What can we learn from the quiet high-latitude ionosphere?

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The auroral oval never disappears even for periods of very low geomagnetic activity. This suggests that magnetospheric energies would be more or less supplied to the polar region and cause corresponding disturbances in the ionosphere and thermosphere. The impacts on the upper atmosphere are likely insignificant to modulate in a global scale but quiet-time measurements may give a new insight to investigate mechanisms working in the M-I-T coupled system, which might be masked by many concurring processes during geomagnetically disturbed periods. This study focuses on a couple of features during period of geomagnetically quiet condition with a weak but significant auroral enhancement at relatively high latitudes. One is an ephemeral red arc, which would represent a moment of the stable auroral red (SAR) arc birth coinciding with pseudo breakup. This is the first time ever to capture the moment because initial phase of the typical SAR arc tends to be masked by bright aurorae at the substorm expansion phase. Two is negative $\mathbf{U}.\mathbf{V}$ in the F-region measurement. The thermospheric wind ($\mathbf{U}$) flows after the ionospheric ion velocity ($\mathbf{V}$), and in most cases, $\mathbf{U}$ is approximately parallel to $\mathbf{V}$, i.e., positive $\mathbf{U}.\mathbf{V}$. This is evidence of kinetic energy conversion from ions to neutral particles. However, $\mathbf{U}.\mathbf{V}$ can be negative when $\mathbf{V}$ suddenly changes direction but $\mathbf{U}$ delays due to its inertia. A negative $\mathbf{U}.\mathbf{V}$ results in larger Joule heating than the positive $\mathbf{U}.\mathbf{V}$ case. This presentation will conclude importance of studying geomagnetically quiet condition to figure out fundamental mechanisms, which cause disturbances in the ionosphere and thermosphere also during active periods.

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