

## Supplemental Information

Table SI-1 Latitude and longitude ranges of the 10 selected regions in China. R1 is referred to Taklimakan desert area; R2, Gobi sand and Loess Plateau areas; R3, the Capital economic circle; R4, Northeast China; R5, Tibet Plateau; R6, Sichuan Basin; R7, Yangtze River Delta; R8, Yunnan-Guizhou Plateau; R9, mainly Pearl River Delta economic region; and R10, East China Sea.

Region	Latitude range from	Latitude range to	Longitude range from	Longitude range To
R1	36.0° N	41.5° N	77.0° E	89.0° E
R2	36.0° N	41.5° N	99.0° E	109.0° E
R3	36.0° N	41.5° N	109.0° E	119.0° E
R4	41.5° N	50.0° N	118.5° E	130.5° E
R5	29.0° N	34.5° N	82.0° E	97.0° E
R6	29.0° N	34.5° N	99.0° E	109.0° E
R7	29.0° N	34.5° N	109.0° E	119.0° E
R8	22.5° N	28.0° N	99.0° E	109.0° E
R9	22.5° N	28.0° N	109.0° E	119.0° E
R10	29.0° N	34.5° N	122.0° E	130.5° E

Table SI-2 Number of pixels of the AECs during the four seasons when the CALIPSO satellite passed through the 10 Regions.

Region	Spring	Summer	Autumn	Winter
R1	403192	528396	414433	227911
R2	267168	309033	254247	194017
R3	276919	323599	259247	227668
R4	420115	496718	404692	267193
R5	165186	98448	69807	74763
R6	166374	220261	129207	145515
R7	244517	276555	206722	301389
R8	159542	176001	139817	135968
R9	164828	240471	227469	211692
R10	239463	247813	211968	189055

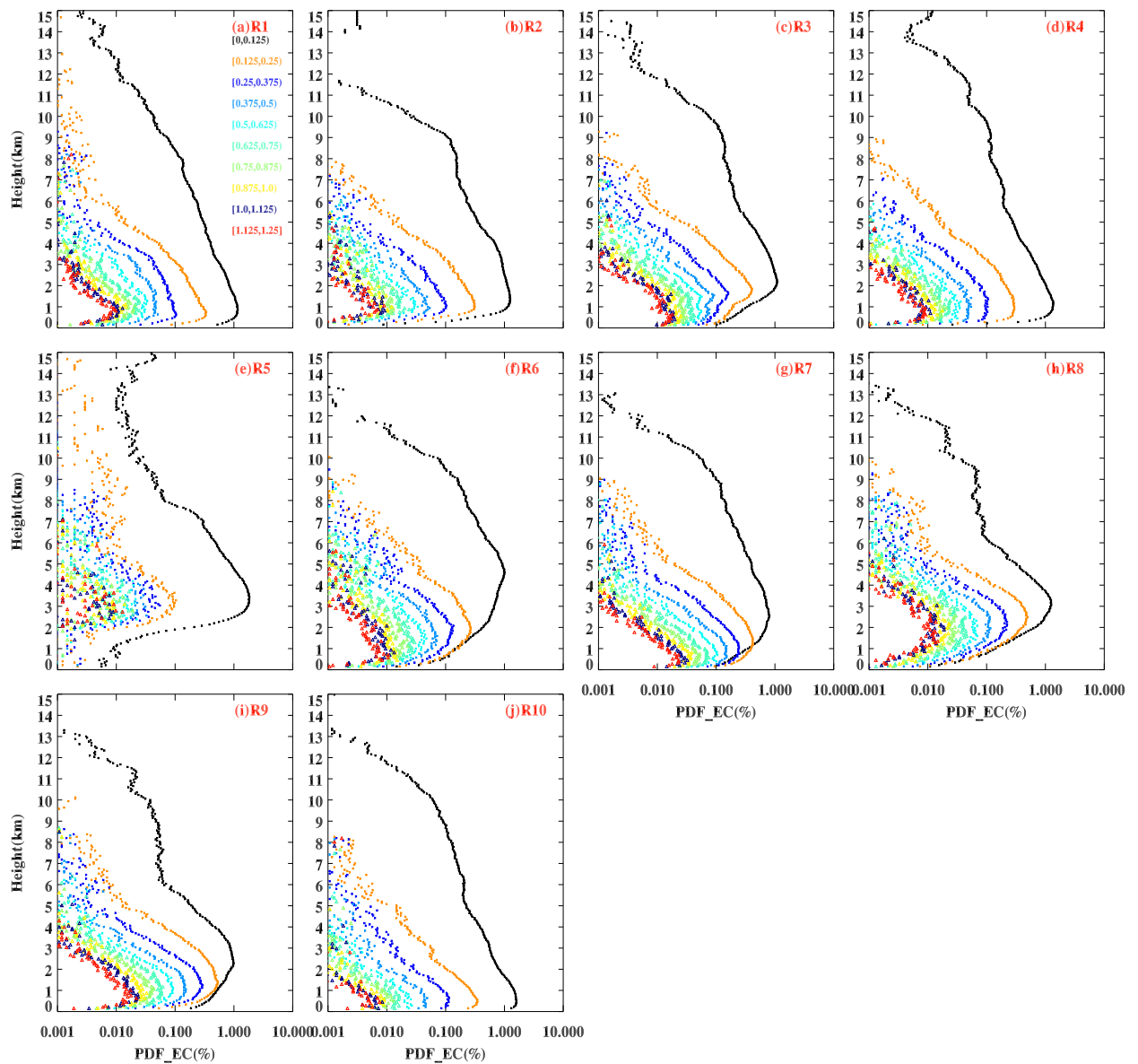


Figure SI-1 Annual profiles of Probability in the 10 AEC sub-ranges in the 10 regions, the sub-range from first to tenth is  $0-0.125 \text{ km}^{-1}$ ,  $0.125-0.25 \text{ km}^{-1}$ ,  $0.25-0.375 \text{ km}^{-1}$ ,  $0.375-0.5 \text{ km}^{-1}$ ,  $0.5-0.625 \text{ km}^{-1}$ ,  $0.625-0.75 \text{ km}^{-1}$ ,  $0.75-0.875 \text{ km}^{-1}$ ,  $0.875-1.0 \text{ km}^{-1}$ ,  $1.0-1.125 \text{ km}^{-1}$  and  $1.125-1.25 \text{ km}^{-1}$ .

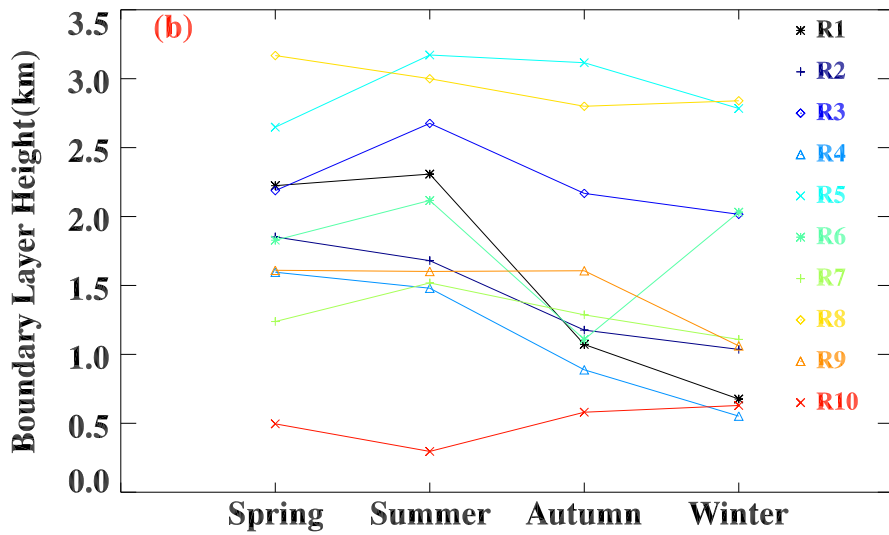
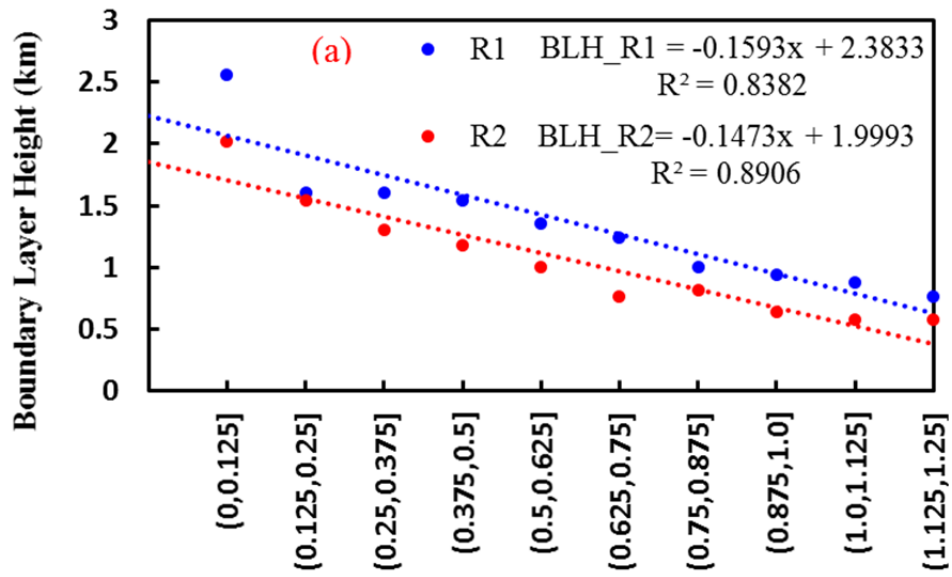


Figure SI-2 (a) Boundary layer height (BLH) for the 10 AEC intervals (0-0.125, 0.125-0.25, and so on to the tenth interval of 1.125-1.25 km<sup>-1</sup>) in R1 and R2 in spring as an example to determine the maximum BLH based on the linear regression between BLH and AEC interval; and (b) the maximum BLH in spring, summer, autumn and winter in the 10 regions.

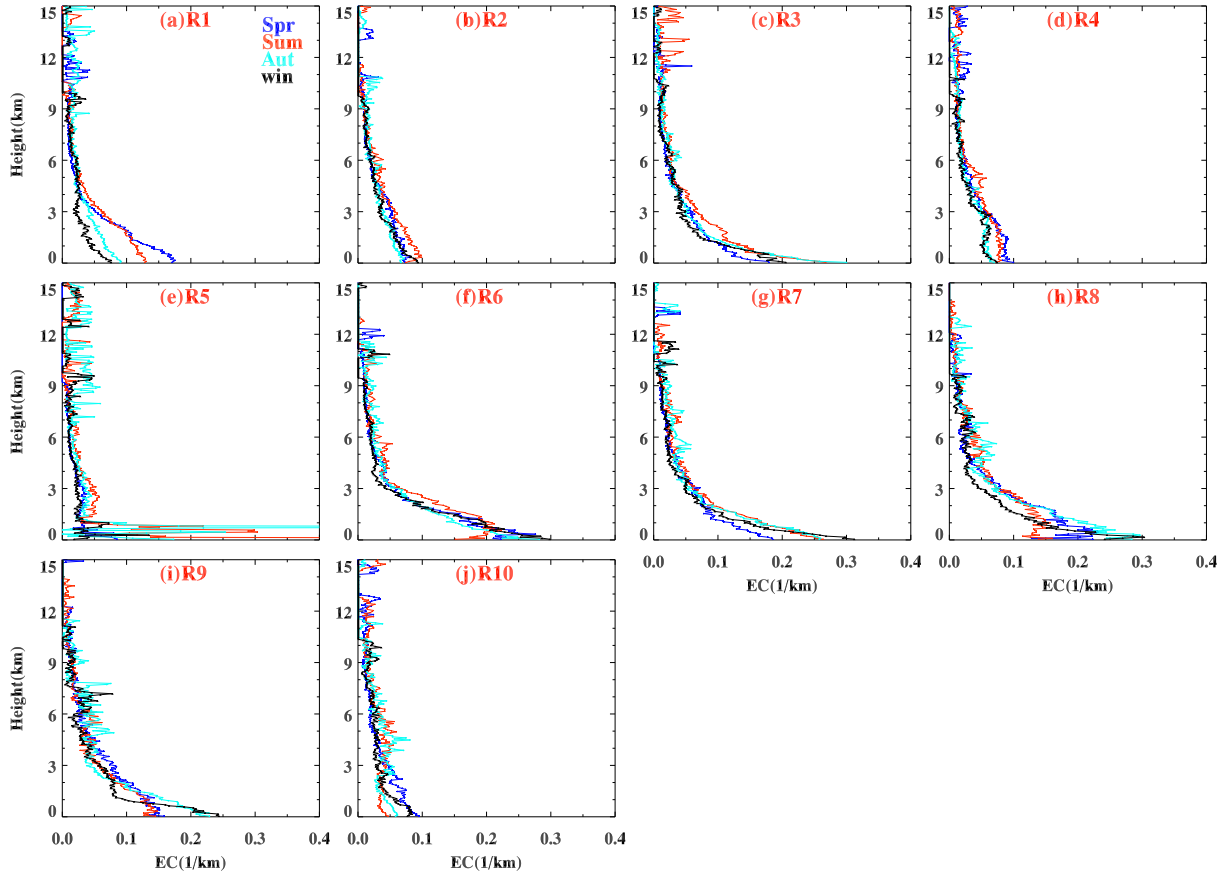


Figure SI-3 CALIPSO vertical profiles of AEC in the 10 regions. The blue, red, light blue and black line represents for spring, summer, autumn and winter, respectively.