Figure S1. Summary of the 2-s observations frequency of cirrus origin (in situ, light blue and liquid origin, darker blue) per day during the CIRRUS-HL flights. The frequency is represented by the total number of counts.
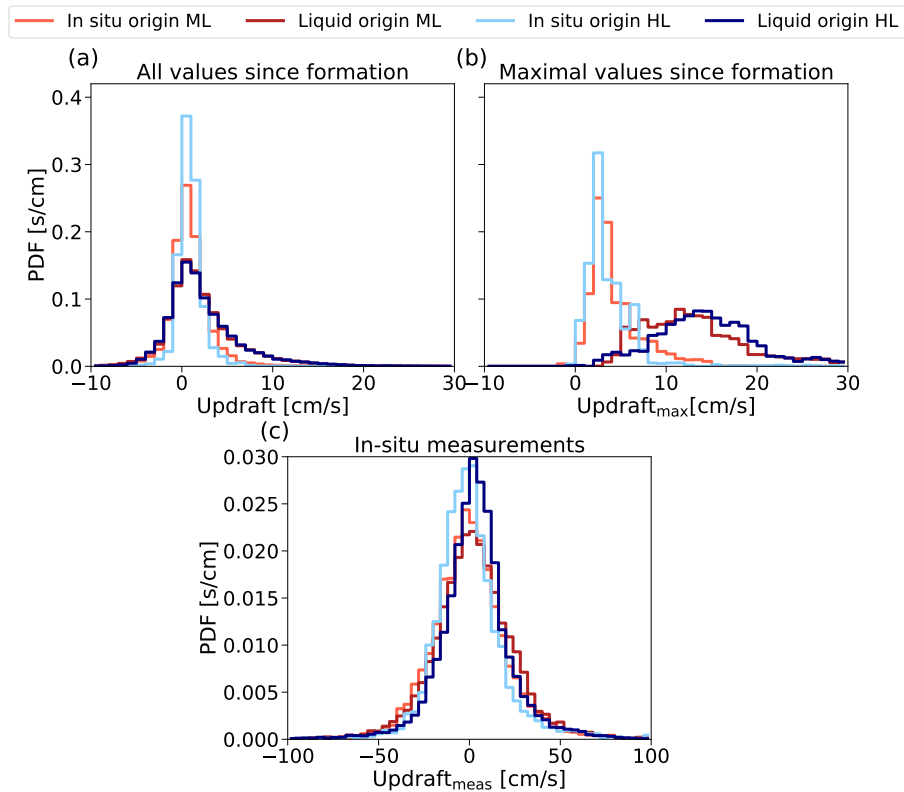
Figure S2. Updraft speed probability distribution functions for in situ ML cirrus (light red), liquid origin ML cirrus (dark red), in situ HL cirrus (light blue) and liquid origin HL cirrus (dark blue). (a) Distribution of all values along the backward trajectories between formation and measurement. (b) Distribution of maximum values along the backward trajectories between formation and measurement. (c) Distribution of the in situ measured updraft speed from the BAHAMAS system. Lower updrafts in (a) and (b) compared to (c) result from the grid point averages of the backward trajectories calculation.
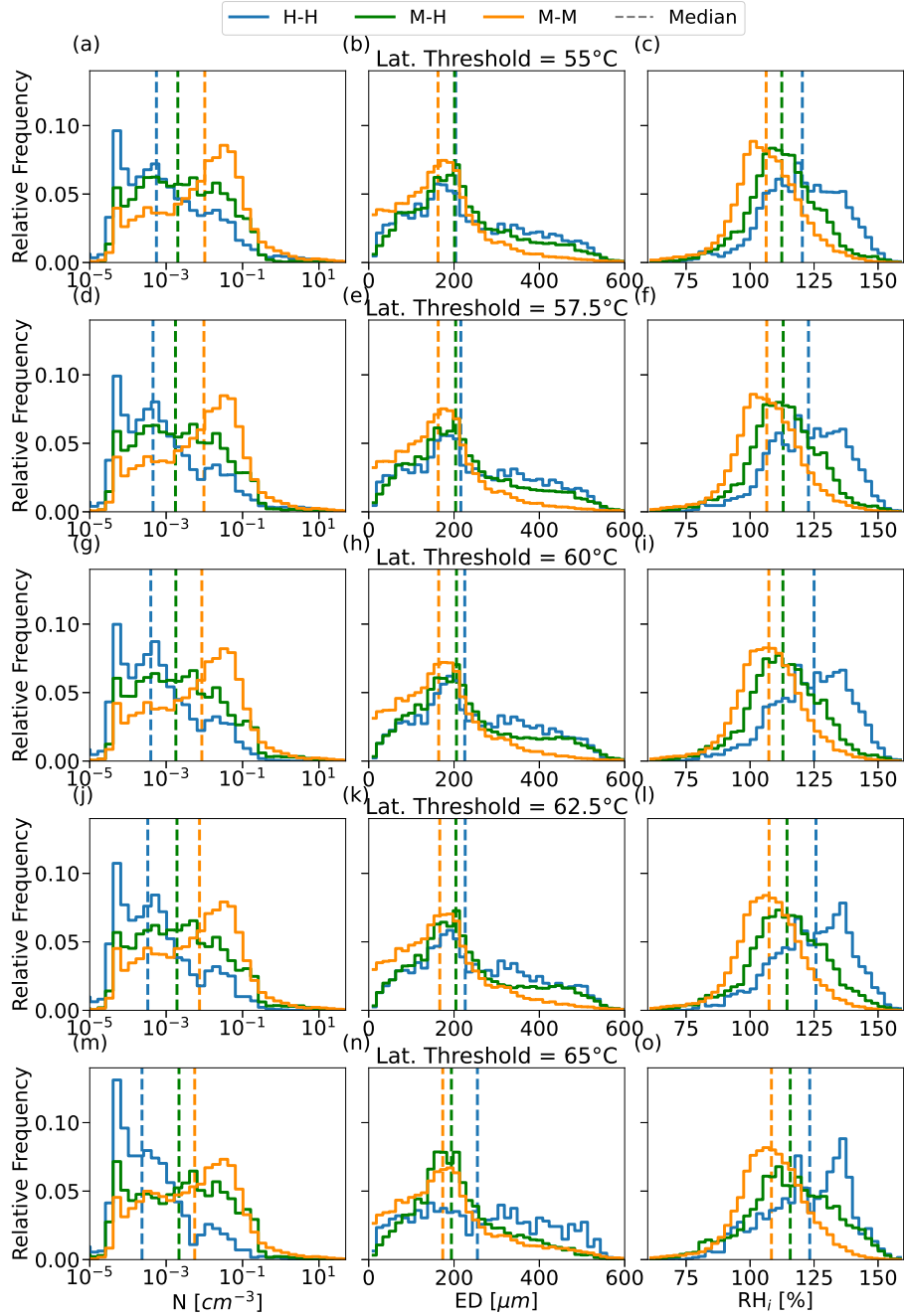
Figure S3. Sensibility study of the latitude threshold selection. The relative frequency of the variables N (left-hand side), ED (center) and RH$_i$ (right-hand side) are represented for the H-H cirrus (blue), M-H cirrus (green) and M-M cirrus (orange) depending on the specified latitude threshold: 55, 57.5, 60, 62.5 and 65 °N. See Fig. 6 in the main text for further details on the relative frequency distributions.