HF RADIO PROPAGATION AT HIGH LATITUDES: OBSERVATIONS AND PREDICTIONS FOR QUIET AND DISTURBED CONDITIONS

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High-frequency (HF) radio communications at high latitudes are greatly affected by geomagnetic and ionospheric conditions, and both civilian and military users need reliable forecasts of the propagation environment. In recent years, a network of channel sounders known as DAMSON (Doppler and multipath sounding network) has been operated in Scandinavia (including Svalbard) on a nearly continous basis. We have analysed DAMSON measurements of multipath spread, Doppler shift and spread, and signal-to-noise ratio on four HF paths under both quiet and disturbed geomagnetic conditions. Correlations have been made with data from other ground-based installations in the same geographic region (HF radars, magnetometers, ionosondes). Long signal delays (several ms) are regularly observed during midday at frequencies above the predicted Maximum Usable Frequency (MUF) and could possibly be caused by ground scatter. Large Doppler spreads (tens of Hz) are observed during disturbed conditions (substorms), when the ionospheric reflection point is located within the auroral oval. We suggest that forecasts of the HF multipath and Doppler environment based on sounder measurements could be utilized as additions to the regular HF predictions of e.g., the MUF and LUF of a propagation path.