Solar wind whips up auroral storms on Jupiter and Saturn

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Studies of Jupiter's auroras by scientists from the University of Leicester have challenged current theories about the processes controlling the biggest light-shows in the Solar System.

The scientists compared a series of ultraviolet images of Jupiter's auroras taken by the Hubble Space Telescope with simultaneous measurements taken by Cassini showing conditions in the solar wind as the spacecraft flew past the giant planet in December 2000 - January 2001. They found that there was a strong correlation between the strength of the solar wind and the behaviour of the aurora that occurred towards the planet's poles.

Until now, scientists had believed that Jovian auroras were caused by the planet's rapid spin and a stream of material emitted from the volcanic moon Io at the rate of one tonne per second.

“The argument is certainly not cut and dried”, said Dr Jonathan Nichols, who is presenting the results today at the Royal Astronomical Society’s National Astronomy Meeting. “Previous work by our group has shown that Jupiter's main auroral oval is not caused by the same type of processes that cause the Northern Lights on Earth. However, this new study shows that the auroras located polewards of the main ovals are directly linked to the strength with which the solar wind is blowing, which means that Earth-like processes are causing these polar auroras. Surprisingly, we’ve also found that the main oval also shows a direct correlation to solar wind strength, which is completely the opposite result to the one we were expecting from our predictions.”

The results indicate that substantial energy is transferred from the solar wind to the planet and this may account for the puzzle as to why Jupiter is significantly warmer than it 'should' be. The new findings may affect theories surrounding other aspects of the Jovian magnetosphere, such as the mechanism by which the plasma originating from Io is lost from the system and determining the length of Jupiter's huge comet-like magnetic tail.

In the same session, Sarah Badman will be presenting results of a study of Saturn’s auroras carried out over three weeks in January 2004. This study also combined images taken by the Hubble Space Telescope with measurements of the solar wind recorded by Cassini as it approached the ringed planet. Miss Badman collated all available images of Saturn's aurora and determined, for the first time, the most common shape and position of the aurora, as well as the occurrence of more unusual features. Her findings corroborate the theory that Saturn's auroras are caused by the explosive release of solar wind energy that is built up and

stored in the planet's magnetic field.

Source: Royal Astronomical Society