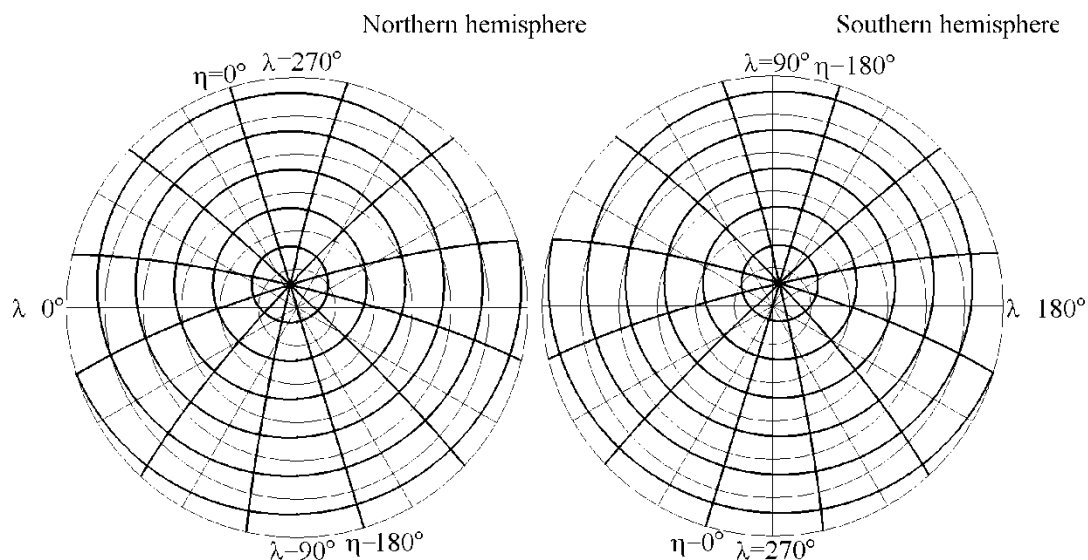


THE MUTUAL TRANSFORMATION OF GEOGRAPHIC AND SIMPLE GEOMAGNETIC COORDINATES

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The spherical geographic coordinates r, φ, λ are a generalization of two geographic coordinates φ, λ (geographic latitude and longitude), when the polar axis is directed to the north geographic pole of the Earth, and the origin direction of an angle λ lies in the plane of the prime meridian. If values φ_0, λ_0 are geographic coordinates of the south magnetic pole (lying in the northern hemisphere), then the coordinates of the spherical geographic system obtained by rotating around the coordinate system origin for the alignment the point (φ_0, λ_0) with the new polar axis, are elements of a spherical simple geomagnetic coordinate system r, θ, η (θ, η are the simple geomagnetic latitude and longitude).



The formulas for the interconversion of geographic coordinates φ, λ and simple geomagnetic ones θ, η are:

$$\sin \theta = \cos \varphi \cos \varphi_0 \cos(\lambda - \lambda_0) + \sin \varphi \sin \varphi_0;$$

$$\sin \eta = \frac{\cos \varphi \sin(\lambda - \lambda_0)}{\cos \theta};$$

$$\cos \eta = \frac{\cos(\lambda - \lambda_0) \cos \varphi \sin \varphi_0 - \sin \varphi \cos \varphi_0}{\cos \theta};$$

$$\sin \varphi = -\cos \theta \cos \eta \cos \varphi_0 + \sin \theta \sin \varphi_0;$$

$$\cos \lambda = \frac{-\cos \theta \sin \eta \sin \lambda_0 + (\cos \theta \cos \eta \sin \varphi_0 + \sin \theta \cos \varphi_0) \cos \lambda_0}{\cos \varphi};$$

$$\sin \lambda = \frac{\cos \theta \sin \eta \cos \lambda_0 + (\cos \theta \cos \eta \sin \varphi_0 + \sin \theta \cos \varphi_0) \sin \lambda_0}{\cos \varphi}.$$