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## Isolated lower mesospheric echoes seen by medium frequency radar at 70° N, 19° E

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**Abstract.** We have noted sporadic instances of strong isolated reflections of medium frequency (MF) radar waves from the mesosphere from as low as 50 km altitude and have devised a set of criteria for isolating these apparently anomalous echoes from those normally occurring from progressive partial reflections in the D-region. The object of this study is to map the occurrences of such echoes facilitating comparisons with other observations. For example, the similarity and simultaneity of the echo structure for the 20 January 2005 with VHF radar results presented by Lübken et al. (2006) are particularly striking. In presenting a number of such echo events since 2001 selected from the MF radar dataset (which spans 1997 to present), we find that virtually all echo occurrences coincide with enhanced solar proton fluxes suggesting that substantial ionisation of the mesosphere is a necessary condition. Strong partial reflections of the radio wave in the lower mesosphere combined with seasonally varying total absorption higher up, thus giving false impressions of lower mesospheric layers preferentially in winter, constitute a scenario consistent with our observations.

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