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Convection-Permitting Models: Added Value and Advances in the Representation of Unresolved Physical Processes and Model Uncertainties

Guest Editor:

Dr. Julien Savre
Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Oberpfaffenhofen, 82234 Weßling, Germany

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Message from the Guest Editor

Convection-Permitting Models (CPMs) are numerical models designed to simulate the atmosphere using horizontal grid spacings sufficient (1 km < Δx < 4 km) to resolve at least part of the dynamics associated with moist convection. It is consequently possible to operate these models without specifically parameterising deep convection, although shallower cumulus clouds still need to be parameterised. More recently, advances in computational capabilities have even permitted the development of global CPMs as well as CPM-based ensemble forecast systems.

In this special issue of Atmosphere, we invite scientific contributions presenting cutting-edge results that demonstrate the added value of CPMs over coarser resolution models. The main focus of this Special Issue is on the representation and predictability of convective-scale processes, including surface precipitation rates or extreme weather events. We also encourage contributions presenting advances that improve the predictive skills of CPMs, in particular concerning the representation of unresolved physical processes and model uncertainties using, for example, stochastic perturbation schemes.

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Editor-in-Chief

Dr. Daniele Contini
Institute of Atmospheric Sciences and Climate (ISAC), National Research Council (CNR), Str. Prv. Lecce-Monteroni km 1.2, 73100 Lecce, Italy

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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Contact Us

Atmosphere Editorial Office
MDPI, Grosspeteranlage 5
4052 Basel, Switzerland

Tel: +41 61 683 77 34
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atmosphere@mdpi.com
𝕏@Atmosphere_MDPI