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Observations of the spectral resonance structures in the range of 0.1-5 Hz in Barentsburg on Svalbard

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Spectra of the electromagnetic noise in the range of 0.1-5 Hz registered on the ground sometimes demonstrate a clear resonance structure that, as assumed, is the signature of the Ionospheric Alfven Resonator (IAR) existing in the upper ionosphere around the F-region maximum. The spectral resonance structures (SRS) have been investigated by several research groups on the basis of observations at several ground stations situated between L=1.4 and L=5.2. In particular, it has been shown that the SRS occurrence is strongly controlled by the solar illumination of the ionosphere above the point of observation. The SRS occurrence increases in the dark time and decreases in sunlight. Since 2002 the Polar Geophysical Institute is carrying out the observations of the magnetic fluctuations by a sensitive search-coil magnetometer in observatory Barentsburg on Svalbard (L=15). The analysis of the magnetometer data shows that SRS can be observed at such high latitude as well. The diurnal, seasonal, and long-term behavior of the SRS occurrence is revealed, which demonstrates both similarity and difference with SRS properties at lower latitudes. The modeling of SRS on the basis the IAR theory and the local EISCAT Svalbard radar ionospheric model is performed. The comparison of the model results with observations shows that in Barentsburg, in contrast to the lower latitudes, the illumination of the ionosphere is not the main factor determining the SRS occurrence. We conclude that the main factor here is the unsteadiness of ionospheric parameters due to variability of particle precipitation and currents. On the dayside the enhanced variability is the reason for disappearance of SRS near the cusp. On the night side such variability is expected when the substorm-related ionospheric disturbance propagating from auroral zone toward the pole approaches the point of observation. Indeed, we found that SRS disappear when the substorm aurora and electrojet are as close to the point of observation as 100-150 km. We conclude that this distance is the horizontal scale of the SRS source. Such localization of the SRS source

agrees with the IAR concept.