

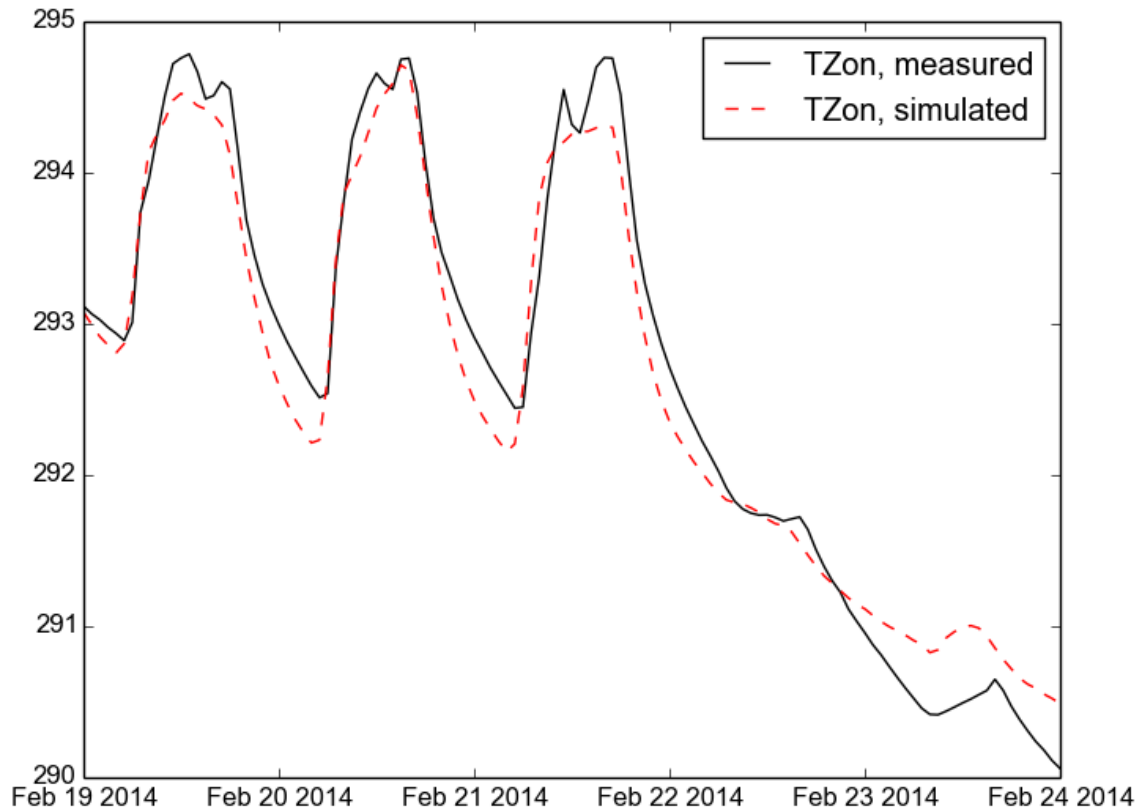


Monitored office building



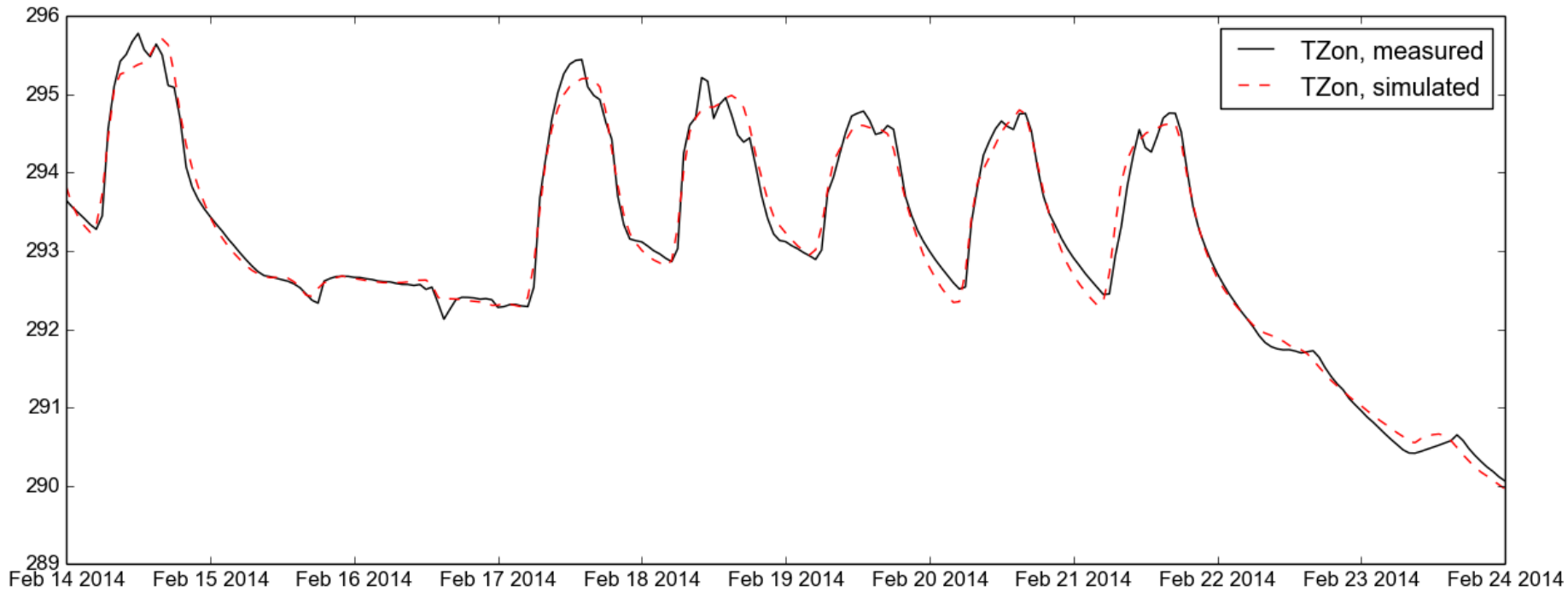
- 10 days of monitoring data
- Parameter estimation based on only 5 days of data

Monitored office building

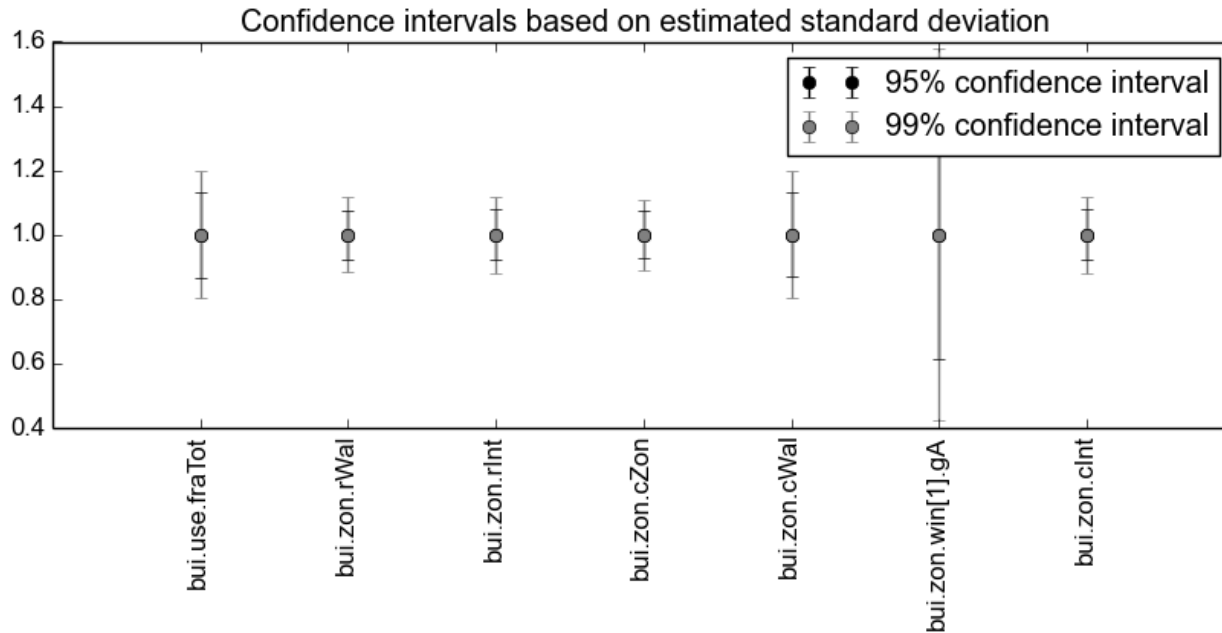


Cross-validation

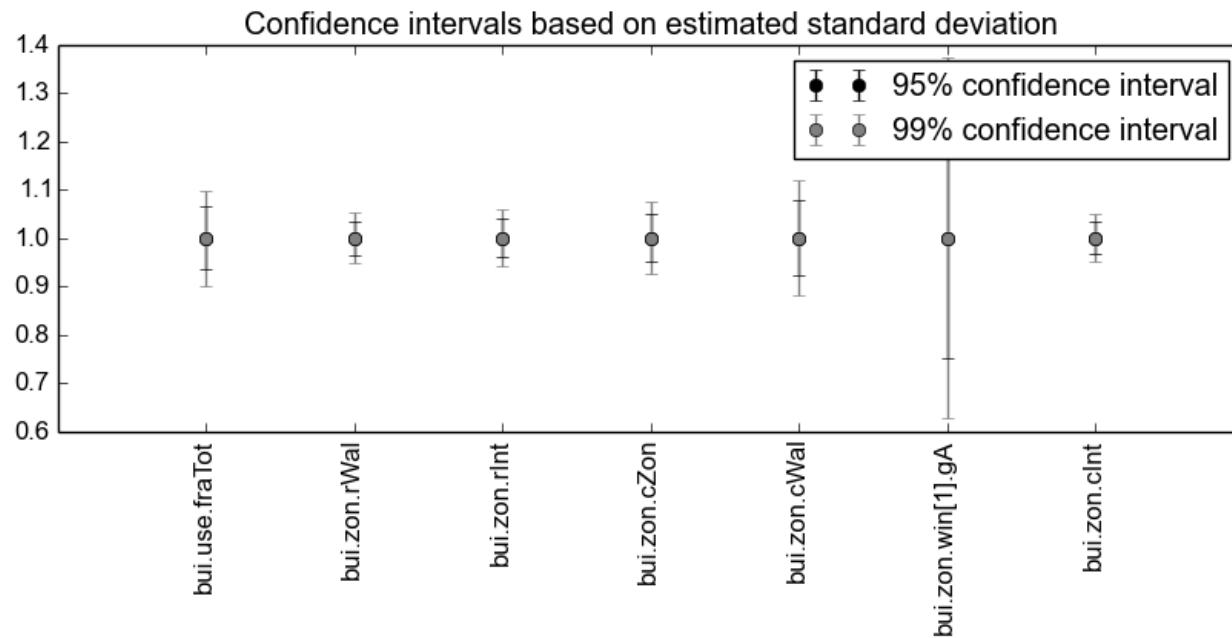
Monitored office building



Parameter estimation on the 10-day dataset



5 days



10 days

Summary

- Python tool chain for parameter estimation of non-linear Modelica models
- Interactive and scripting/automation
- JModelica.org for compilation, simulation and optimization
- FastBuildings library (<https://github.com/open-ideas/FastBuildings>)
- Latin hypercube sampling for search space coverage
- Real use and validation by APPLICATION of the models (MPC)
- License: investigating dual license: free for non-commercial use.



Thank you for your attention!

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