

Cosmic rays as a clock (or Using cosmic rays for imaging and to study past)

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Abstract: Earth is constantly bombarded by cosmic rays, high-energy charged particles, mostly protons, coming from our galaxy. Heliosphere and geomagnetic field can modulate and suppress cosmic rays flux (1). But some particles are sufficiently energetic to reach Earth's atmosphere. On impact with common atoms in Earth's atmosphere and crust, they break apart these atoms to create new rare isotopes known as cosmogenic nuclides (2). The rate of their production is determined by several factors like intensity of primary cosmic rays, the level of solar activity, strength of the Earth's magnetic field, etc.

Quantitative information about past solar and geological activity and even archeological findings over long timescale can be obtained using a method based upon cosmogenic isotopes as indirect proxies.

In addition, non-destructive emerging imaging technics like cosmic ray muons tomography and radiography use the natural radiation of cosmic ray muons to create 2D and 3D images of objects (3). This work will review some of the uses of cosmic rays that can find applications in a wide variety of fields, from astronomy, geology, and archaeology to biology, engineering, and security.

References

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