

The monthly surface mass balance dataset provided here is based on the regional climate model MAR version 3.12.1 run at a resolution of 35 km over Antarctica and driven at its lateral boundaries by 6-hourly ERA5 from 1979 to 2021.

ASCII files (CVS) are provided on Zwally and Rignot basins. Description of each column is given in the file headers.

NetCDF files are provided on the native 35 km MAR grid using the standard Polar Stereographic EPSG:3413 projection. Each variables and units are described in the NetCDF file.

The uncertainties for the integrated values are computed as described below:

1. We computed a RMSE for inclusive SMB intervals of [0, 50, 100, 300, 1500] mmWE/yr by using SMB observations data from the SAMBA dataset of Favier et al. (2013), updated with observations from Wang et al. (2016) and yearly values of shallow ice cores from Thomas et al. (2017), as used in Antarctic SMBMIP (Mottram et al., 2020). Modelled and observed SMB values used in the uncertainty estimation were computed in two steps: the original modelled SMB values were first interpolated to the observation location using a four-nearest-neighbours inverse-distance-weighted method. Secondly, all the interpolated SMB values contained in the same grid cell were averaged as well as the observations to finally create 780 comparison pairs. We used all the observations available (see "raw" on Fig. 1, left) and 80% of the observations best matching with MAR (624 comparison; see "perc80" on the Fig. 1, right) to remove the largest discordances that might also involve measurement errors that cannot be quantified. The "perc80" curve was then approximated with a simple linear function (see "error" on the figure below) of SMB in mmWE/year. This function is the ERROR variable listed in the NetCDF files.

2. For each basin, we randomly generated 100000 errors (based on the previous error function) following a Monte-Carlo method applied to each model grid cell before integrating the SMB value at the scale of the whole basin:

```
do l=1,100000 ! Monte-Carlo
  call random (r) ! r = float between -1 and 1
  do i ; do j    smb(i,j) = smb(i,j) + r * error(smb(i,j))
  integrated_value(l)=integrated_value(l)+smb(i,j)
```

3. The uncertainties in the CSV files are estimated as the standard deviation of these 100000 basin-integrated SMB values.

```
uncertainty=std(integrated_value)
```

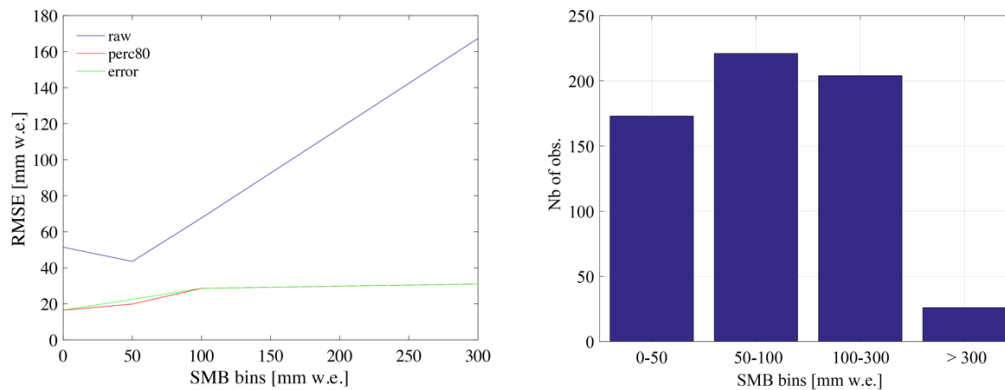


Fig. 1 – (Left) Root mean square error by SMB bins using all available observations (blue curve), 80% of the observations best matching with the model (red curve), and linear fit (green) used in the uncertainty determination. (Right) Number of observations per SMB bins.

Favier, V., Agosta, C., Parouty, S., Durand, G., Delaygue, G., Gallée, H., Drouet, A.-S., Trouvilliez, A., and Krinner, G.: An updated and quality controlled surface mass balance dataset for Antarctica, *The Cryosphere*, 7, 583–597, <https://doi.org/10.5194/tc-7-583-2013>, 2013.

Mottram, R., Hansen, N., Kittel, C., van Wessem, J. M., Agosta, C., Amory, C., Boberg, F., van de Berg, W. J., Fettweis, X., Gossart, A., van Lipzig, N. P. M., van Meijgaard, E., Orr, A., Phillips, T., Webster, S., Simonsen, S. B., and Souverijns, N.: What is the surface mass balance of Antarctica? An intercomparison of regional climate model estimates, *The Cryosphere*, 15, 3751–3784, <https://doi.org/10.5194/tc-15-3751-2021>, 2021.

Wang, Y., Ding, M., van Wessem, J. M., Schlosser, E., Altnau, S., van den Broeke, M. R., Lenaerts, J. T., Thomas, E. R., Isaksson, E., Wang, J., and Sun, W.: A comparison of Antarctic Ice Sheet surface mass balance from atmospheric climate models and in situ observations, *J. Climate*, 29, 5317–5337, <https://doi.org/10.1175/JCLI-D-15-0642.1>, 2016.