

## ***Interactive comment on “Brief Communication: Upper air relaxation in RACMO2 significantly improves modelled interannual SMB variability in Antarctica” by W. J. van de Berg and B. Medley***

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This short paper shows the interest of using an upper air relaxation (UAR) in the regional model RACMO2 for simulating the SMB over Antarctica in the aim of correcting biases in the inter-annual SMB variability simulated by RACMO. This brief communication is well written, fits well with TC and it is the first time to my knowledge that the interest of using UAR is demonstrated over Antarctica. Therefore I recommend to accept this paper with minor revisions.

I have only two remarks:

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1. As the authors know, we use the same technique in the regional model MAR to prevent MAR to simulate its own general circulation when the integration domain is very large like Antarctica. However, our upper nudging is limited to the stratosphere ( $> 10$  km (250hPa,  $\sigma < 0.25$ ) above the topography) to prevent the large scale forcing to impact the precipitation processes in MAR. Here, the relaxation in RACMO starts at  $\sim 5$  km (500hPa,  $\sigma < 0.6$ ) above the surface and therefore impacts the precipitation simulated by RACMO as shown by the authors (Precipitation discrepancies could also be due to differences in the general circulation simulated by RACMO). Are there some justifications to start the relaxation zone at  $\sigma = 0.6$  ? Lower sigma values have been tested ? It should be interesting to show the impact of the vertical relaxation coefficient distribution to precipitation by re-simulating one year only.
2. Using UAR impacts firstly the general circulation simulated by RACMO. Are there significant differences between the mean Z500 simulated by RACMO with and without UAR ? With ERA-Interim ? To show the interest of using UAR, comparison with daily surface pressure observed in the centre of the integration domain (or from ERA-Interim) helps also to show the impact of using UAR to the general circulation simulated by RACMO. If it is not a big job for the authors, I recommend to add a short paragraph discussing more in depth the impact of UAR to the general circulation simulated by RACMO.

Minor remark: - the abbreviation SMB should be defined in the abstract. I am not sure also that we can use SMB in the title even if everybody understands. - idem for RCM (abstract) and ECMWF IFS (section 2.1)

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