

# Cosmic Ray Proton and Antiproton's Spatial Distribution Computed in Radiation Belts II

# Michio Fuki[1]

[1] Sci Edu, Education, Kochi Univ

High energy charged particles, protons, electrons, atomic nuclei and so on are flying about in the space. Very rare antiprotons were observed by the balloon-borne experiments in the Polar regions and by the satellites on the lower orbits. How do the antiprotons exist near the Earth ? The production process and probable spatial distribution of them are studied by the simulation. 1) The three models are supposed; (1) antiprotons containing in Cosmic Rays, (2) antiprotons pair-produced from the collisions with upper air, (3) antiprotons decayed from antineutrons pair-produced from the collisions.

The model 1 shows that the Cosmic Ray antiprotons inject in the Polar regions and only those of high energies come in the lower latitude. The model 2 can make the Rigidity Cut-off distributions by the Earth's magnetosphere, where IGRF is used, and appears the differences of cut-off energies between them and protons. The model 3 shows that the antiprotons are trapped in the inner radiation belts and make the south Atlantic Anomaly (SAA) region in the low orbits as well as protons. The left figure shows the relative particle number distribution simulated by the Monte Carlo method that antiprotons are injected with the model 3 and their orbits are traced. It shows much in the lower orbits about 3,000 km. The slanted eccentric dipole field is used for the computing time reduction.

But they cannot live so much and so long at the low altitude because of annihilation by collision with the air if once they are produced. The existential amount are not so much expected. In the right figure, the lifetime of antiprotons is calculated by the attenuation in the USA standard upper air model and the probable existence rate is multiplied with it. They are expected to be trapped in the outer region higher than 10,000 km. The quantitative estimation are needed by integrating these models.

1)M. Fuki, Cosmic-Ray Antiproton Spatial Distributions Computed in Magnetosphere, International Journal of Modern Physics A, Vol.20, No.29(2005), P.6739-6741

(left) Relative Production Rate of Antiprotons  
 (right) Relative Existence Probable Rate of Antiprotons

