

# Cosmic-ray variations between local atomic filaments

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Gamma-ray observations by Fermi LAT in nearby clouds have shown that the cosmic-ray flux within 500 pc around the Sun is fairly uniform except in the Eridu cloud, which exhibits a puzzling 30 % drop in gamma-ray emissivity per gas atom. The magnetic field in this filamentary cloud is well aligned with the cloud axis and points towards the halo. In the case of anisotropic diffusion, cosmic rays would stream along the filament towards high altitudes above the Galactic plane.

We have therefore compared the gamma-ray emissivity in Eridu with that expected from the cosmic-ray flux incident on the heliosphere. We have also studied the gamma-ray flux recorded in another nearby, highly-inclined filamentary cloud. The magnetic field in this Reticulum cloud is also well ordered, aligned with the filament, and oriented towards the halo.

We have found that, because of 20-30 % systematic uncertainties between hadronic cross sections for gamma-ray production, we cannot conclude whether the cosmic-ray flux in Eridu is consistent or not with the flux at the Sun.

We find a gamma-ray emissivity in Reticulum that is close to the local average rather than to the low value in Eridu. The difference between the two filaments provides an important test case to study cosmic-ray transport in diffuse clouds and ordered magnetic fields.

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