



# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*

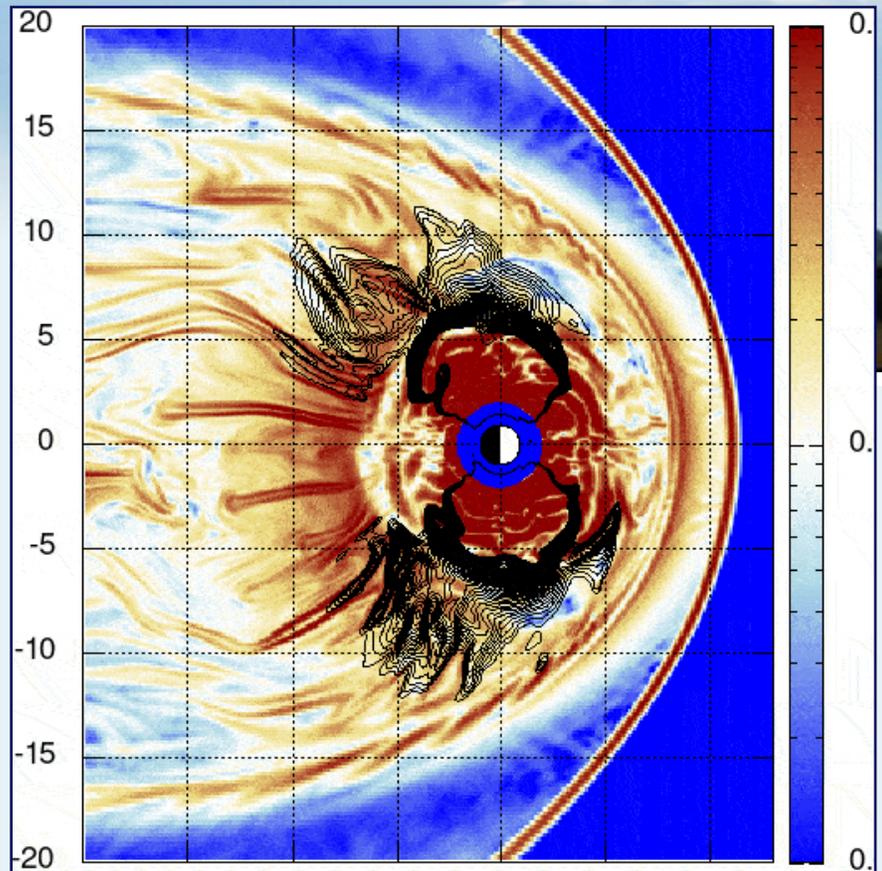
## MAKING WAVES IN THE MAGNETOSPHERE

By Mark D. Schneider

Fascinating new research about the outer reaches of the Earth's atmosphere was published in the journal *Nature Communications* and highlighted in a recent story on *spaceweather.com*. A team of scientists at Embry-Riddle Aeronautical University has discovered waves along the edges of Earth's Magnetosphere. The magnetosphere protects us from the bombardment of our Sun's radiation; in fact, the front edge of the magnetosphere is rounded or squashed-shaped because it is deflecting charged particles that would otherwise make the Earth uninhabitable. The waves that were found are called Kelvin-Helmholtz waves and are also commonly seen in our skies' cloud formations. The physics behind their formation involves fluids and gases of different velocities and densities flowing past each other and creating turbulent waves. Their shape can be seen in both images above, including the cloud photo and also the modeled image of the Earth's Magnetosphere.

Data from two of NASA's spacecraft, THEMIS and MMS, taken from 2007 to 2018 (Solar Cycle 24), shows that Kelvin-Helmholtz waves occur much more frequently around the spring and fall seasons. The image represents a computer model that visually shows Kelvin-Helmholtz waves several times the size of the Earth rippling along the outer edges of the magnetosphere during the

Fluctus/KH wave clouds forming over Mount Duval, NSW, Australia. Source: wikicommons (GRAHAMUK)



Credit: Shiva Kasovi of Embry-Riddle Aeronautical University.

Fall equinox. The Embry-Riddle team observed that the waves occurred three times more frequently around the time of the Autumn and Spring equinoxes than around the Summer and Winter solstices. The basic explanation is that this activity corresponds to the tilt of the Earth's axis during these seasons.

Interestingly enough, research and observations have shown for decades that geomagnetic activity peaks near equinoxes and now there may also be a correlation between geomagnetic activity and Kelvin-Helmholtz waves. Since January 2022, when *The Atmospheric Reservoir* article about geomagnetic storms was published, our current Solar Cycle 25 has impressed night sky watchers over much of our planet. Even southern U.S. states have been fortunate enough to partake in some Northern Light shows recently!

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