

Interactive comment on “Three-year monitoring of stable isotopes of precipitation at Concordia Station, East Antarctica” by Barbara Stenni et al.

Anonymous Referee #1

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The manuscript summarizes data on isotopic composition of snow precipitation collected on daily basis in central Antarctica during 3 complete years. The collected data are unique, there are very few datasets like this for central Antarctica. The isotopic content data are interpreted in terms of air temperature using AWS temperature observations, as well as GCM modeling. The results raise many questions concerning the isotope-temperature relationships and, in general, the factors that form the isotopic composition of precipitation. I believe these questions will be addressed in future papers. The results of this study, combined with the ongoing studies of isotopic composition of atmospheric water vapor and post-depositional processes in snow, will contribute a lot to understanding the deep ice core isotopic composition data.

Specific comments:

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page 5, line 28 and page 6, line 1: please indicate, what was the sampling frequency before end of 2007.

page 6, line 11: or supersaturated air mass?

page 8, lines 13-14: should average slope (0.35) be between summer (0.51) and winter (0.39) slopes?

page 9, line 18: do these precipitation amounts account for the hoar frost?

page 9, line 24: I cannot see the number of snowfall events in Figure 3.

page 9, line 31: it's better to use the same units for precipitation and accumulation, for example, mm w.e.

page 10, lines 5-7: I did not understand well this part of text. Annual sums of sublimation are 1.4, 0.16 and 1.4 mm, right? Sublimation occurs in summer, and summer sublimation is 3 mm, right? Then the difference between summer sublimation (3 mm) and total annual sublimation (e.g., 1.4 mm) is due to partial re-deposition of moisture during the winter months?

The same place: when you write "sublimation = -3 mm" for me it means that the water vapor is re-sublimated on the snow surface, since negative sublimation = re-sublimation or deposition.

Concerning difference between measured precipitation amount and accumulation: can it be due to underestimation of the hoar frost deposition that is likely an important contributor to mass balance at Dome C?

page 11, lines 26-30: do you have the data on snow surface temperature to compare with the hoar isotopic composition? For the hoar, condensation temperature should be close to snow surface temperature (or air temperature just above the snow) that may be significantly lower than the T2m.

Table 1: at Vostok, temperature was obtained not at AWS, but from the "classical"

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manned meteorological station by manual measurements.

Table 24: first 3 lines show isotope-T2m slopes, while lines 4-6 show slope of isotopes versus inversion temperature. Thus in lines 1-3 the slope values are smaller, because the amplitude of T2m variability is much larger than that of the inversion temperature. But why value in line 2 is almost the same as in line 5?

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