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Cloud statistics obtained by LITE, GLAS and CALIPSO missions : focus on high semi-transparent clouds

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One of the important objectives of the current climate research programs is the understanding of the impact of clouds and aerosols on the global radiation budget. They induce various climatic feedbacks that are still not enough known. The spatial heterogeneity of cloud structures significantly contribute to the modulation of the earth energy budget. Moreover, the surface flux distribution in longwave radiation is very sensitive to both the geometrical structures and altitudes of clouds. A better knowledge of the tri-dimensional distribution of cloud layers is then required to improve existing climatic models.The extraction of the data registred by spacebornes backscatter lidar systems, included in the missions LITE (1994, NASA), GLAS (2003-today, NASA), and the in-progress mission CALIPSO (2006-today, NASA&CNES), gives us today insight in the vertical distribution of clouds and aerosols in the atmosphere, and provides new information on variables required for a better understanding of radiative and dynamical processes linked to the climate change problem. However, in the case of lidar systems operated from space, atmospheric backscattered signals present reduced signal to noise ratios as compared to ground-based systems, and a specific processing needs to be applied to retrieved cloud parameters. In this work, we have applied and adapted an algorithm developed to assess the probability density function of cloud layers top heights from the three spaceborne lidar databases. Morever, the spaceborne lidar is the only one instrument available to give us a real statistic of high semi-transparents clouds, such as cirrus. The distribution and the radiative impact of this latter are not well-known. Thus, we focus our study on this particular cloud type, and compare the retrieved cloud statistics obtained from both lidar and onboard passive satellite instruments.