

Cosmic Rays and Katrina

A 2008 study showed a relationship between galactic cosmic rays, solar activity, and the infamous hurricane Katrina, which devastated New Orleans in 2005.¹

As described in the study, one key component in the intensity of cyclones and hurricanes is the temperature difference between the relatively warm ocean, compared with the colder upper atmosphere. A greater temperature difference leads to a more intense convection process, in which the warmer ocean air rises up to meet the colder air high in the atmosphere above.

In the case of Katrina, while the storm was out over the Atlantic Ocean, the Earth's magnetic field entered a period of intense fluctuation, known as a "geomagnetic storm."² Geomagnetic storms can, in turn, reduce the galactic cosmic rays entering the Earth's atmosphere, because the Earth's magnetic field generally acts to deflect charged particles like

galactic cosmic rays. This lowering of cosmic-ray flux reaching the Earth due to a geomagnetic storm is a well-known phenomenon, called a Forebush decrease.

The constant inflow of cosmic rays causes an ionization of the Earth's atmosphere, inducing condensation of water vapor, and the release of latent heat. Because this latent heat release plays an active role in warming the already cold upper atmosphere, if the cosmic-ray flux is reduced, so then is the ionization, condensation, and latent heat release—leading to a further cooling of the upper atmosphere.

As Katrina approached the Gulf of Mexico, the reduction of the cosmic-ray flux caused by the geomagnetic storm of Aug. 24-25 led to a 9°C drop in the temperature of the upper atmosphere, and a consequent increase in the intensity of the hurricane, since this increased the temperature difference between the warmer ocean and the now even colder upper atmosphere, resulting in increased convection and intensity.

In the context of discussing active weather modification, it is worth considering the possibility that perhaps such stores of potential energy (latent heat) could be actively modulated by mankind to defend our population against storm systems. If less ionization/condensation can lead to an intensification, then perhaps increasing the ionization/condensation could be used to weaken threatening storms as well?

1. V.G. Bondur, S.A. Pulinet, and G.A. Kim, "The Role of Galactic Cosmic Rays in Tropical Cyclogenesis: Evidence of Hurricane Katrina," *Doklady Earth Sciences*, 2008, Vol. 422, No. 2, pp. 244-249.

2. Geomagnetic storms are generated by strong outbursts of solar activity which bombard and rattle the Earth's magnetic field, causing fluctuations in the intensity.