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The Challenge of Weather and Climate Prediction

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Message from the Guest Editors

Weather and climate prediction (forecasting) are among the greatest challenges faced in theoretical and applied atmospheric science. Both require comprehensive theoretical knowledge and extensive operational systems. Due to the presence of deterministic chaos in the atmosphere–ocean dynamic system, long-range forecasting is limited. Ensemble forecasting is a useful probabilistic component of the forecasting system as it is able to inform us of the reliability of medium-range weather forecasting. As time goes on, the reliability decreases; thus, after 10 days, medium-range weather forecasts are considered non-reliable. However, if atmosphere–ocean global models are considered as boundary condition problems instead of as initial condition problems, then useful seasonal and even centennial outlooks can be achieved, but with "condensed" products. Determining the limitations of weather and climate forecasting can be achieved by comparing forecasts with real observations, i.e., via forecast verification.

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Message from the Editor-in-Chief

Continued developments in instrumentation and modeling have driven atmospheric science to become increasingly more complex with a deeper understanding of concepts, mechanisms, and interactions. This is the field that innovation built and it has led to a better appreciation for the complexity with atmosphere. Human life is intertwined in this complexity as we strive to better understand our atmosphere. Climate change is constantly stretching the limits of our thinking and forcing new ideas and concepts to be played out. Welcome to the Anthropocene!

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