Cross-field anisotropy of small-scale irregularities as compared with model ionospheric convection

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Recently it was shown that in the F layer high latitude ionosphere a close correlation exists between the anisotropy of subkilometer irregularities and ionospheric convection. In this presentation the orientation of subkilometer irregularities in a plane perpendicular to the geomagnetic field is compared with model calculations of the plasma flow direction. Experimental data on anisotropy of irregularities were obtained in a heating experiment in 1997 at three receiving sites spaced by approximately 100 km from each other in the northern Norway. Ionospheric convection was calculated using Heppner-Maynard-Rich-1989 model.

In a series of cases the cross-field orientation of irregularities was nearly the same at all three sites, which means that the layer of irregularities remains spatially constant within about a hundred-km interval. In these cases the orientation of cross-field anisotropy was close to the calculated direction of the plasma flow. It was found that such measurements fall into the main large-scale convection cells where the direction of the plasma flow remains nearly constant at very large distances.

In several cases the orientation of irregularities was different at three receiving sites. The analysis showed that in these cases the measurements came from the regions of local convection vortices far from the main convection cells. In such turbulent areas the direction of the plasma flow could vary significantly within comparatively small interval.

In some registrations the irregularities were observed during periods of heating the ionosphere. Due to the heating the spatial distribution of such irregularities was rather complicated, e.g., the irregularities could be observed not at all three receiving sites. It was found that the observed location of irregularities could be explained by fast carrying the heated plasma out of the cone of efficient heating in the direction of ionospheric convection.