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Radar imaging of meteor echoes using VHF atmospheric radar

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High-power-large-aperture (HPLA) VHF radars at the lower frequency band around 50 MHz have been employed to observe the atmosphere for several decades, which can collect not only the echoes from clear-air turbulence in the neutral atmosphere and plasma irregularities in the ionosphere, but also the returns from aircrafts, meteors, precipitation, and so on. In this study, we examined the meteor echoes collected by the middle and upper (MU) atmosphere radar, operated by Research Institute for Sustainable Humanosphere, Kyoto University, Japan. Twenty receivers and five frequencies (46.25, 46.375, 46.5, 46.625, 46.75 MHz) were utilized in observation. With multi-channel echoes, angular and range distributions of the meteor heads and long-duration trails in the radar volume have been resolved by using adaptive constrained methods such as the Capon method and its modified version, the so-called norm-constrained Capon method. Some results will be shown. For example, fragmentation of the meteoroid can be disclosed from the range imaging of the long-duration trail echoes, angular imaging can make an identification of multiple echo centers that could be associated with meteoric fragmentation.