



Response of parameters of HF signals at the long radio paths on solar activity

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A technique for multiposition Doppler HF sounding of the ionosphere that use the emission of broadcasting radio-stations as probing signals is developed in the Institute of Radio Astronomy of National Academy of Sciences of Ukraine (IRA NASU) during some last decades. At present the Internet-controlled receiving sites designed by IRA NASU are located in Arctic, Scandinavia, Europe, Africa, and Antarctica. The analysis of HF signal propagation on the super long radio paths is one of the major tasks of this network. This paper discusses the results of the analysis of signal propagation from Europe and Northern America to Antarctica. The signals of time and frequency services were used as probe because of the excellent stability of their parameters. The radiation of RWM (Moscow, carrier frequencies 4996, 9996, and 14996 kHz) and CHU (Ottawa, frequencies 3330, and 7850 kHz) stations are recorded round-the-clock at the Ukrainian Antarctic Station (UAS, 65.25S, 64.27W) *Akademik Vernadsky* since 2010. Time and spectral analysis of the RWM pulse signals allowed to detect experimentally four different pathways: the direct and reverse paths lying on the great circle, and trajectories outside the great circle formed by focusing along the solar terminator and scattering on the ionospheric irregularities of auroral ovals. For the last spatial mode it is possible to estimate the location of equatorial boundary of auroral oval and one projection of plasma drift velocities. An impact of solar activity on super long HF propagation is demonstrated by comparison of monthly averaged spectrograms corresponded to different years. The example presented at figure 1 demonstrates that, the spectrograms of the signals which propagated under the various conditions (Septembers of 2010 and 2011 are characterized by mean F10.7 = 81.1, Amp = 8.8, and F10.7 = 134.5, Amp = 19.3. respectively) are quite different. Various spatial modes demonstrate the different reactions on solar activity. The variations could be explained by different intensity and location of plasma turbulence associated with polar ovals, gradients of plasma parameters along the solar terminator, critical frequencies and absorption. These mechanisms will be discussed within the presentation.

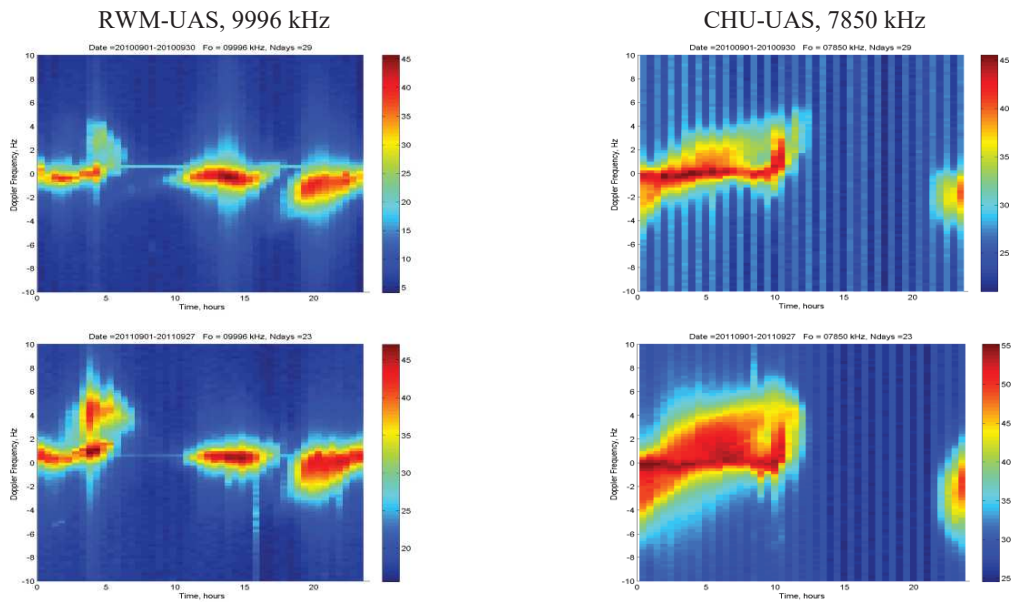


Figure 1. Monthly averaged daily Doppler spectrograms of RWM 9996 kHz (left) and CHU 7850 kHz (right) signals received at UAS *Akademik Vernadsky* in September, 2010 (top) and September, 2011 (bottom).