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Concepts and methods for better predictions in climate and environmental science

Skillful predictions in climate and environmental science are essential for planning operations, assessing risks, guiding adaptation strategies, and building resilience. This talk synthesizes key concepts and methods for enhancing predictive performance in these domains, with a particular emphasis on predictive uncertainty estimation, extreme event prediction, and the role of big datasets and large-scale benchmarking in this context. Along the way, we discuss core strengths, limitations and open challenges across the concepts and methods in predictive settings. Rather than diving deeply into any single method, we focus on their interconnections and practical trade-offs. We explore both established and envisioned applications in areas such as hydrological forecasting and bias correction of climate forecasts and satellite data. To foster the discussion, the talk concludes by reflecting on the transferability of the analyzed concepts and methods to fields such as energy demand forecasting, and on how such a transfer can be effectively achieved.

Special/ Invited session

Data science for climate and environment

Classification

Both methodology and application

Keywords

Big data, extreme events, predictive uncertainty

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