An analysis of a flight of in situ observations of a deep cloud system over Sichuan Basin, Southwest China is presented to discuss why the deep cloud system does not form any precipitation. Using PMS probes and a hot-wire LWC sensor, the distribution of particle size and number concentration as well as characterized particle spectra are analyzed. The results show that the cloud system is a Cirrostratus-Altostratus2-Altostratus1-Stratocumulus2-Stratocumulus1 structure with dry layers inside, and only Cirrostratus is cold. The dry layers between cloud layers accelerate falling particles evaporation. The liquid water distributes quite unevenly with height, showing several peak values. The rich water area is in Stratocumulus. The spectral width of particles in Cirrostratus, Altostratus2, Altostratus1, Stratocumulus2, and Stratocumulus1 is respectively 811.5, 24.5, 615.0, 4400.0, and 276.9 micrometer. The particle concentration density scale of Cirrostratus is smallest, and super-cooled water is scarce. The cold cloud process is weak. In Altostratus2, particles are quite small. In Altostratus1, large droplets are lack, precipitation particles form from cloud droplets mainly through condensation growth. In Stratocumulus2, precipitation particles form from cloud droplets through condensation growth and collection growth. However, most of the precipitation particles in Stratocumulus2 are small. These precipitation particles could not pass the dry layer to impact Stratocumulus1. And Stratocumulus1 has not yielded particles larger than 300 micrometer. Thus, the warm cloud process could not form abundant large particles to reach the ground.