

**43rd COSPAR Scientific Assembly, Sydney, Australia 2021;
E1.16 – oral [User-ID: 37011, Abstract-ID: 28017]**

**Dependencies of CR cutoff rigidities from the altitude
during 1950 – 2050 for different latitude – longitude
zones and zones over great magnetic anomalies**

Lev Dorman^{1,2 *}, Anatoly Belov¹, Uri Dai², Evgenia Eroshenko¹, Raisa Gushchina¹, Boris Gvozdevsky³, Mark Idler², Lev Pustilnik², Abraham Sternlieb², and Victor Yanke¹

¹Pushkov's Institute of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation (IZMIRAN), Russian Academy of Sciences, Moscow, Russia, 108840.

²Cosmic Ray and Space Weather Center with E. Segre Observatory on Mt. Hermon (ESOI) of Tel Aviv University, Ariel University, Shamir Research Institute & Israel Space Agency, Israel

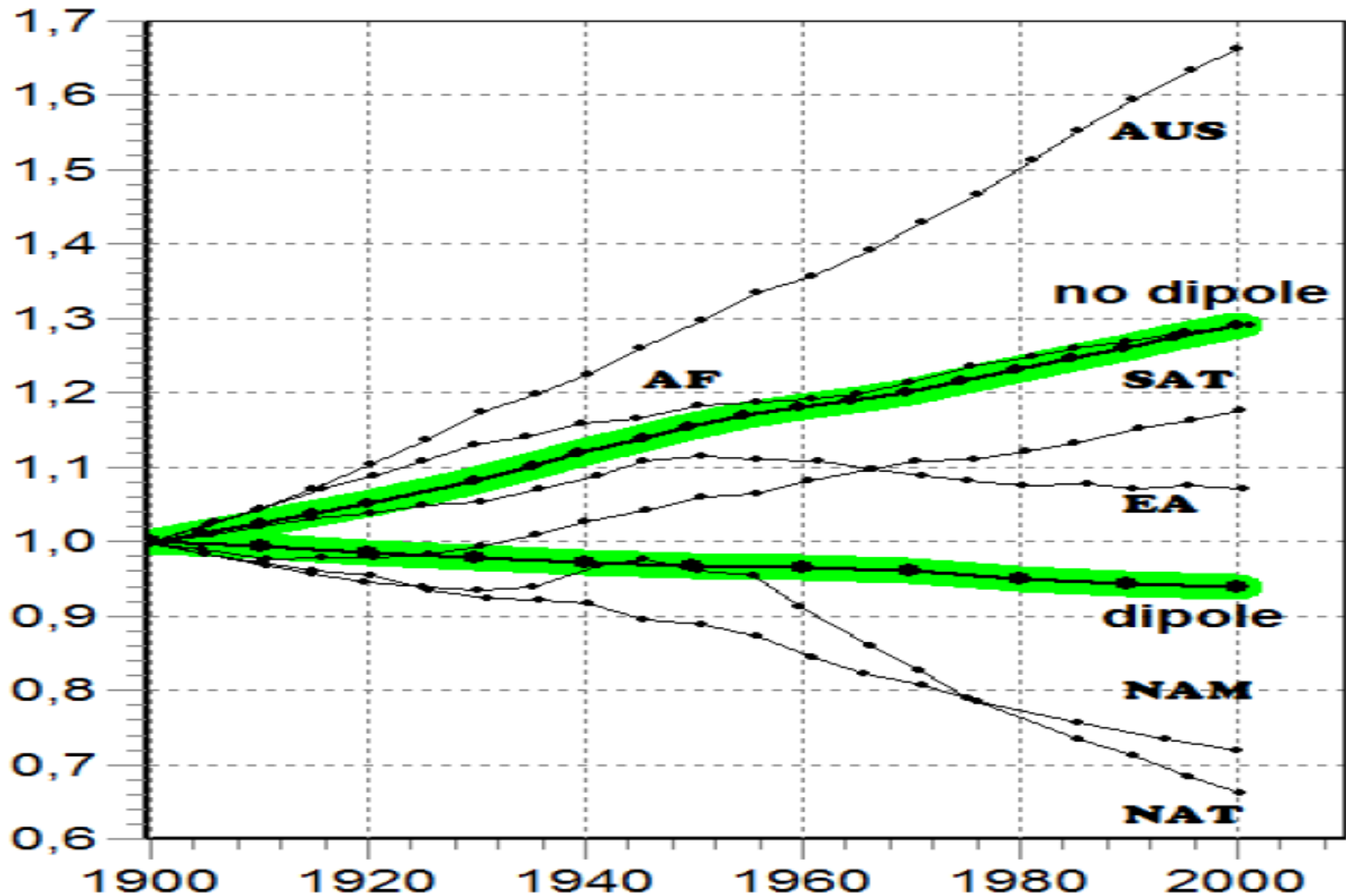
³ Polar Geophysical Institute, Firsman Str., 14, Apatity 184209, Russia;

**Corresponding Author, e-mail: lid010529@gmail.com*

Abstract

- By using information on secular variations of Gauss coefficients of main geomagnetic field during 1950-2050 and Tsyganenko model on the changing of magnetospheric current systems during different levels of geomagnetic activity we determine by direct trajectory calculations space-time distribution of CR effective cutoff rigidity R_c . On the basis of these results we then determine how R_c depends from altitude H for different latitude – longitude zones and special zones with great influence of planetary magnetic anomalies. For convenient using this information for estimation level of radiation hazards from galactic and solar CR for satellites on different orbits at different moments of time we try to approximate the found dependencies of R_c from H by some analytical functions.

Change of the Earth's magnetic field



Change of the Earth's magnetic field

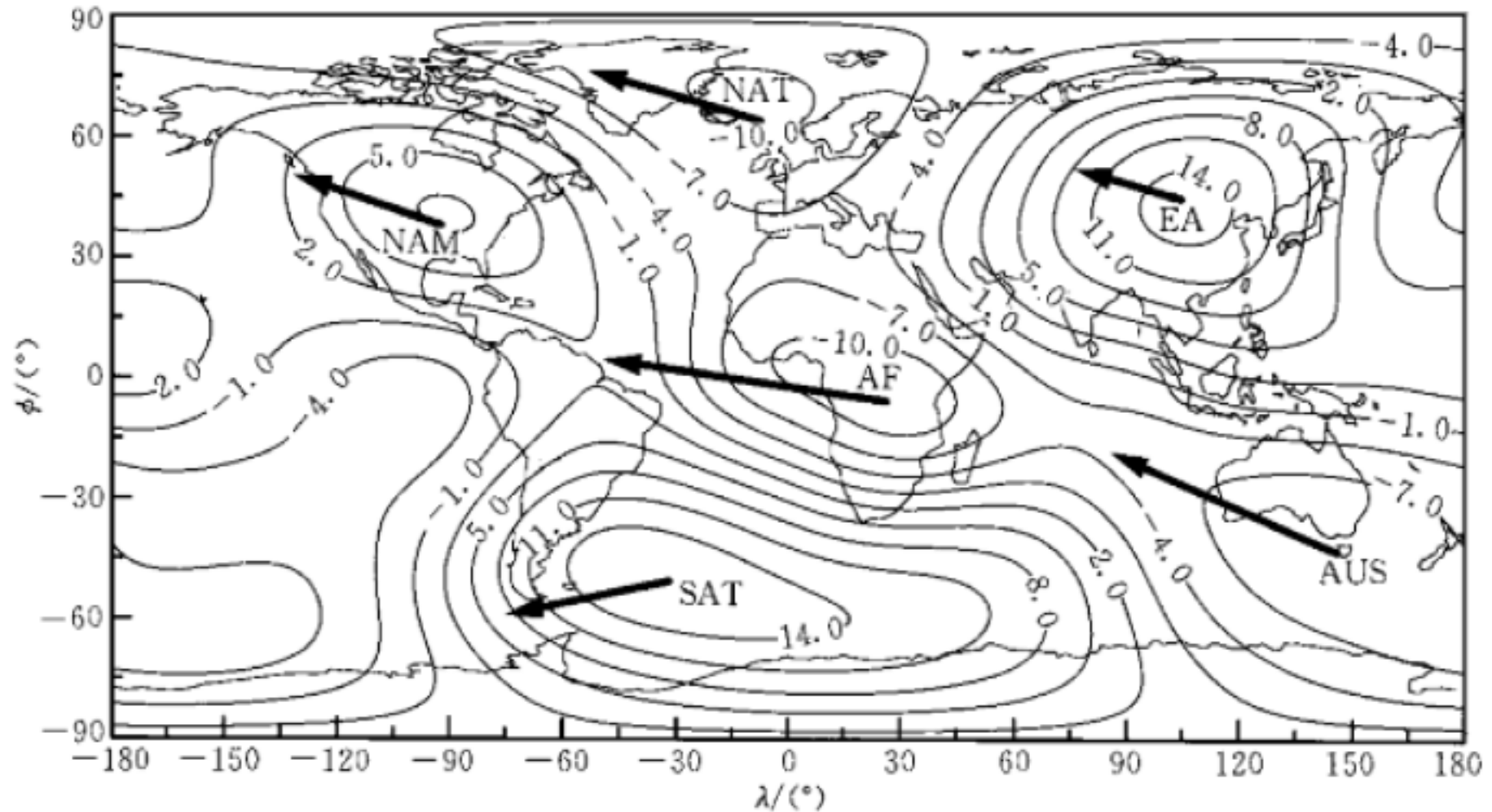


Figure 2. Movement of six magnetic anomalies during 1900-2000: AF – $0.26^{\circ}/\text{year}$, NAM – 0.12 , SAT – 0.04 , AUS – 0.23 , EA – 0.09 , NAT – $0.13^{\circ}/\text{year}$.

Cosmic Ray Variations and Magnetospheric Effects

$$N = \int_0^{\infty} \delta(R) \cdot m(R, h_0) J(R) dR = \int_{R_c}^{\infty} m(R, h_0) J(R) dR$$

$$\frac{\delta N}{N} = \overbrace{-\delta R_c W(R_c, h_0)}^{\text{magnetospheric}} + \overbrace{\int_{R_c}^{\infty} W(R, h_0) \frac{\delta m}{m}(R, h_0) dR}^{\text{atmospheric}} + \overbrace{\int_{R_c}^{\infty} W(R, h_0) \frac{\delta J}{J}(R) dR}^{\text{primary-variation}}$$

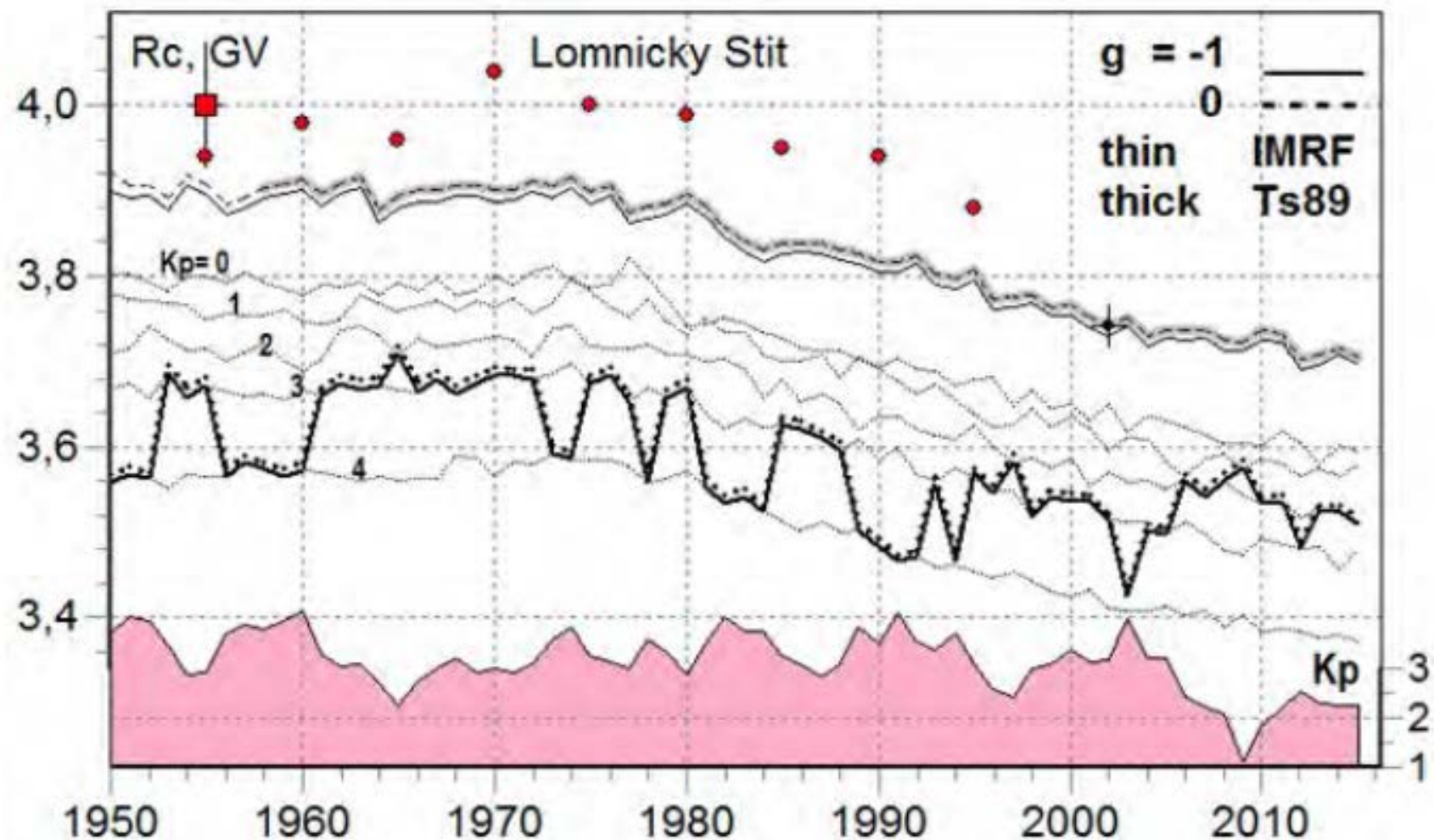
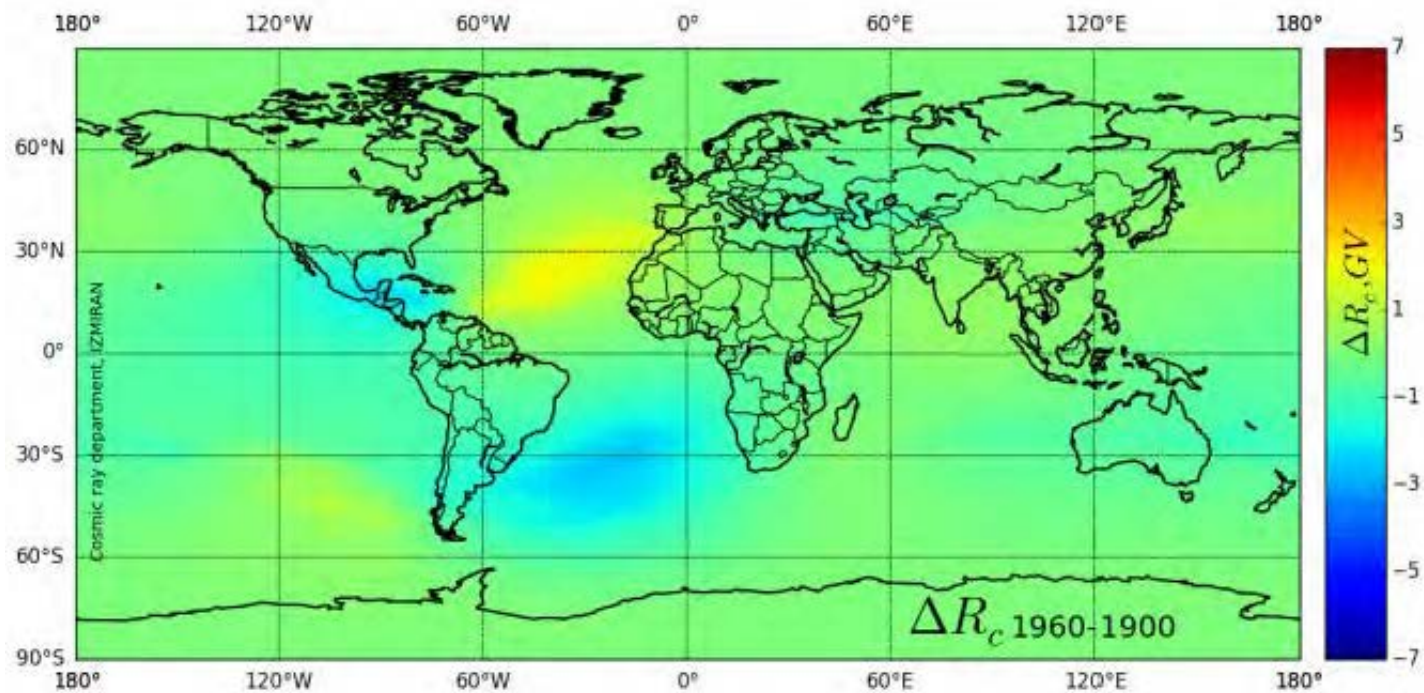
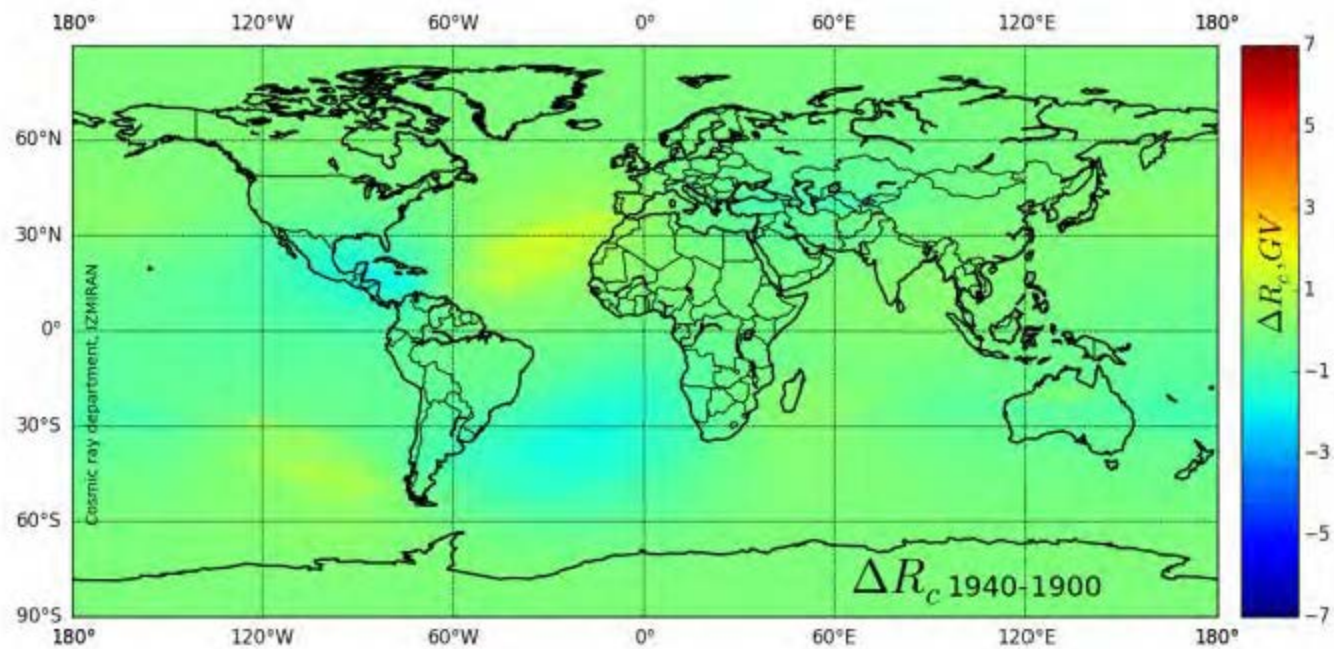
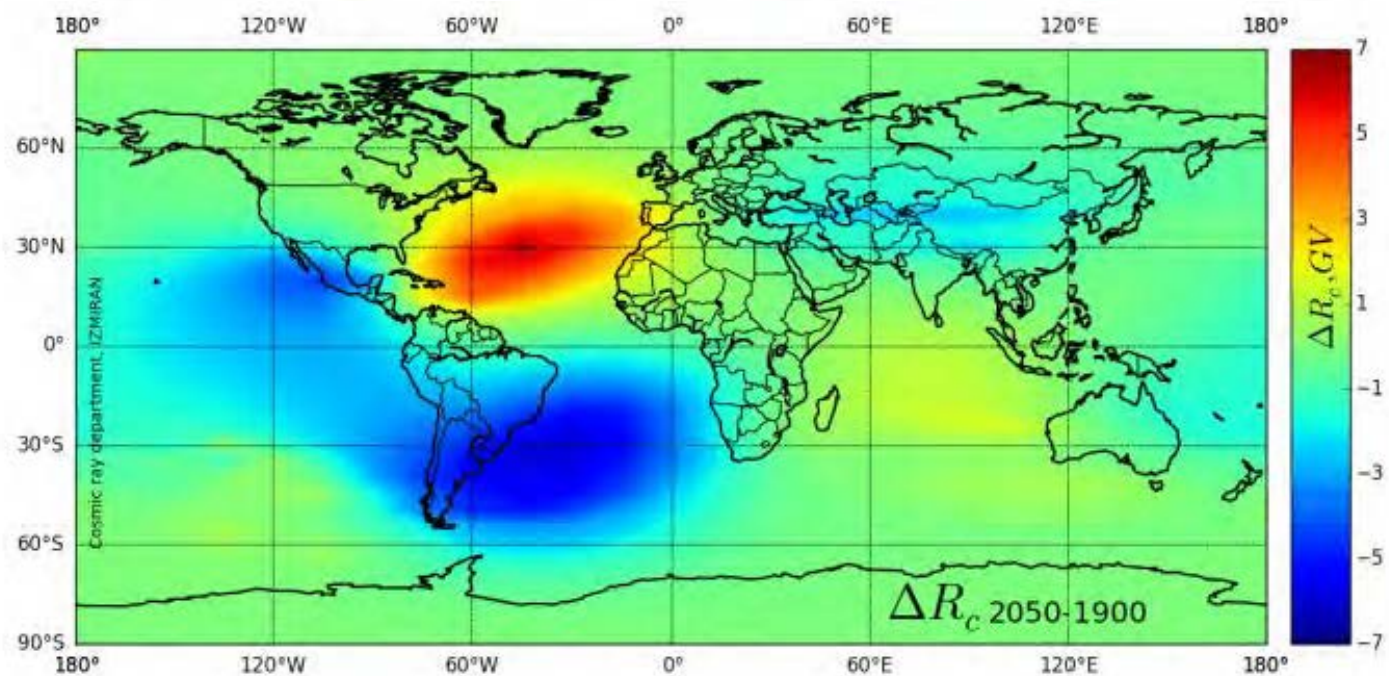
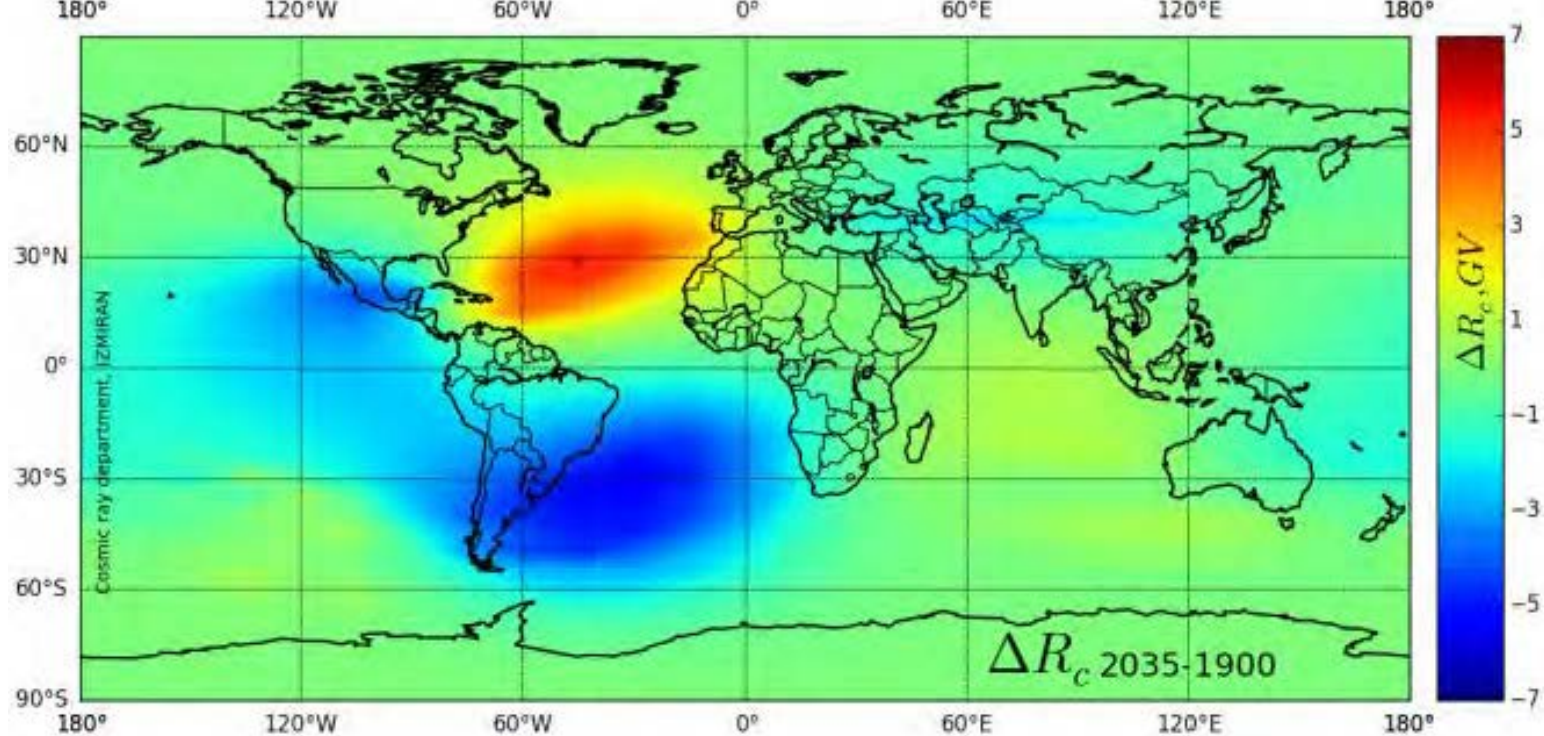
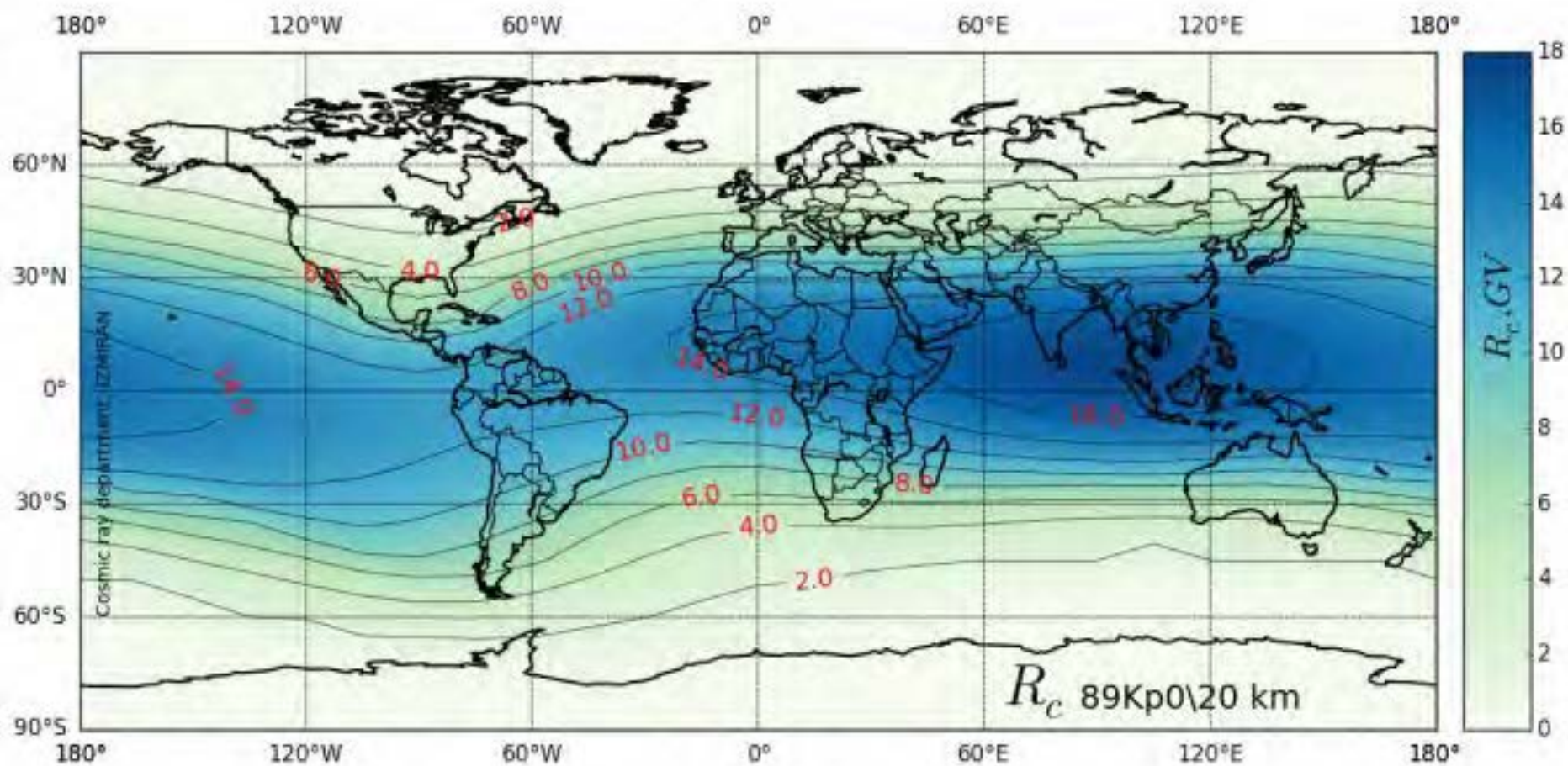
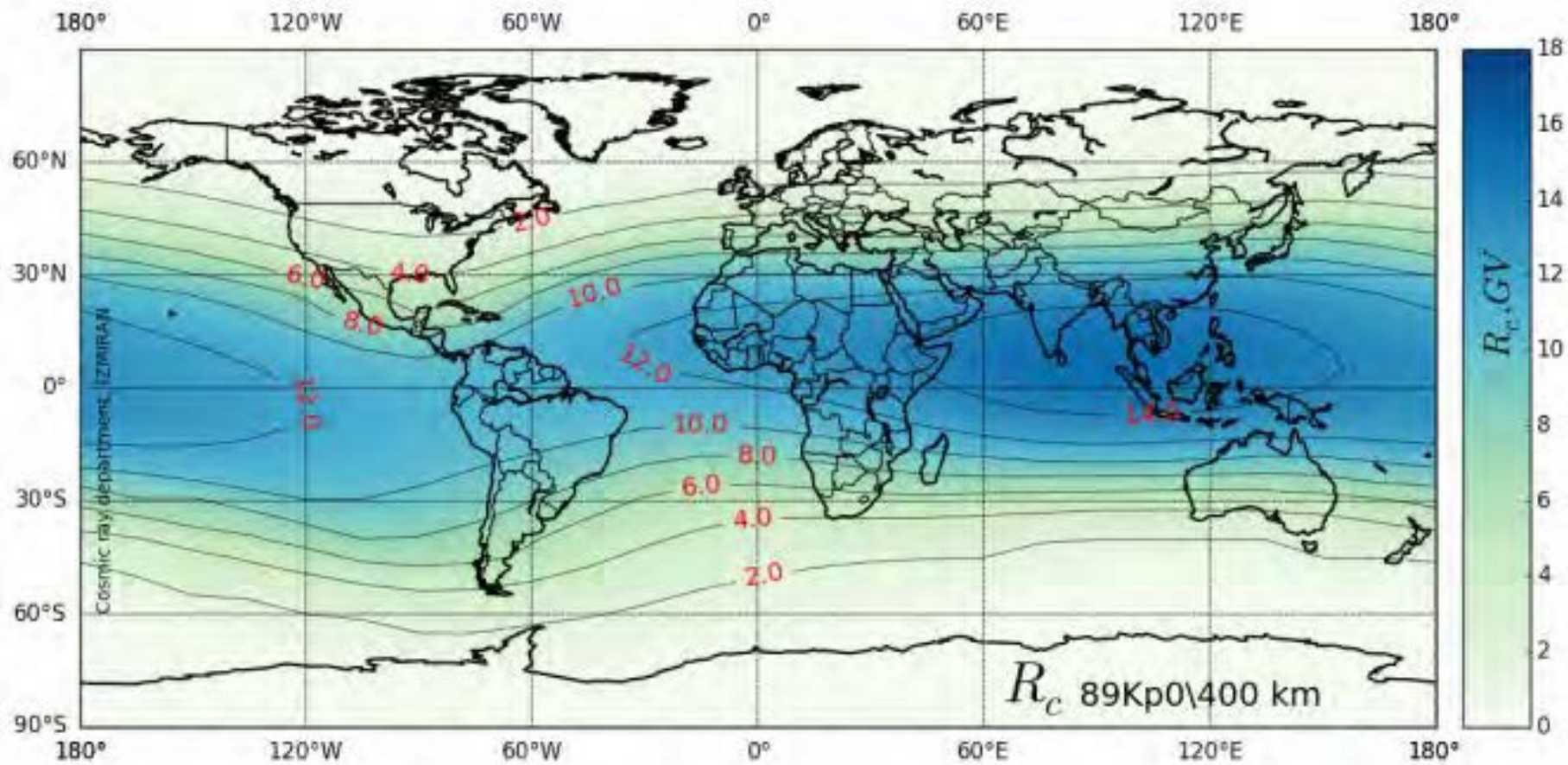


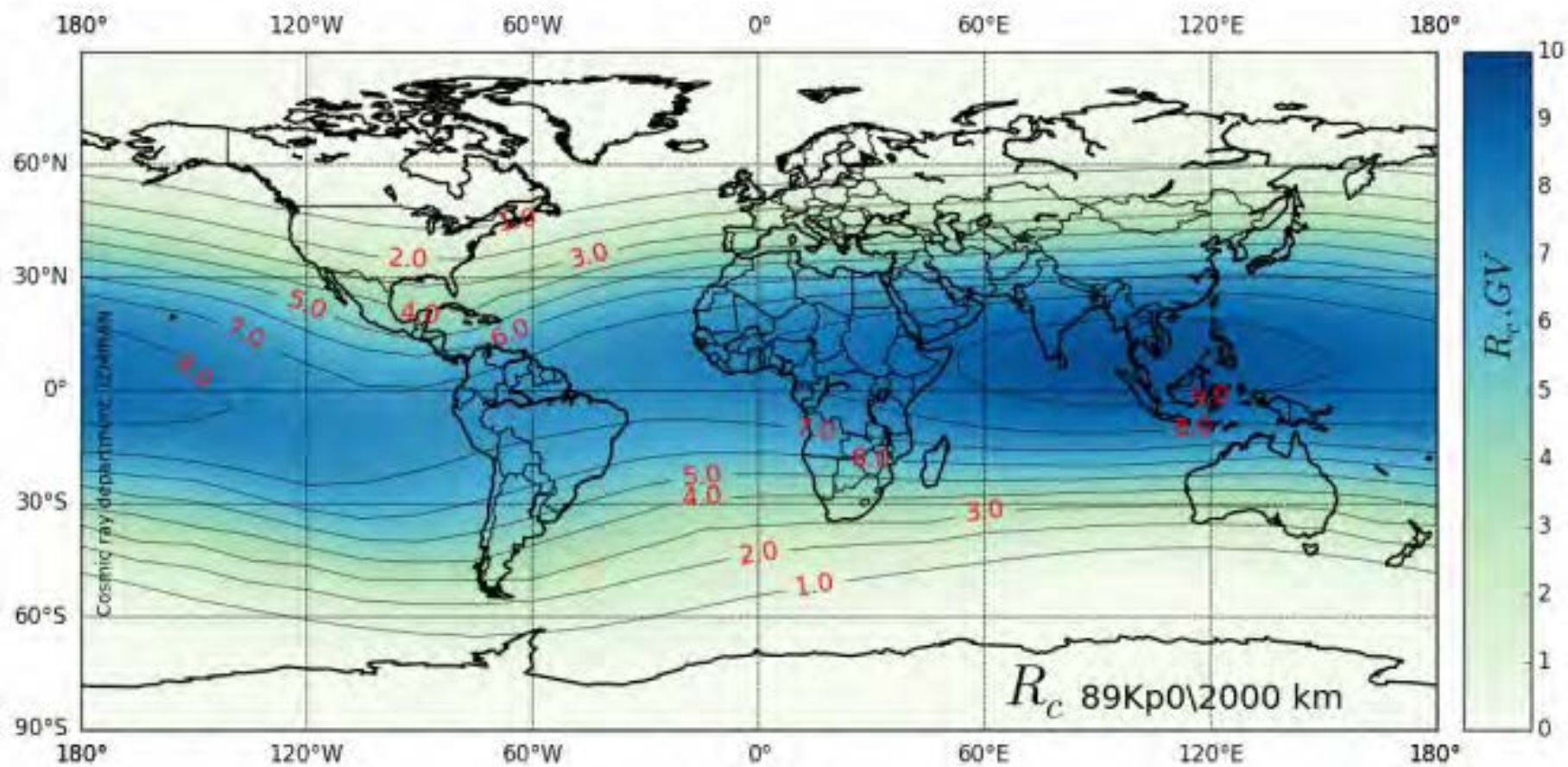
Figure 8. Changes of the CR cutoff rigidity for Lomnicky Stit for two models of magnetosphere (IMRF and Ts89).

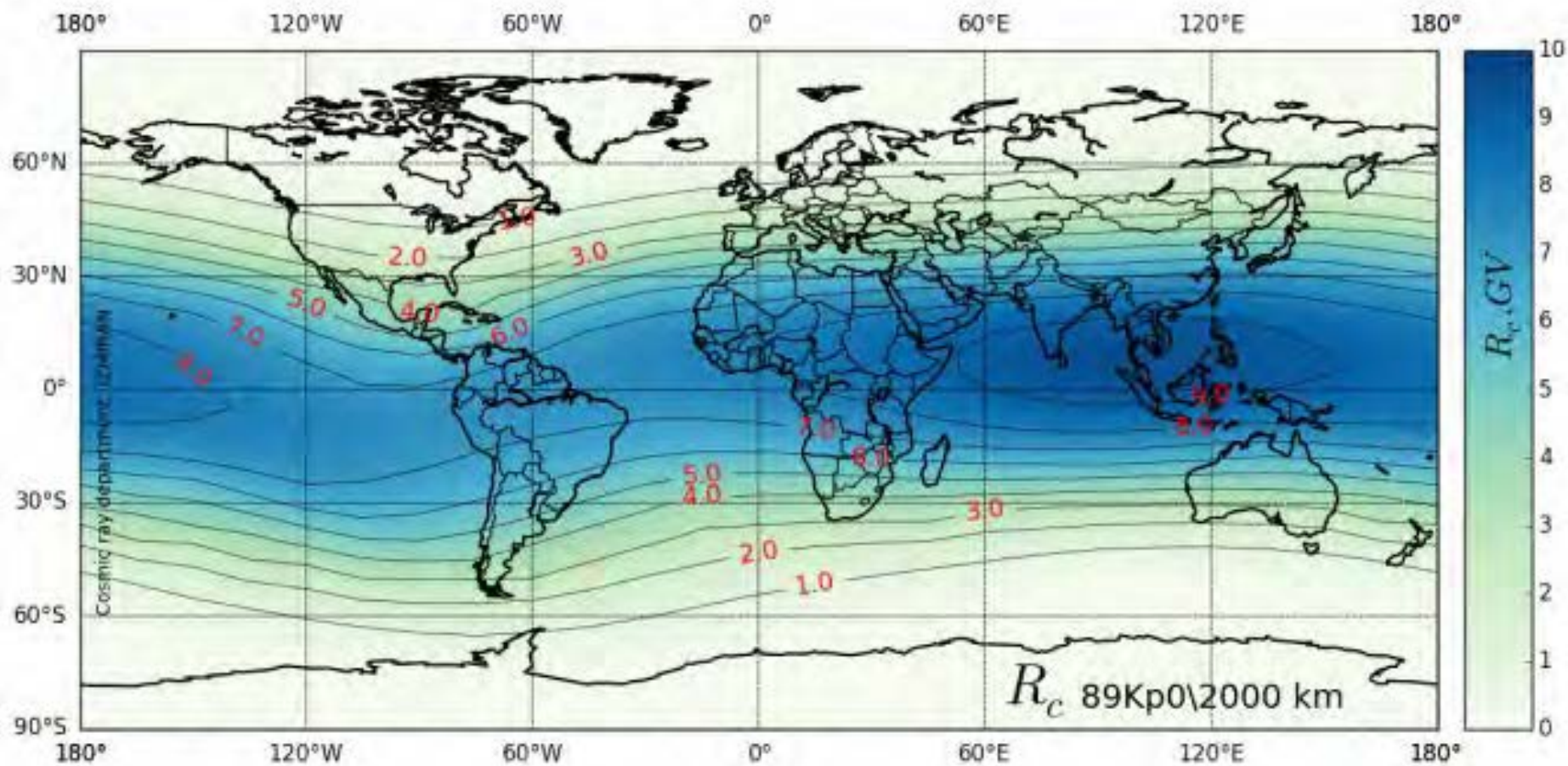


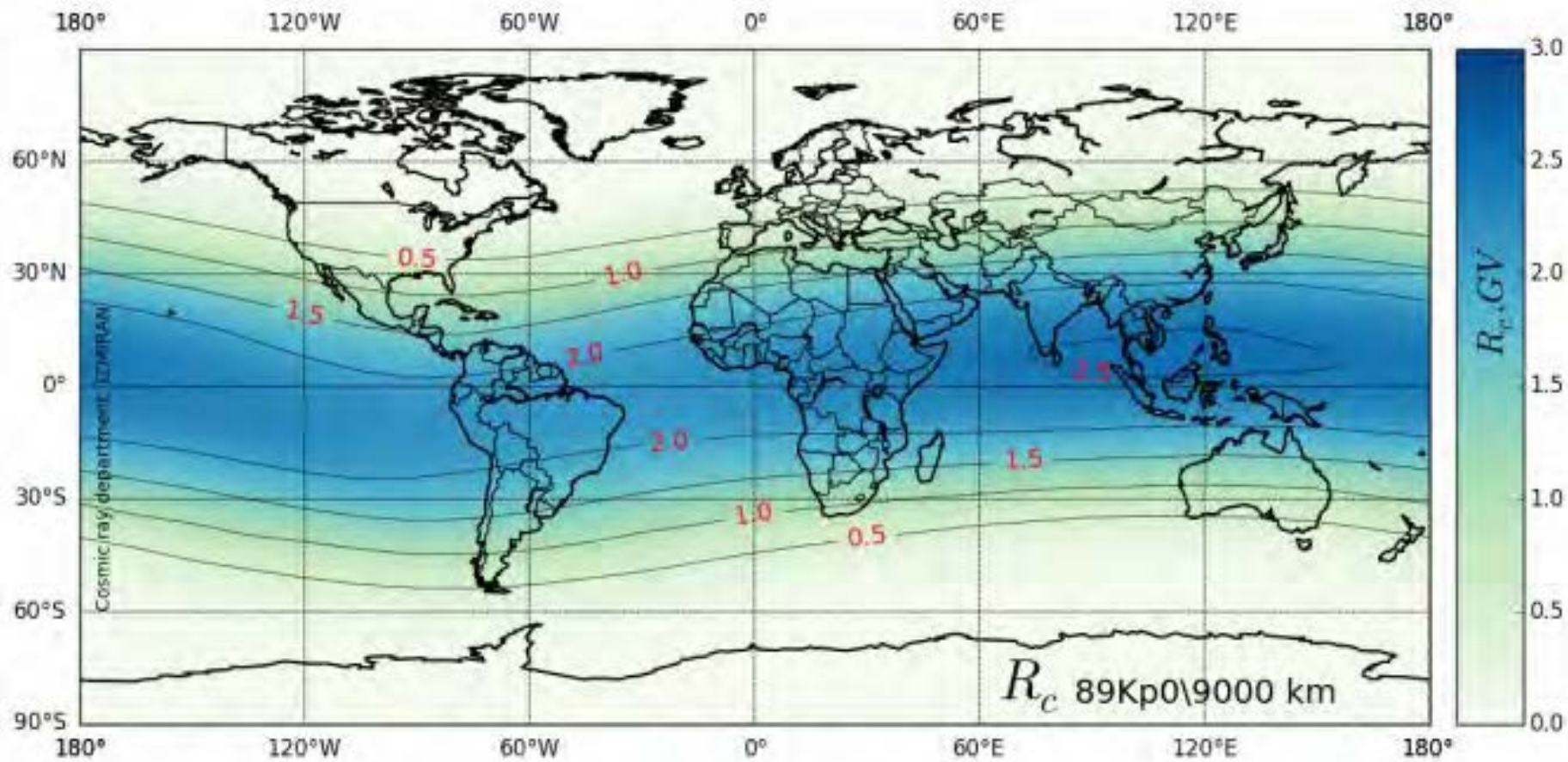


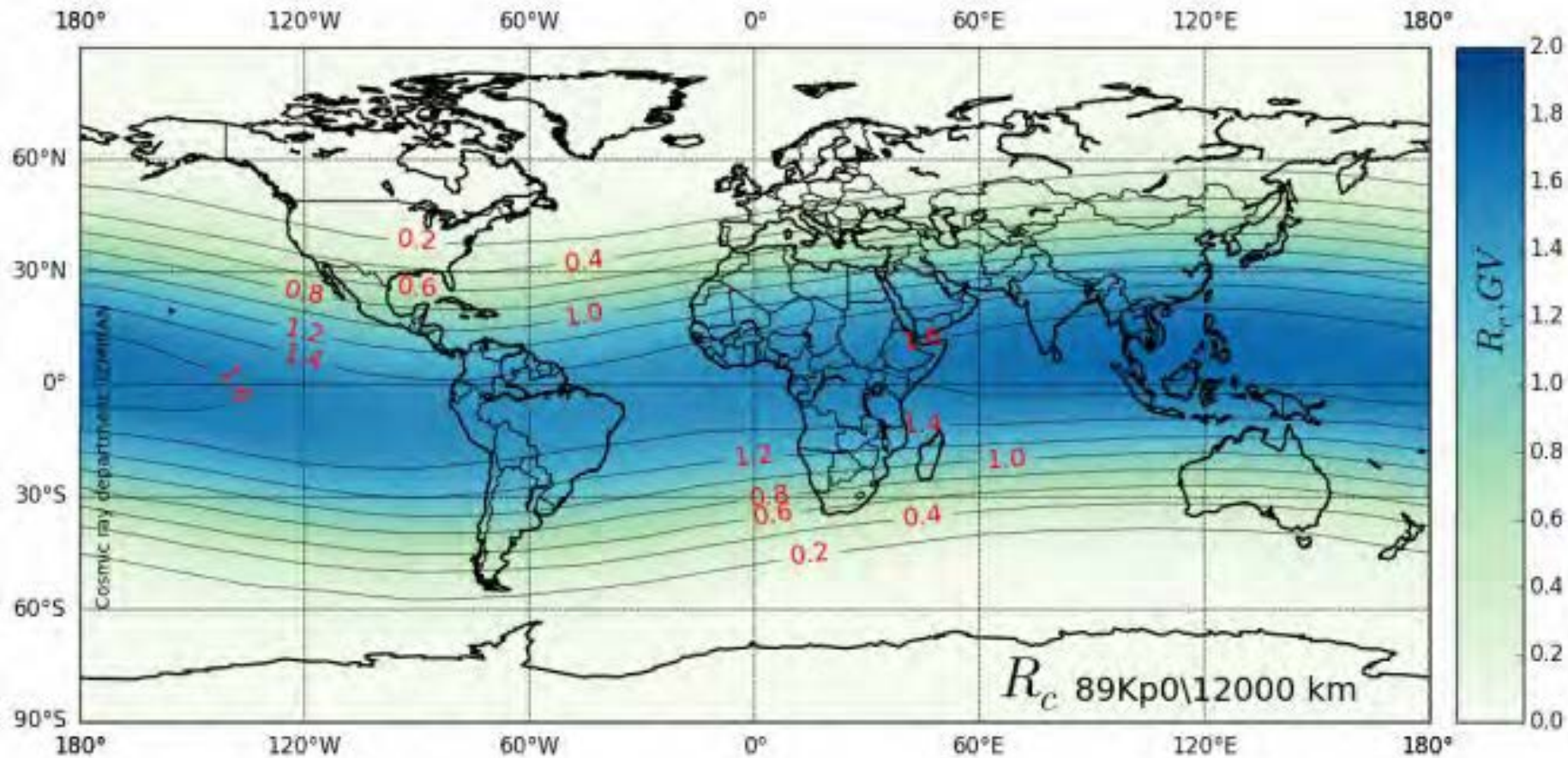


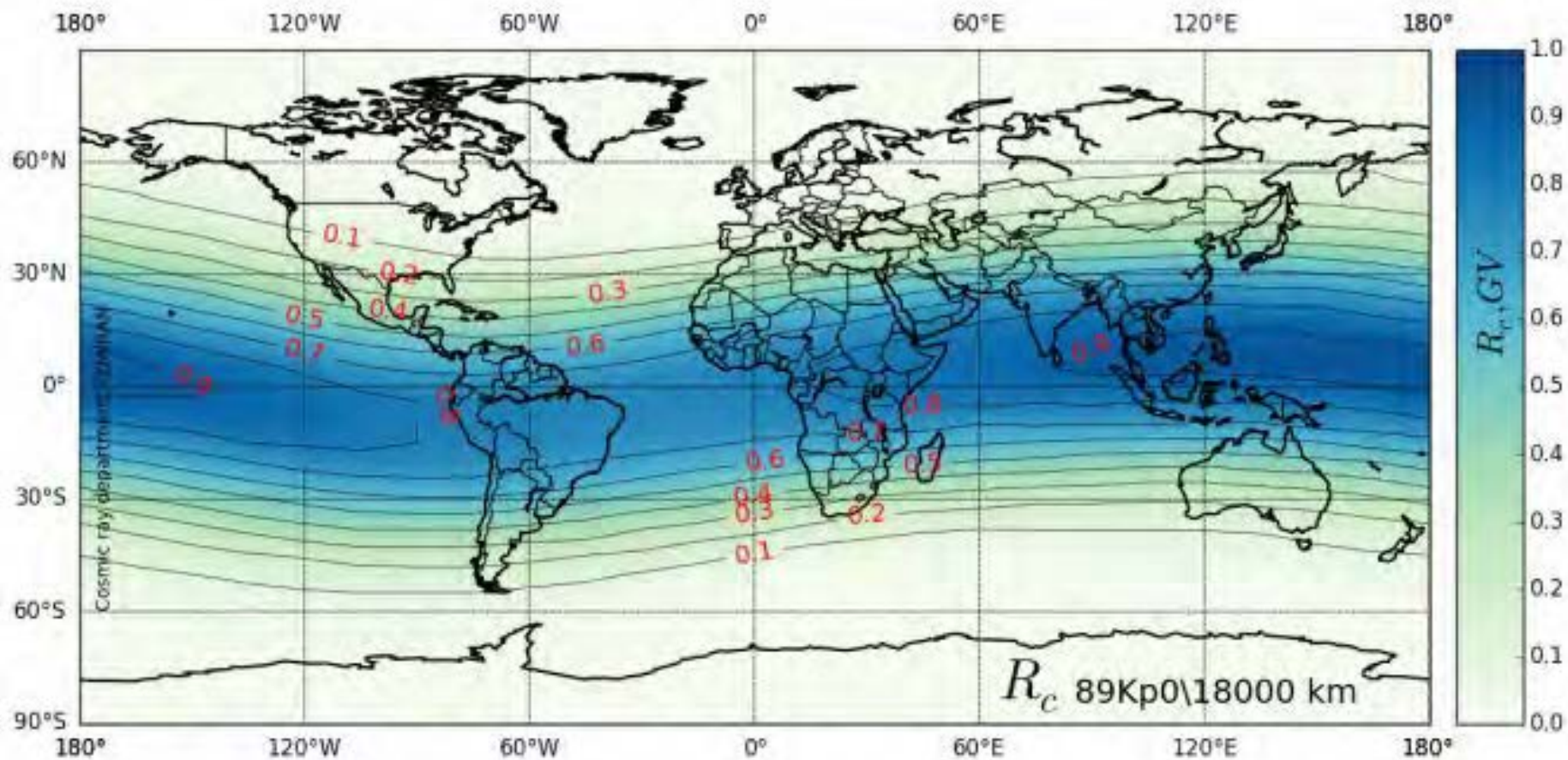


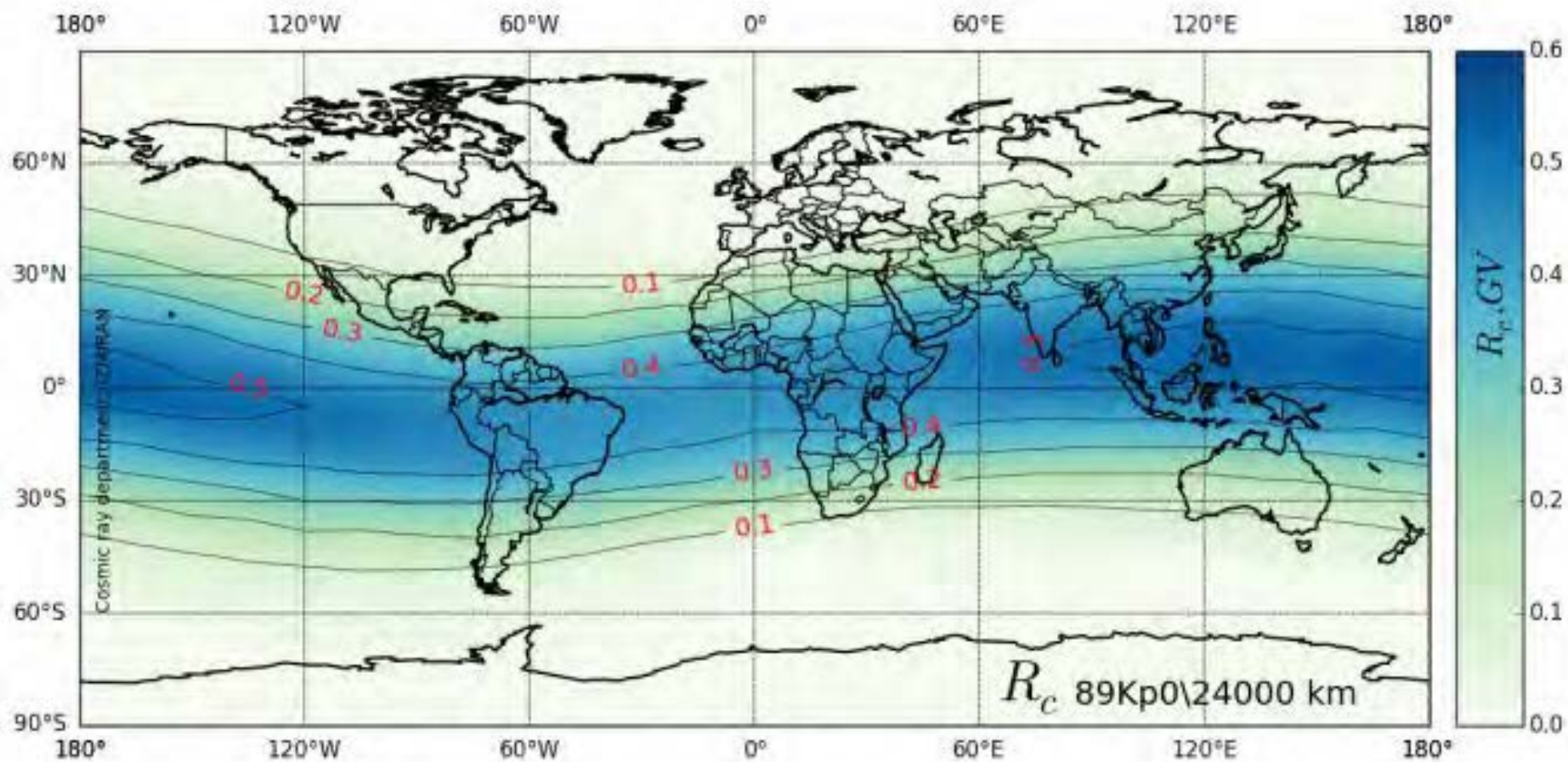


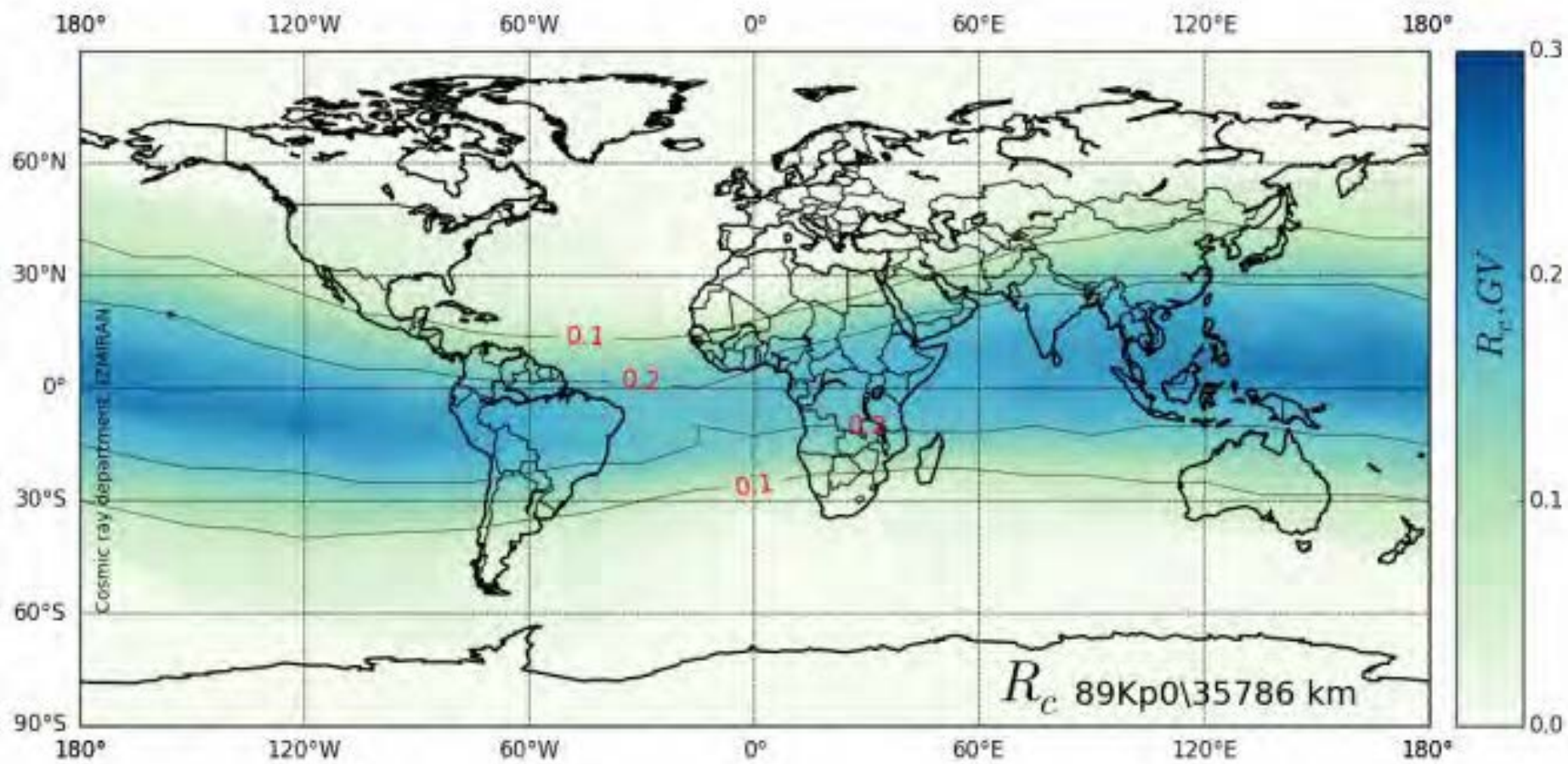


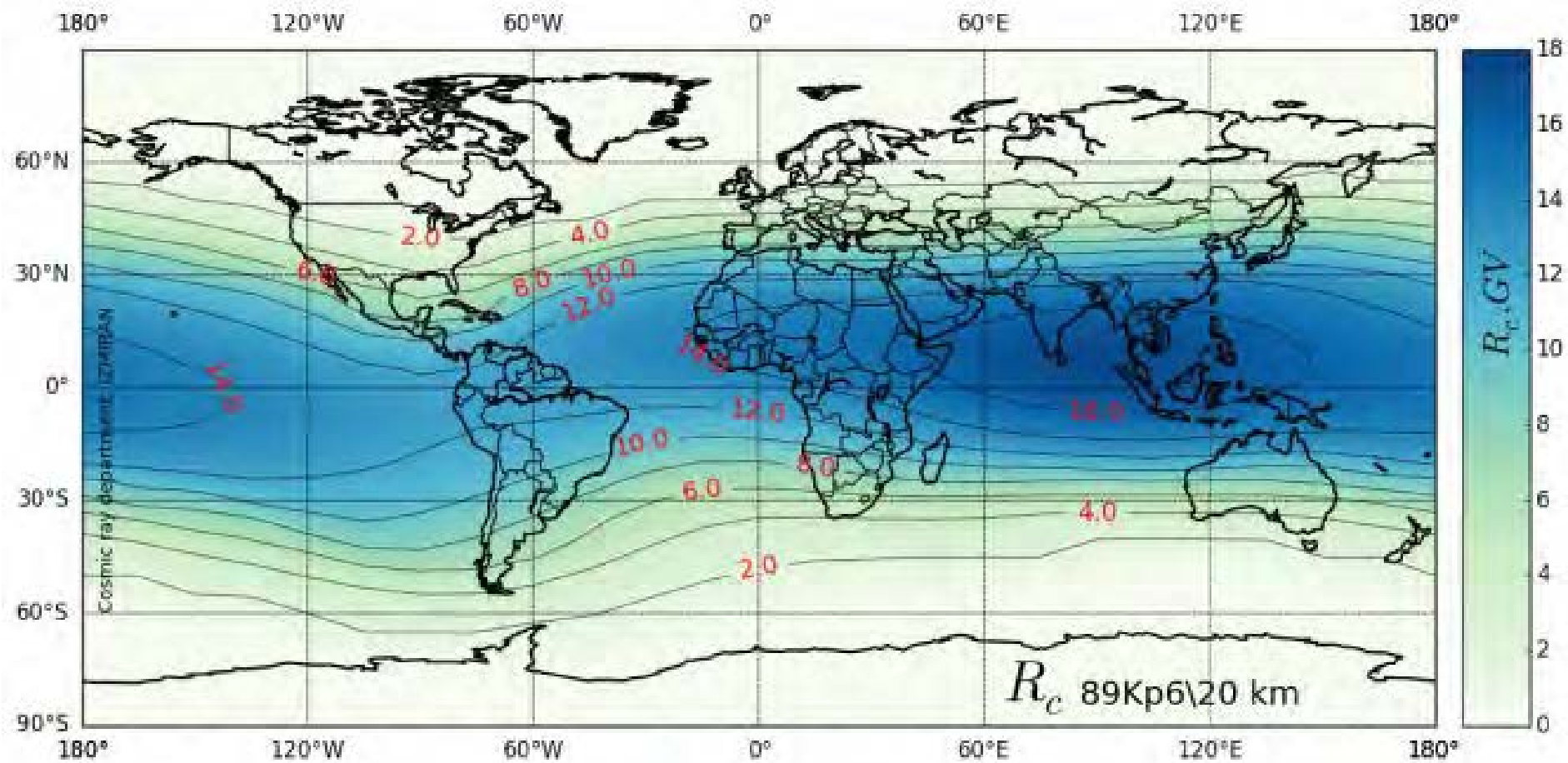




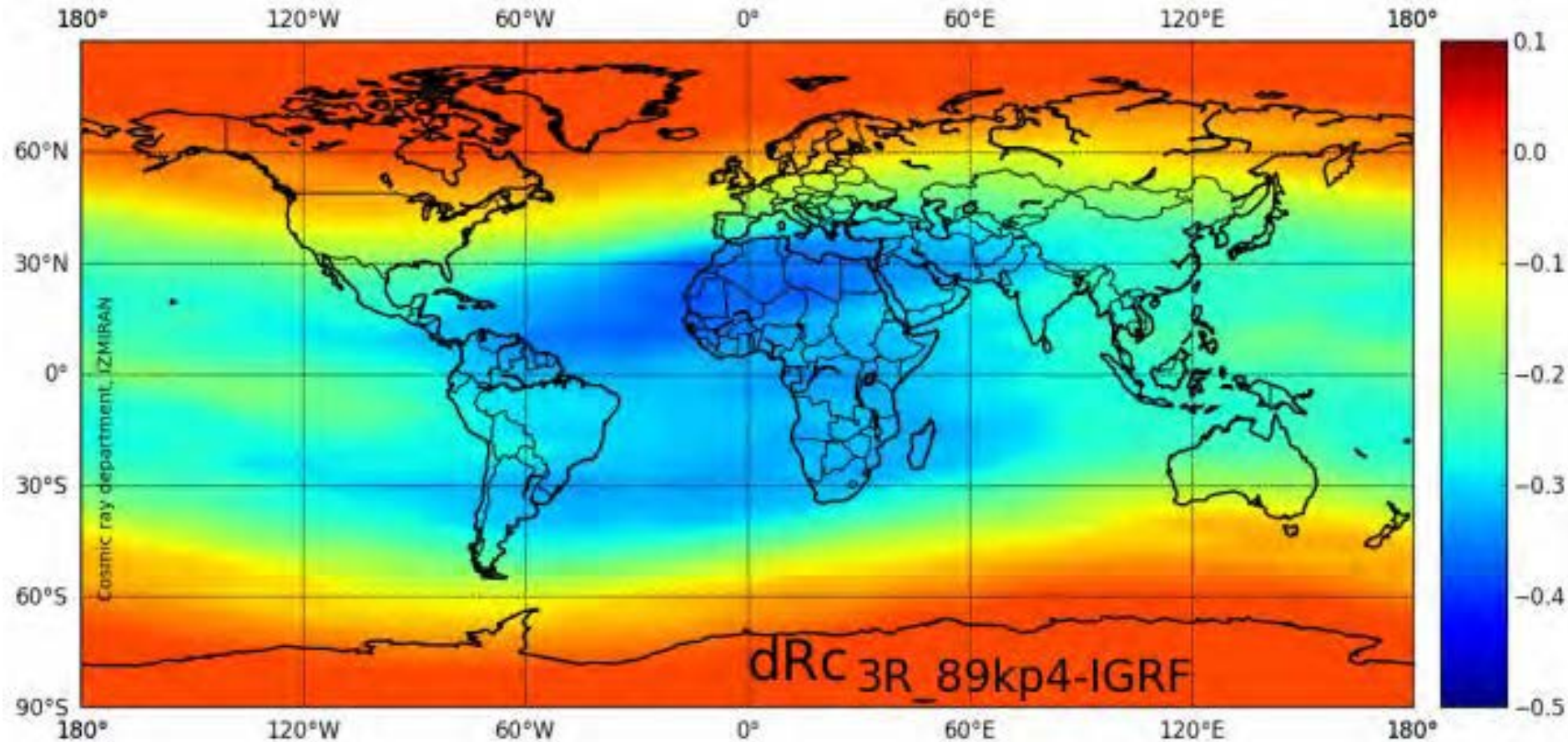








Distribution of ΔR_c on 20 km (difference at $K_p = 4$ according to Tsyganenko model and at IGRF model).



HOW CHANGED THE INFLUENCE OF
GEOMAGNETIC ACTIVITY ON DISTRIBUTIONS
OF R_c WITH INCREASING ALTITUDE FOR $Kp = 6$
ACCORDING TO TSYGANENKO MODEL ?

