A small note after thinking on this further - a more rigorous way to tie together INP measurements with PMF factors would be to do the factorization excluding the INP measurements, then to calculate correlation coefficients between the factors and the INP measurements. Additionally, you may get different results depending on the INP activation temperature chosen, but correlations could be calculated for several temperatures. I suspect correlations will be limited and of low statistical significance, but this method is at least more robust.

Response: Thank you for your valuable comments. We performed a correlation analysis between the daily contribution percentage of the Factor 1 (mineral dust) and the N_{INP_air} concentration at various freezing temperatures. As shown in Figure R1, positive correlations were observed across all freezing temperatures, with statistically significant correlations in the range of – 11°C to – 19.5 °C. These results further demonstrate that mineral dust plays an important role in contributing to INPs in our study region. The new analyses have been incorporated into the revised manuscript (see revised Figure 3, Figure S3, and the main text).

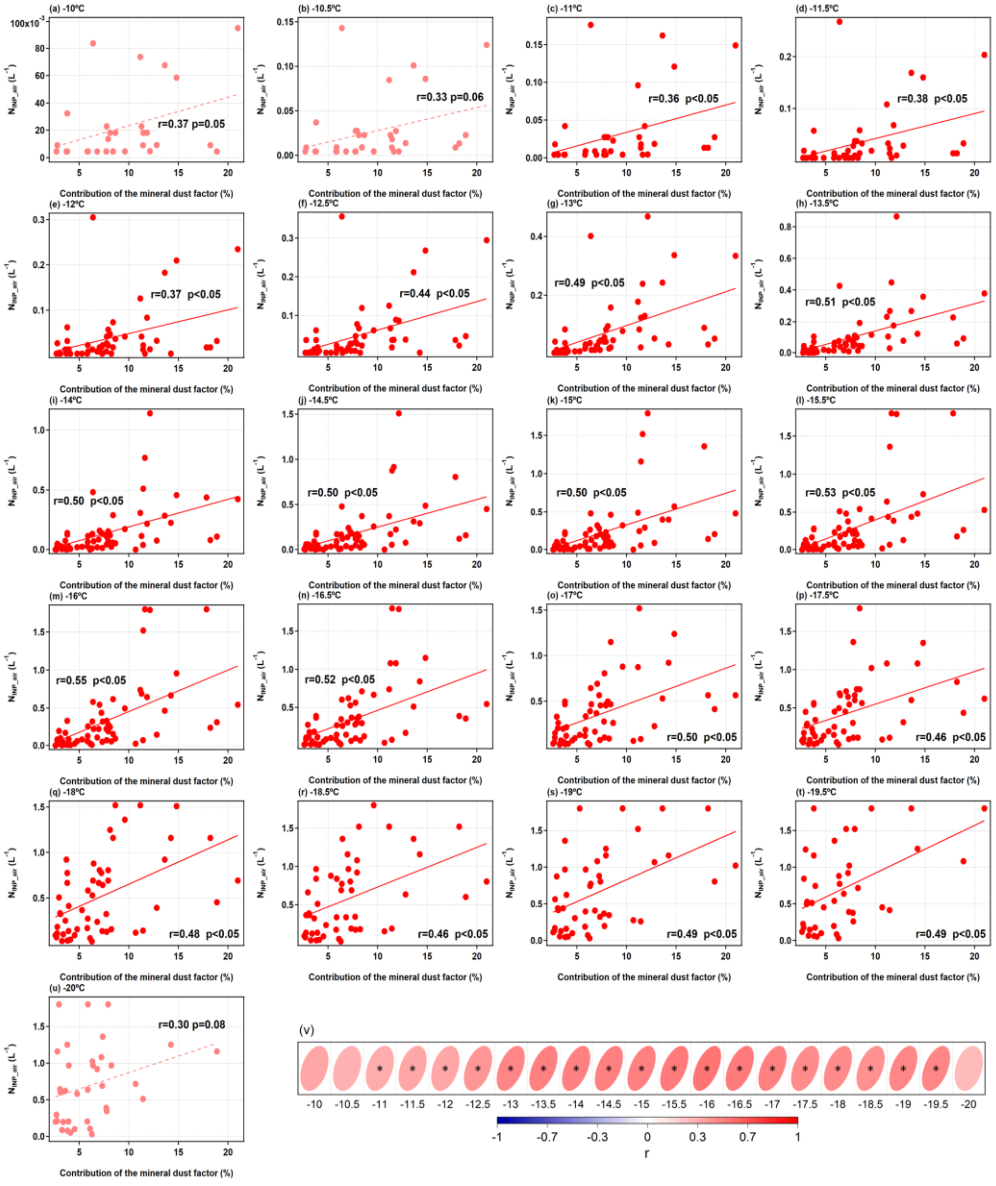

Figure R1 Correlation between daily contribution percentage of Factor 1 (mineral dust) and N_{INP_air} concentration at different freezing temperatures.

The following revisions have been made in the revised manuscript.

Figure 3c illustrates the contributions of the six sources to N_{INP_air}. At a freezing temperature of −16 ℃, mineral dust was the dominant contributor, accounting for 43.6% of N_{INP_air}. This contribution increased markedly to 71.7% in spring, underscoring the dominant role of mineral dust (Figure S12b). To further examine this relationship, we performed a correlation analysis between the daily contribution percentage of the mineral dust factor obtained from PMF model and N_{INP_air} at different freezing temperatures (Figure 3d). The significant positive correlations observed within −11 ℃ to −19.5 ℃ further indicate that mineral dust is a major contributor to INPs.