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Ionospheric 2-6 min waves observed by the two-frequency multipoint Doppler sounder in Central Europe in November 2012

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Ionospheric Doppler type sounding can be used for observations of wave activity at ionospheric heights down to periods of tens of seconds. Multifrequency multipoint sounding enables to study propagation of waves in vertical as well as in horizontal direction. Since October 2012, sounding frequencies 3.59 MHz and 4.27 MHz have been used on three sounding paths of the Doppler sounder installed in the Czech Republic.
Wave activity with periods between 2-6 min was observed in ionospheric F region on 6 November 2012 between 00:00 and 04:00 UT (LT=UT+1h). The wave forms were observed in the 3.59 MHz Doppler shift spectrogram (height of reflection $\sim$ 250-300 km) and then, with a time delay of 30-45 s, corresponding wave forms were observed in the 4.27 MHz Doppler shift spectrogram (height of reflection $\sim$ 280-330 km). It means in vertical direction, the waves were propagating upwards during the whole studied interval. As for horizontal propagation, we did not find any prevailing direction. We assume that the waves have their origin in lower atmospheric layers below the region of Doppler sounding. A tropospheric weather front can be considered a possible source of the 2-6 min ionospheric waves as time of occurrence of these waves corresponds with the time of passage of a cold front above the Czech Republic.