

Investigation of the auroral hiss propagation conditions from the source to the ground

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Auroral hiss is a whistler-mode radio emission registered on the ground in high latitudes. The frequency spectrum of the auroral hiss has a peak at 8-10 kHz.

The auroral hiss is generated at altitudes of 5-20 thousand km by incoherent Cerenkov radiation from the precipitating electrons. Generated waves become amplified by the Landau resonance mechanism.

The auroral hiss propagates near the whistler-mode resonance cone close to 90 degrees to the geomagnetic field. Since the electric field of the generated waves dominates, the waves are electrostatic.

It is believed that electrostatic waves cannot penetrate to the ground because of the lower hybrid reflection at altitudes of 3-5 thousand km. Waves pass this altitude via scattering by meter-scale field-aligned electron density irregularities. Scattered waves have a wide spatial spectrum. Some of these waves have wave normals within the propagation cone and can reach the ground.

Past studies show that the area on the ground illuminated by the auroral hiss can range from a few tens hundred kilometres to a thousand kilometers. Because of the geometrical spreading small size of the illuminated area cannot be explained by scattering at altitudes of 3-5 thousand km. We investigated conditions for the electrostatic waves to reach the ground and propagation features that explained the observed small-size illuminated areas.