

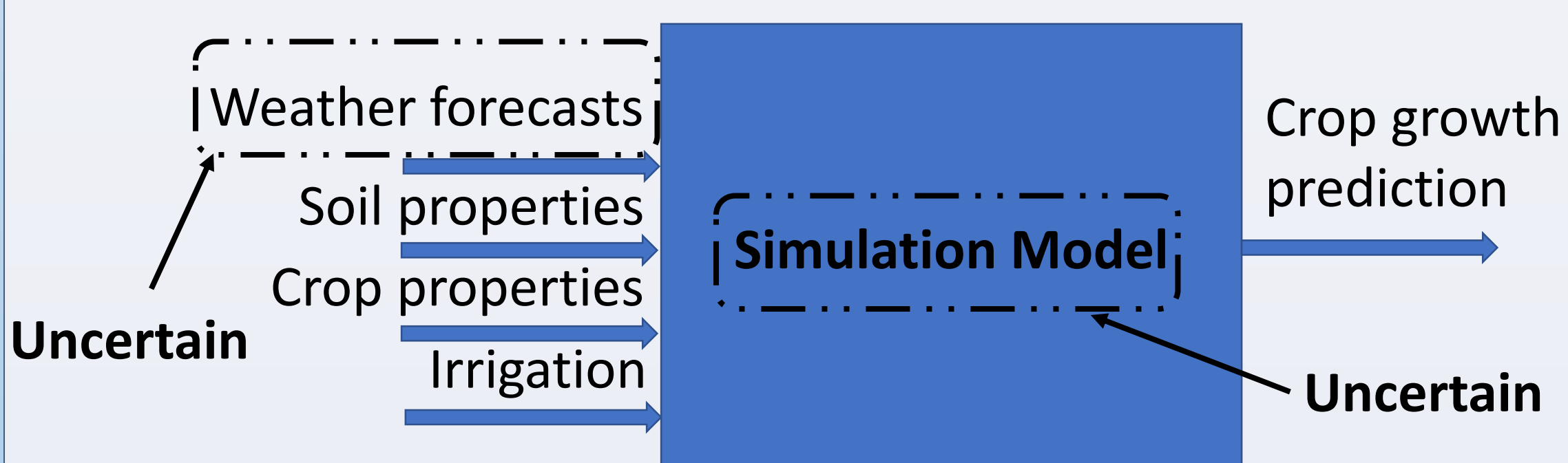
# A novel inflation method for Ensemble Kalman Filter-based data assimilation in a crop model used for irrigation scheduling

Alaa Jamal, Raphael Linker

Faculty of Civil and Environmental Engineering, Technion

## Motivation

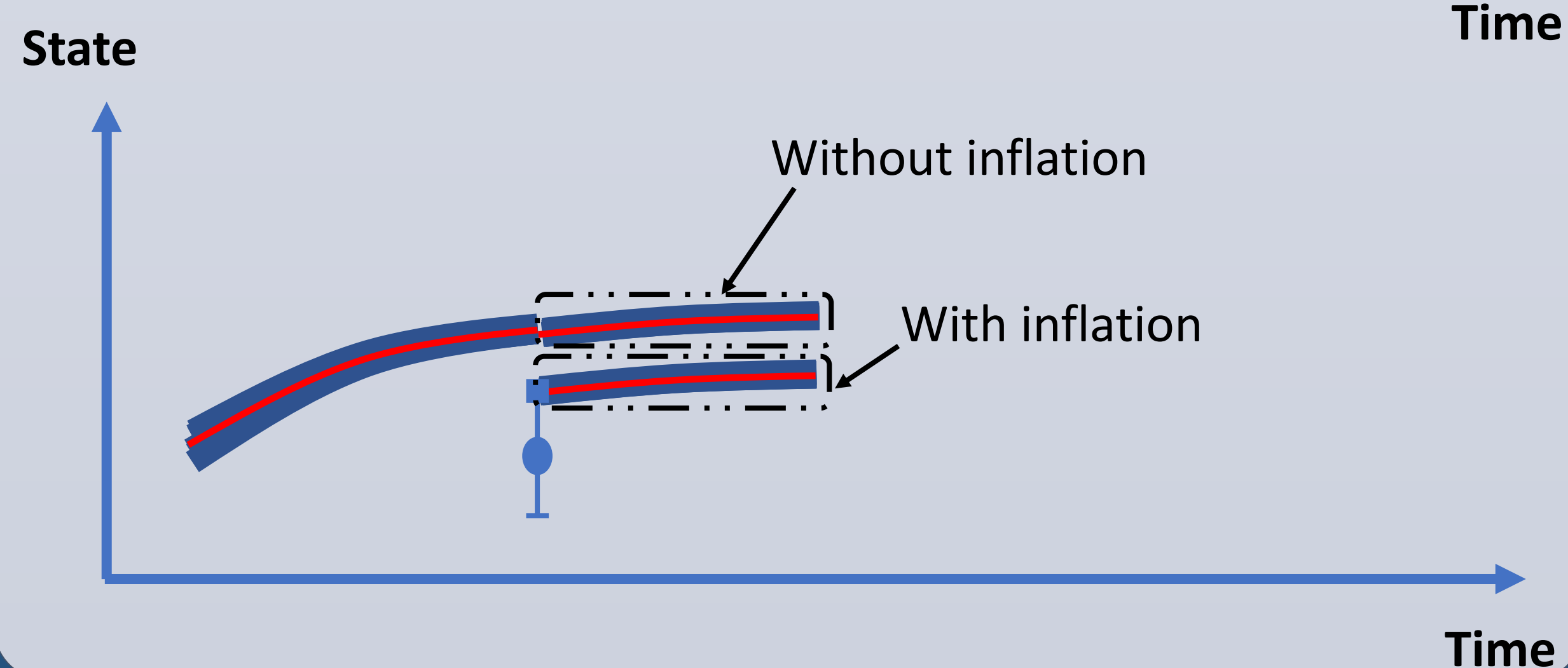
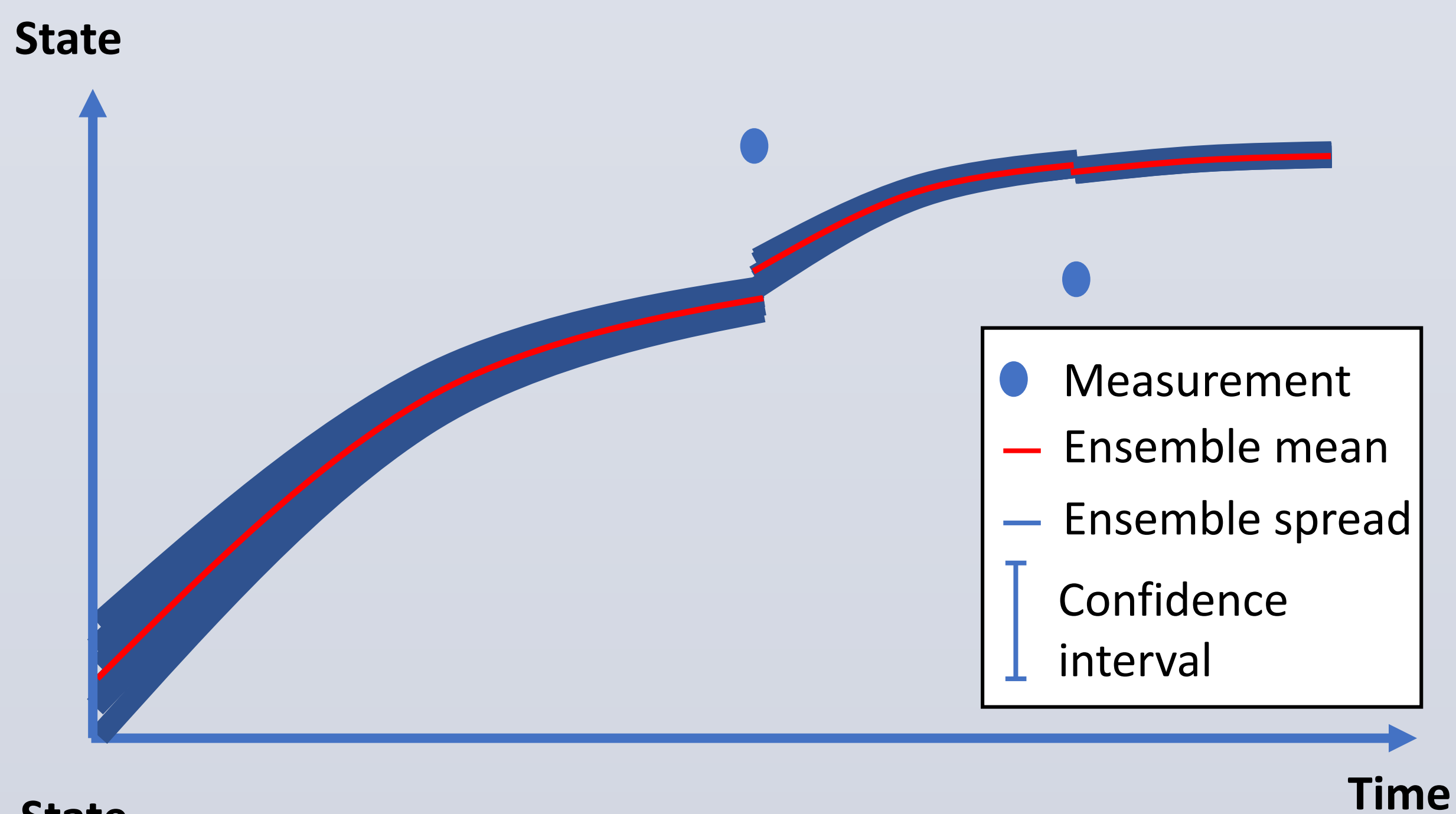
- Crop models can be used to perform model-based irrigation scheduling.



- To deal with the weather uncertainty, stochastic irrigation scheduling can be used.
- To improve the accuracy of crop growth estimation, measurements are assimilated with data assimilation algorithms such as Ensemble Kalman filter (EnKF).
- EnKF considers the accuracies of the model and of the measurements based on their covariances.
- Because some of the model errors are unknown, and because of sampling errors, the covariance of the model are reduced drastically, which causes measurements rejection.

## Method

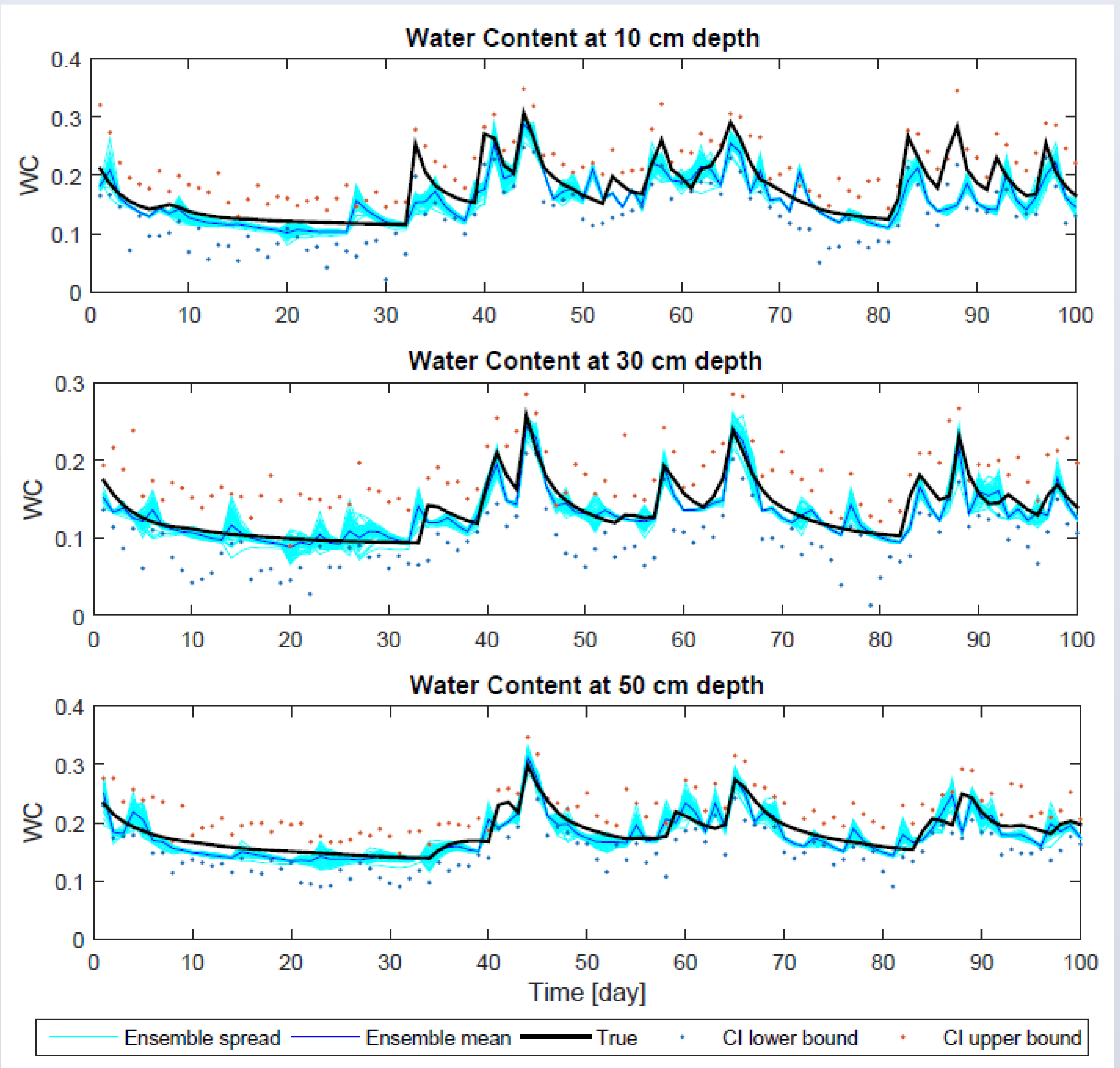
- Covariance inflation is performed to enlarge the model covariance.
- We propose to relate the amplitude of the inflation to the Confidence Interval of the true state based on the measurements.



## Preliminary Results

Case study:

- Hydrus 1D model is used for simulating soil water flow.
- Two models were generated: True model (with true soil and crop properties) and Biased model (with different soil and crop properties).
- Measurements were generated based on the true model results to be assimilated into the Biased model.
- The simulation includes 60 cm soil profile along a period of 100 winter days.
- Measurements were collected at 10 cm, 30 cm and 50 cm depths.



## Summary and On-going Work

- Determining the covariance inflation based on statistical data, rather than using predetermined constant factors or other heuristic methods to improve the model prediction accuracy.
- Next step will be to determine how model improvements translate into improvement of the irrigation schedule.

## Contact

alaaj@campus.technion.ac.il