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Decadal cirrus climatology with lidar at midlatitude

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High-altitude clouds, like cirrus, have been identified as one important regulator of the radiance balance of the earth-atmosphere system (Twomey, 1991), and constitute about 30% of the earth's surface cover (Liou, 1986). Through radiation effects, these clouds are likely to modulate climate system on all scales and are important regulators of the radiative balance of the atmosphere despite their optical depth (Liou et al., 2002). Currently, role of cirrus clouds in the regulation of water vapor as well as the vertical transport of water vapor and ice particles in the vicinity of the tropopause is not perfectly known (Corti et al., 2008). The processes involved are debated (Kiemle et al., 2008) and different formation processes could lead to different cloud characteristics that require to be identified before specific statistical analysis (Keckhut et al., 2006). Lidar measurements provide accurate information on the vertical distribution of cirrus and, therefore, are now used to develop highly resolved cirrus database. A first climatology of cirrus clouds at Midlatitude from lidar measurements has shown cirrus clouds were observed in half of the time ($\sim$54%) with subvisible cirrus clouds (SVC) events composing $\sim$23% of the occurrence (Goldfarb et al., 2001). However no distinction according the altitude have been investigated although altitude range and vertical extension of cirrus clouds are critical parameters for the radiative balance of the atmosphere. In a more recent study, a statistical multivariate analysis of one year lidar data acquired in south of France have been realized in order to determine distinct classes of cirrus showing three different classes (Keckhut et al. 2006). Similar results according the classification have been observed in this present study based on a climatology constructed over the period 1996-2007 using a high resolution Rayleigh-Mie-Raman lidar. As the database is long enough, the evolution of cirrus clouds occurrence has also been investigated, and showed different evolution for each cirrus cloud class.