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Average auroral configuration parameterized by geomagnetic activity and solar wind conditions

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Average proton and electron auroral images are compiled from three years of observations by the IMAGE spacecraft, binned according to concurrent Kp and upstream solar wind conditions measured by the ACE spacecraft, including solar wind velocity and density and interplanetary magnetic field (IMF) magnitude and orientation. We use the overall variation in brightness in the images with respect to the binning parameters to determine which best order the auroral response. We find that the brightness varies by a factor of 50 with Kp, a similar amount with estimated dayside reconnection voltage, 15 with the IMF, 3 with solar wind density, and 2 with solar wind velocity. Clearly, geomagnetic activity as measured by Kp and auroral dynamics are closely associated. In terms of the solar wind-magnetosphere coupling that drives auroral dynamics, the IMF is of paramount importance in modulating this, with solar wind speed and density playing a lesser role. Dayside reconnection voltage, derived from the solar wind velocity and IMF magnitude and orientation, orders the data almost as well as Kp, though we find a plateau in the auroral response between voltages of 100 and 150 kV.