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Galactic cosmic ray model

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard uses the translation method equivalent to ISO 15390.2004 "Space Environment (Nature and Labor) Galaxy Cosmic Line Model".

This standard has made the following editorial changes.

--- Change the standard name to "Galaxy Cosmic Line Model";

--- Added introduction, a brief description of the background of the model;

--- Added an explanation of the relevant physical symbols in each formula to facilitate understanding and application of the relevant formulas in this standard;

--- Added references to identify the source of the relevant formula in this standard.

This standard is proposed and managed by the National Aerospace Technology and its Application Standardization Technical Committee (SAC/TC425).

This standard was drafted. Beijing Satellite Environmental Engineering Research Institute, China Aerospace Standardization Institute, Harbin Institute of Technology, Beijing Tiangong Branch

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Introduction

The ISO 15390 Galaxy Cosmic Ray (GCR) model was developed based on the Nymmik model of the Moscow State University (MSU) (see reference).

The literature [1] and reference [2]), the data source is the flux monitoring data of protons, He and heavy ions in the early.1990s. need

It should be noted that in the ISO 15390 model only the unique parameters (Wolf number) are used to describe the monitoring data, so it is a half experience.

The model (see reference [3]), the relevant formulas in the model are all data fitting formulas (the dimension cannot be fully corresponded), not the theoretical deduction

formula. In the ISO 15390 model, the GCR flux change is relative to the solar activity disturbance hysteresis and the magnetic field stiffness, the solar activity week is odd

Or even, solar cycle phase, etc., but the model does not include anomalous cosmic rays.

Later, the widely used CRÈME model for studying the effects of GCR on spacecraft radiation, such as CREME96 (see reference)

The [4] and CREME2009 models (see Ref. [5]) use the ISO 15390 model (see Reference [6]).

Galaxy cosmic line model

1 Scope

This standard specifies models for the analysis of the radiation effects of the Milky Way cosmic rays on space hardware, organisms and other objects.

Provide experimental evidence for the flux of the Galaxy cosmic rays.

This standard gives the Milky Way cosmic rays with energy range from 10MeV to 105MeV (electrons and protons outside the geomagnetic field in the near-earth space).

Model parameters for particles with a nuclear charge number of Z = 2 to 92).

2 Terms and definitions

The following terms and definitions apply to this document.

2.1

Galaxy cosmic galacticcosmicrays

Milky Way Cosmic Ray

GCR

A high-energy charged particle stream from the interstellar space that penetrates the solar layer.

2.2

Wolf number wolfnumber

W=10g f

Here, g is the number of sunspots, and f is the number of sunspots on the visible sun surface.

2.3

Stiffness spectrum

Phii R( )

Cosmic ray particle flux distribution with stiffness.

2.4

Energy spectrum energy spectrum

Fi E( )

Cosmic ray particle flux distribution with energy.

3 Model principle

3.1 This model describes the flux of GCR in the 22-year solar cycle with solar activity and the large-scale solar layer magnetic field (solar polar region)

The change in the magnetic field).

3.2 In the Earth's orbit outside the geomagnetic layer, the angular distribution of GCR flux is isotropic.

3.3 Solar activity is characterized by the mean (W) of the 12-month Wolff number (sunspot number).

3.4 It is assumed that the change of the magnetic field of the large-scale Japanese sphere is proportional to the change of the magnetic field of the solar pole, and the strength and polarity of the magnetic field of the solar pole depend on

The solar activity level and the solar activity week number are odd or even, calculated according to equation (1) (see reference [1]).