New map of cosmic rays in the Southern sky presented at physics meeting

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For the first time, scientists have an almost complete sky map of high-energy cosmic rays.

While waiting for construction of the IceCube Neutrino Observatory to be completed at the South Pole, researchers there have been mapping cosmic rays in the Southern Hemisphere. They discovered an excess of cosmic rays coming from certain directions in the sky.

The research was presented at the American Physical Society's April Meeting in Anaheim, Calif., Saturday, April 30.

"We have observed that these cosmic rays come preferentially from certain parts of the sky, and this is the first time that such an observation is done in the southern sky," said Marcos Santander, of the University of Wisconsin-Madison. The excess, called an anisotropy, mimics one already observed in the Northern Hemisphere. Santander will speak about their discovery of anisotropies in the southern sky at the April Meeting.

When high energy cosmic rays collide with atoms in the Earth's atmosphere, they produce elementary particles called muons. Though IceCube was built to detect astrophysical neutrinos, it can also detect these cosmic ray-produced muons, finding tens of billions of them each year. Scientists say these high concentrations shouldn't exist and are working to understand their sources. Analyzing this new data may help to

determine the origins of these anisotropies.

The construction of IceCube at the geographic South Pole was completed in December. The experiment is designed to use one cubic kilometer of Antarctic ice as a subatomic particle detector of neutrinos or other difficult-to-detect elementary particles.

More information: Observation of a cosmic ray anisotropy in the southern sky with IceCube, meetings.aps.org/Meeting/APR11/Event/145730

Abstract
IceCube is a kilometer-scale neutrino telescope currently in the final stages of its construction at the geographic South Pole. When complete, the detector will consist of 5160 Digital Optical Modules (DOMs) deployed at depths between 1.5 and 2.5 km over an instrumented volume of 1 km^3. Although the main scientific goal of IceCube is the detection of astrophysical neutrinos, it also detects tens of billions of muons per year, which are produced by the interaction of TeV cosmic rays with the Earth's atmosphere. Such a high level of statistics has allowed us to probe, for the very first time, the southern sky for anisotropies in the arrival direction of cosmic rays in this energy range. We report on the discovery of a cosmic ray anisotropy over a wide range of angular scales in the sky, which is consistent with anisotropies previously observed in the northern sky by other experiments.

Provided by American Physical Society

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