Comment on "Ice Particle Concentration in Clouds"

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It appears worth questioning the accuracy of the "ice enhancement ratios" reported by Hobbs and Rangno (1985) in Tables 1, 2 and 3 of their article entitled, "Ice Particle Concentrations in Clouds." It seems doubtful whether the precision with which these results are presented can be justified. Even if it is granted that the numerator of the ratio, the measured ice crystal concentration, is free from error, it is questionable whether the denominator, the concentration of ice-forming nuclei calculated from Fletcher's empirical equation (1962), provides anything approaching a reliable measure of the concentration of ice-forming nuclei that were actually present in the clouds investigated.

As has been noted in a recent study of ice nuclei concentrations (Bowdle et al., 1985) "IN concentrations can vary markedly during the course of a day, from day to day, and cyclically over periods of days to weeks." This variability is evident from the wide latitude that exists in the choice of values for parameters β and n_0 in Fletcher's equation, $n(\Delta T) = n_0 \exp(\beta \Delta T)$, where $n(\Delta T)$ is the number of nuclei active at supercoolings less than ΔT. According to Fletcher, "the usual value of β is about 0.6 with values between 0.4 and 0.8 being common. n_0 is more variable, typically being about 10^{-5} L^{-1} with variations of several orders of magnitude sometimes occurring."

Depending on the values chosen for β and n_0, it can be calculated that at $-20°C$ the ice nuclei concentrations can vary by a factor as large as 10^5. In view of the large uncertainty that exists concerning the ice nuclei concentrations that may have existed at the time of the ice crystal measurements, it is of interest to know if there are circumstances that justify the presentation of some enhancement ratios to as many as two significant digits. It would be useful for the authors to provide some estimate of the probable accuracy of the values they have calculated.

REFERENCES

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