DIFFUSE, MONOENERGETIC, AND BROADBAND AURORA: THE GLOBAL PRECIPITATION BUDGET

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We present an auroral precipitation model which distinguishes between the discrete aurora and both the electron and ion diffuse aurora. The discrete aurora includes acceleration by two distinct physical mechanisms, quasi-static electric fields, producing monoenergetic peaks, and dispersive Alfvén waves, producing broadband electron acceleration. It turns out that the diffuse aurora is surprisingly dominant, constituting 83% of the energy flux into the ionosphere during conditions of low solar wind driving (62% e-, 21% ions). The diffuse aurora is far from quiescent, tripling in power dissipation from our low to high solar wind driving conditions. Even under the latter condition, the diffuse aurora contains 75% of the hemispheric energy flux (61% e-, 14% ions).

The monoenergetic aurora contributes more energy flux (13% quiet, 15% active) than does broadband acceleration signatures (5% quiet, 10% active). However the broadband aurora rises fastest with activity, increasing by a factor of 6.6 from low to high driving. Moreover, this most dynamic auroral type contributes very high number fluxes, exceeding even that of monoenergetic aurora under active conditions (23% of hemispheric precipitation versus 19%). Thus dynamic ionospheric heating and ion outflow is likely heavily affected by the wave aurora.

Although energy flux peaks on the nightside, number flux peaks on the dayside. The cusp, as previously reported, is much better defined by ions than electrons. Hence the ion number flux peak is confined, corresponding to the cusp, while the region with high electron number flux is broad (a cleft, corresponding to the boundary layers, including the closed LLBL).

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