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# Short-term tunnel-settlement prediction based on Bayesian wavelet: a probability analysis method

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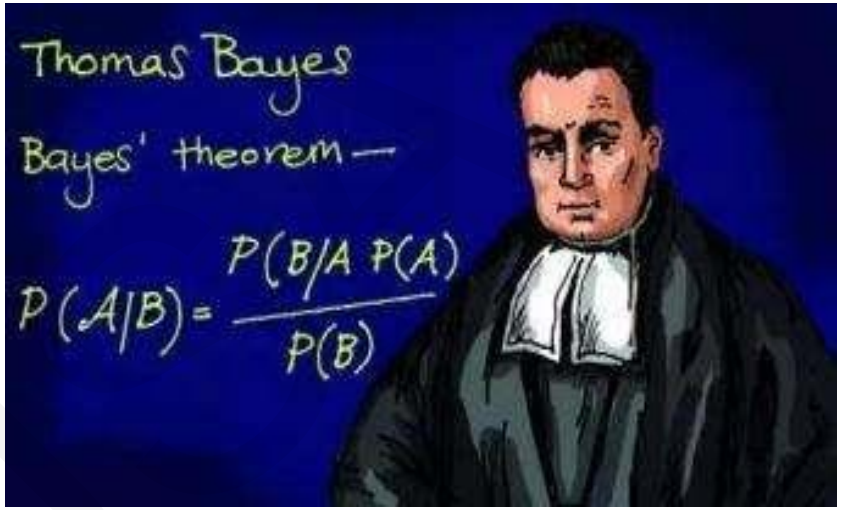
# Uncertainty modeling method

## Classical probability

- Analyzing the data characteristics from a deterministic view
- The parameters are unknown and certain constants
- Objective probability
- Based on large amounts of experiment data




## Bayesian probability

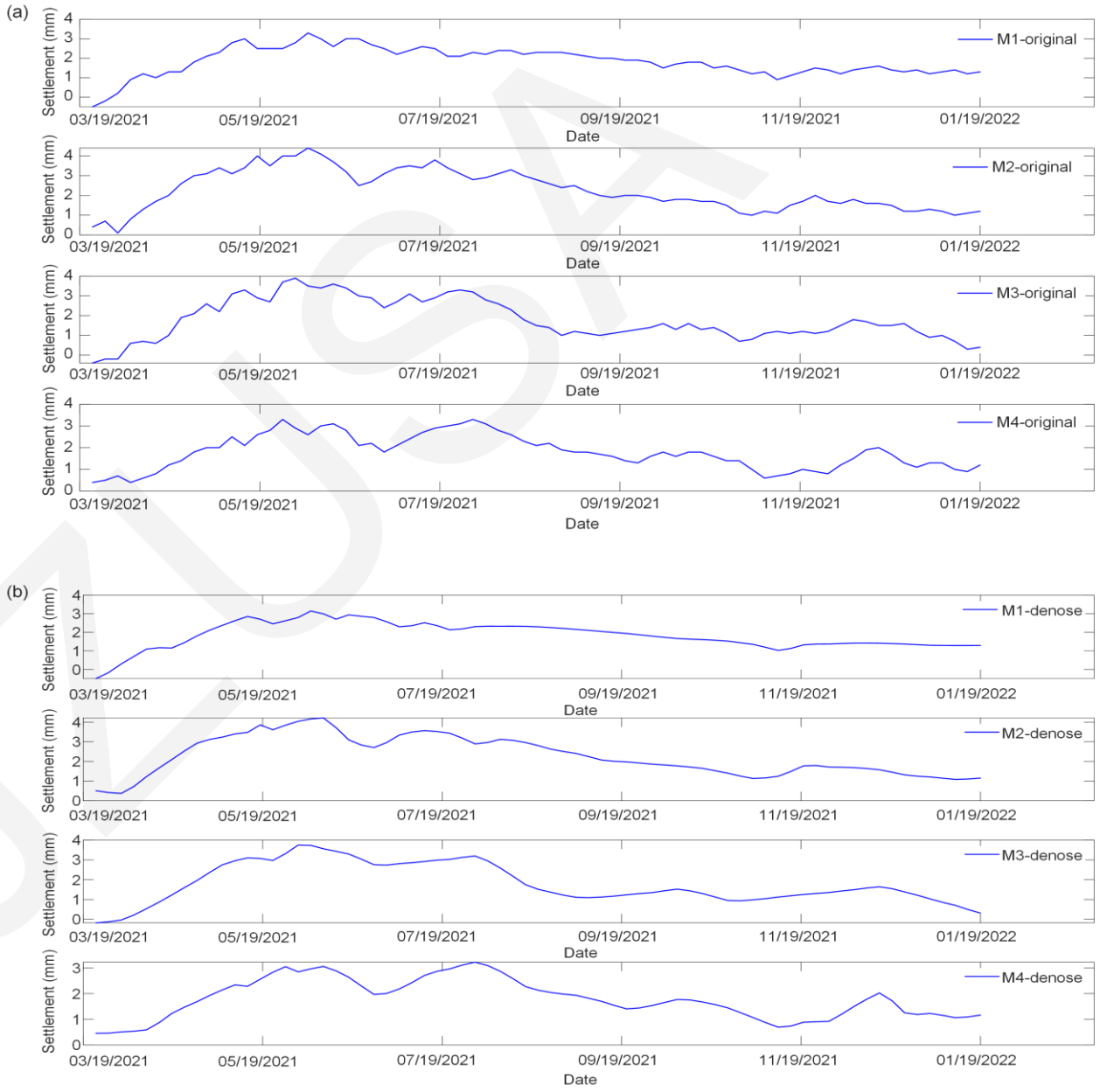
- The parameters are variable
- Quantifying and reducing the uncertainty
- Posterior will be updated continually with more data acquired

# Data processing

**Original data**

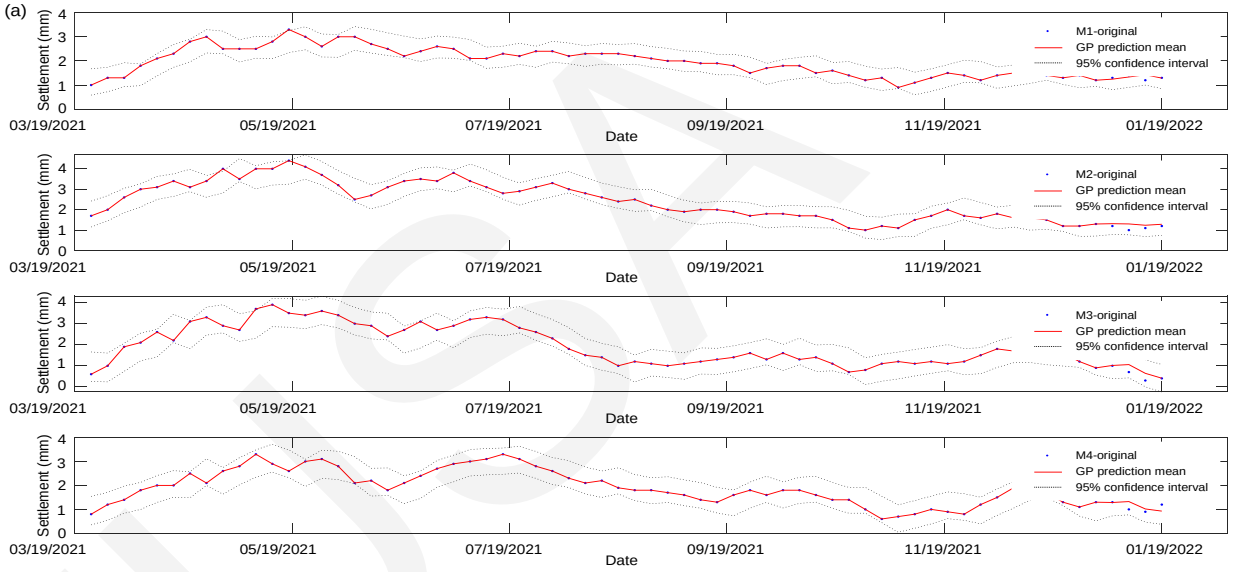
**Wavelet decomposition method**

**Denoised data**

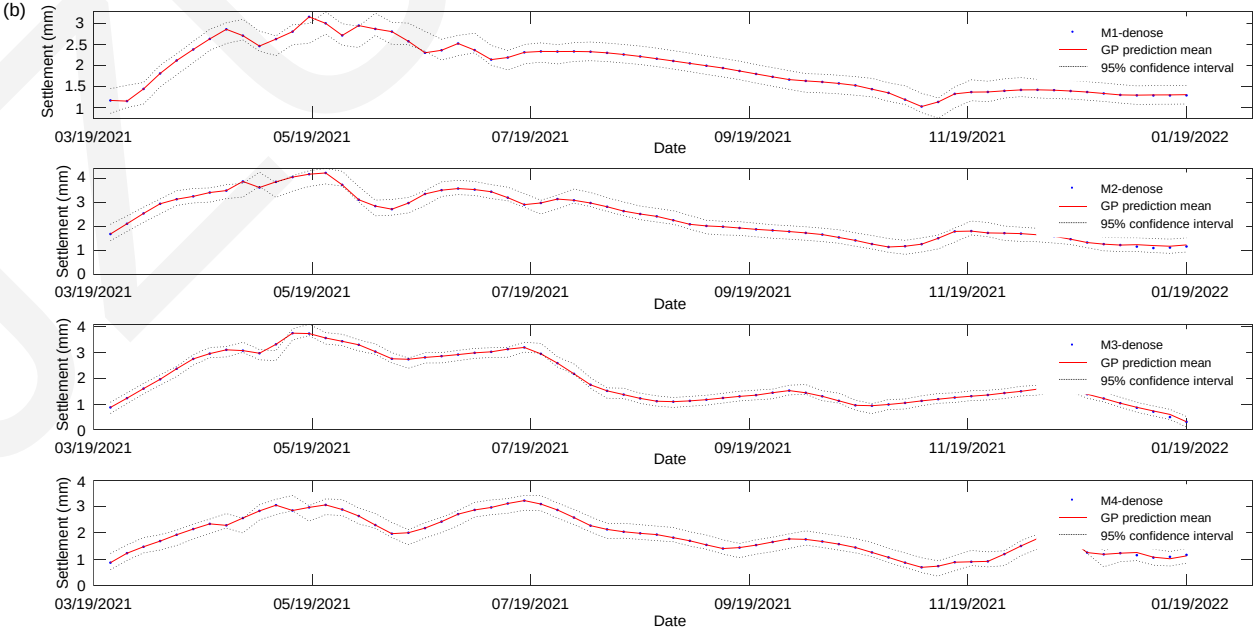


# Settlement probability prediction

**Probability prediction based on original data**




**Probability prediction based on denoised data**



# Conclusions

- The larger the prediction ratios of settlement, the worse the prediction performance of the GPBE model. A moving window of 5 offers the best prediction performance within the model.
- The prediction performance of the WD-GPBE model is better than that of the GPBE model, demonstrating that it is necessary to denoise the original settlement-monitoring data before using it in the model.