

## *High-resolution climate simulations using a regional climate model*

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Although practitioners of dynamical downscaling are well aware that the jump of resolution between the driving data and the nested regional climate model impacts the simulated climate, the issue has never been properly studied. Larger is the jump of resolution, larger is the distance from the lateral inflow to fully develop the small-scale features permitted by the increased resolution. This latter point has repercussions on the computational cost, and becomes an issue for large jump of resolution.

My research has focused on those methodological issues for high-resolution climate simulation purposes. Using the idealized "perfect model" framework so-called the Big-Brother experiment, we have shown that the multiple nesting approach is not only appropriate for a large jump of resolution between the GCM and the RCM, but also reduces the computational cost. This is explained by a substantial reduction of the spatial spin-up, reducing, then, the minimal required domain size. Those results have led to a new study design to deepen our understanding about spatial spin-up. Using a similar Big-Brother experiment but with different jumps of resolution between the lateral boundary conditions and the grid mesh of the nested model, we have shown that the spatial spin-up is intimately linked to the jump of resolution and the weather regime. Thus, explaining the reduction of spatial spin-up observed in our previous study using the multiple nesting approach. In other world, since the multiple nesting reduces the jump of resolution, it also reduces the spatial spin-up distance. As a paramount result of our study, an empirical equation to estimate the spatial spin-up lateral distance has been developed. A complementary part of my research consists in an application of these findings for simulating the freezing and frozen precipitation occurrences in a climate-change context using various precipitation-type diagnostic algorithms.

In the last decade, several efforts have been made to foster high-resolution climate-change information through coordinated experiments such as CORDEX in which a strict simulation framework is imposed, including domain size and location. Ours findings have shed light on some of the methodological issues associated to dynamical downscaling which might help to elaborate such frameworks.

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Thursday, 9 February 2017, 3:30 PM Refreshments 3:15 PM NCAR-Foothills Laboratory, 3450 Mitchell Lane Bldg. 2, Main Auditorium, Room 1022



