

Variations of the meteor echo heights at middle latitudes

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Detecting the changing of the upper atmosphere is an important and challenging issue. The change in the meteor peak height observed by a meteor radar should contain information of the neutral density in the meteoroid ablation region. In this work, observations from the VHF all-sky meteor radars operated at Beijing (40.3 °N, 116.2° E) and Mohe (53.5 °N, 122.3° E), China, are collected to explore the temporal patterns of the meteor peak heights. The daily meteor peak height is determined through a least-squares fitting of the height profile of meteor radar echoes under a normal distribution assumption. There are considerable seasonal variations in the meteor peak height, being dominated by an annual component at Beijing and a semi-annual one at Mohe. The seasonal oscillation is partly captured by the empirical models of the neutral atmosphere. Moreover, the Ensemble Empirical Mode Decomposition (EEMD) is employed to determine the overall trends in the series of the meteor peak heights. The EEMD analysis reveals an overall decrease in the meteor peak heights at both stations, indicating the descending trend in neutral density near 90 km altitude at middle latitudes. The meteor peak heights show a rather weak solar activity effect at Beijing, which is different from the positive effects reported at some other sites.