EMS Annual Meeting Abstracts
Vol. 18, EMS2021-271, 2021, updated on 19 May 2022
https://doi.org/10.5194/ems2021-271
EMS Annual Meeting 2021

Evaluation of the near-surface evolution of Foehn events in COSMO-1

Yue Tian[1], Juerg Schmidli[1,2], and Julian Quimbayo-Duarte[1,2]
[1]Institute for Atmospheric and Environmental Sciences, Goethe University Frankfurt, Frankfurt am Main, Germany
[2]Hans Ertel Centre for Weather Research, Model Development branch, Goethe University Frankfurt, Frankfurt am Main, Germany

Foehn is a downslope wind with a large impact on society due to its gusty nature and the associated high-temperature extremes. It is influenced by and interacts with near-surface processes, such as the cold air pool (CAP), an important phenomenon that is often present in the foehn valleys during the cold season. Therefore, it is challenging to accurately forecast the foehn characteristics, in terms of the onset, strength, and decay as the near-surface evolution is the result of multi-scale interactions between the larger atmosphere and the mountain/local valley topography. From a meso-/micro-scale perspective, this study investigates the skill of the COSMO model (v5.7) at 1.1 km grid spacing in simulating the near-surface foehn evolution for a set of south foehn events, representative of different foehn types around the Alps. The evaluation is based on a comparison to station data from the automatic monitoring network of MeteoSwiss, with a focus on the Rhine Valley. Significant cold and moist biases are found in the model during foehn hours in all the chosen cases. Biases in Foehn duration and spatial extent are also studied. The sensitivity of these biases to several land-surface parameterization choices, e.g., skin layer, bare soil evaporation, and resistance for heat fluxes, are investigated and presented. Simulations for the same foehn events with COSMO at 500 m grid spacing are also evaluated for a better understanding of the model biases. Further studies from the perspective of climatological statistics are needed to establish the relationships between model biases and foehn types.