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Lateral boundary relaxation and large scale nudging in RCM runs

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Almost universally, in Regional Climate Modeling (RCM) integrations, Davies' relaxation lateral boundary conditions are applied. They force variables in a number of rows around the boundary to conform to the driver global model values, completely at the boundary, and less and less toward the inside of the integration domain. Very often, in addition, investigators apply so-called large scale or spectral nudging inside the domain, forcing the integration variables not to depart much from those of the driver model.

It is pointed out that there is no scientific basis for these two practices. So why are they used? In particular for the former of these two, it is suggested that reasons must be either a belief that this is a practice RCM should follow, or a technique to address numerical issues of the limited area model used, or a combination of the two. For the latter, a belief only.

Examples are shown that, in the absence of these two stratagems, the limited area model can improve on large scales inside its domain. This demonstrates that their use, aimed to force variables inside the domain not to depart much from the driver model data, should be detrimental, if possible numerical issues of the model used were to be remedied.