

Summer E-Region Doppler Spectral Bands Detected Using HF Digisonde and MF Radar at High Southern Latitudes

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Abstract

This paper presents new observations of Bragg scatter events in the high-latitude E-region ionosphere using HF digisonde and MF radar. The digisonde transmitted in a swept-frequency mode from 1.2 to 2.7 MHz while the MF radar transmitted at a single frequency at 1.94 MHz. The two independent instruments were programmed to record E-region backscatter. Results from spectral signal analyses show evidence of Doppler spectral bands in the respective HF digisonde and MF radar data. The backscattered signals observed from these different radar techniques at two Antarctic stations appear to originate from the same E-region heights. Moreover there is a remarkable tendency for such spectral bands to occur during intervals of ionosphere slant Es condition (SEC) with lacuna. Independent MF radar observations from Davis (78.0°E, 68.6°S geographic, 74.6°S magnetic) during 2001 and 2003, and HF digisonde observations from Casey (66.3°E, 110.5°S geographic, 80.4°S magnetic) during 1996, are presented. The instrumentation used at the Australian Antarctic stations and in this study is briefly discussed. The plausibility of these spectral band events being related to E-region ionosphere plasma instability processes will be discussed.