Supporting Information
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**Fig. S1.** Relative loss of precipitation at the daily scale as a function of daily precipitation intensity as measured by the MRR radar and simulated with the ECMWF IFS model over the year of interest (November of 2015 to October of 2016). Relative loss at the daily scale is the difference between the maximum accumulation of precipitation over the vertical column and the near-ground accumulation normalized by the maximum accumulation. The solid lines correspond to median values, and the shaded areas correspond to the interquantile range from 10 to 90%. Statistics are computed over bin sizes of 0.1 mm h$^{-1}$. If fewer than 20 measurements fell into a bin, the bin size was increased by 10% iteratively until it contained at least 20. We can observe that events of higher intensity are relatively less affected by low-level sublimation.

**Fig. S2.** Cross-section of 1-y (November of 2015 to October of 2016) cumulative snowfall obtained with the ECMWF IFS model. The section crosses the location of the DDU station (66.6628° S, 140.0014° E), and it is drawn approximately in the direction of maximum slope toward the Antarctic plateau. This figure is a 2D representation of what is shown in Fig. 2. Close to the margin of the ice sheet, maximum accumulation does not occur at near-ground heights. Fig. 3 illustrates the mechanism leading to this vertical structure.
Fig. S3. Map of 1-y mean wind speed in Antarctica from the ECMWF IFS model. Highlighted on the map are the locations of 12 scientific stations where atmospheric balloon soundings are conducted daily. The blue number close to the acronym of each station indicates the value of sublimation ratio as in Fig. 4C. For the DDU station, in red, the estimate of sublimation ratio from MRR measurements down to 300 m above ground is also shown. A separate panel for each of the locations shows the statistics corresponding to 10 y of data of relative humidity with respect to ice as a function of height above sea level. The statistics are conditioned on precipitation occurrence based on the ERA-Interim reanalysis. The solid black lines indicate median values, the red shaded area indicates the interquantile range from 25 to 75%, and the blue shaded area indicates the interquantile range from 10 to 90%. Statistics are computed for each bin of 0.1 km, and at least 100 measurements are contained in each bin.
Fig. S4. Quantification of the expected bias in satellite-based estimates as a consequence of the satellite blind range only for a 1-y period (November of 2015 to October of 2016). The bias is calculated using ECMWF IFS data, and it is defined as the difference between cumulative snowfall at the blind range minus the cumulative snowfall reaching the ground (normalized by the ground value). (A) Blind range of 800 m. (B) Blind range of 1,200 m.

Fig. S5. Height of the maximum cumulative snowfall over continental Antarctica using ECMWF IFS model data over the year from November of 2015 to October of 2016. This height is defined as the height where the curve in Fig. 2 reaches its maximum.