Geophysical Research Abstracts
Vol. 13, EGU2011-1592, 2011
EGU General Assembly 2011
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Generation and escape of the Auroral Kilometric Radiation in thin plasma cavities

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The properties of the electron cyclotron maser instability in thin sources are theoretically investigated within the waveguide model. The general dispersion equation describing the Auroral Kilometric Radiation (AKR) driven by hot electrons moving to the Earth along the magnetic field is obtained. The eigen waveguide modes are found and it is shown that inside a source the wave polarization is strongly coordinate dependent and the electric field component transverse to the source boundary may be significantly greater than the component directed along the boundary. Calculations of wave amplification factor made under assumption of geometric optics have demonstrated that the wave energy could reach high values during the wave propagation inside a source. However, whatever the value of wave energy, there is no possibility of a direct connection between the internal unstable waves and the external X mode waves. It is shown that the time dependent processes, such as wave scattering at the waveguide frontiers in the presence of low frequency fluctuations, could play a key role in the wave escape. The theoretical results have been compared with measurements obtained onboard INTERBALL-2 in the auroral region.
This work was supported by the grant RFBR 10-02-93115.