# Alfvén Wave Energy Flow into the Polar Region

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Earth's aurora occurs statistically and often simultaneously in an oval-shaped belt around the magnetic poles. Magnetic field lines connect this auroral oval to the magnetosphere. The dayside and nightside auroras are associated with different magnetospheric phenomena. The nightside aurora is the result of the sudden release (over the time period of tens of minutes to hours) of large amounts of energy, which is periodically extracted from the solar wind and stored in the magnetic field of the magnetotail. Through a sequence of energy transfer processes, a large fraction of this energy is transported to the auroral acceleration region (located at an altitude of 5000 to 15000 km above the polar regions), where electron energization processes occur to create the intense electron beams that cause the aurora. In contrast, the dayside aurora is connected to the cusp region and is driven by other, yet uncertain mechanisms. In either case, the aurora is powered by energy flow along the magnetic field lines. It is now established that Alfvén waves are major contributors to this energy flow, and that the ionosphere and the magnetosphere are electrodynamically coupled via Alfvén waves over the entire auroral region.

In this presentation, we contrast the global contribution of Alfvén waves under two geomagnetic conditions, substorms and storms. Both are periods of intense energy redistribution in the magnetosphere. It will become apparent that there are significant differences in the global morphology and intensity of Alfvén waves. The data for this study were collected from NASA's Polar spacecraft over the course of six years. Polar's orbit was well suited to monitor the waves over the entire polar region as they are funneled from the distant regions into the polar ionosphere.