Systematic underestimation of snow accumulation rate by stake measurements in central Antarctica

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We demonstrate that the accumulation-stake measurements in central Antarctica systematically underestimate the value of the snow build-up due to the compaction of snow layer between the stake base and the snow surface. We have developed two methods to define the corresponding correction to the snow build-up measurements at the stake farm near Vostok station. The first method is based on "Sorge's law" to calculate the rate of thinning of the snow layers using the vertical snow density profile. The second method consists of direct instrumental measurements of this thinning in the field. We have also involved the data of other two independent methods to estimate the snow accumulation rate in the vicinity of Vostok - first, geodetic data on the rate of snow layer sinking and, second, glaciological data from snow pits. The most reliable estimate of the snow accumulation rate in this region is $2.26\pm0.10$ g cm$^{-2}$ year$^{-1}$, that is $8\pm4$ % higher than initial (not corrected) value from the accumulation-stake measurements.