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Mesospheric temperatures estimated from the meteor radar observations at Mohe, China

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In this work, we report the estimation of mesospheric temperatures at 90 km height from the observations of the VHF all-sky meteor radar operated at Mohe (53.5 °N, 122.3° E), China, since August 2011. The kinetic temperature profiles retrieved from the observations of Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) onboard the Thermosphere, Ionosphere, Mesosphere, Energetics, and Dynamics (TIMED) satellite are processed to provide the temperature (TSABER) and temperature gradient (dT/dh) at 90 km height. Based on the SABER temperature profile data an empirical dT/dh model is developed for the Mohe latitude. First, we derive the temperatures from the meteor decay times (Tmeteor) and the Mohe dT/dh model gives prior information of temperature gradients. Secondly, the full-width of half maximum (FWHM) of the meteor height profiles is calculated and further used to deduce the temperatures (TFWHM) based on the strong linear relationship between FWHM and TSABER. The temperatures at 90 km deduced from the decay times (Tmeteor) and from the meteor height distributions (TFWHM) at Mohe are validated/calibrated with TSABER. The temperatures present a considerable annual variation, being maximum in winter and minimum in summer. Harmonic analyses reveal that the temperatures have an annual variation consistent with TSABER. Our work suggests that the FWHM has a good performance in routine estimation of the temperatures. It should be pointed out that the slope of FWHM and TSABER is 10.1 at Mohe, which is different from that of 15.71 at King Sejong (62.2° S, 58.8° E) station.

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