Galactic cosmic rays impact the Earth’s atmosphere and create radioactive species from the nitrogen, oxygen and argon composing the atmosphere. The production of short-lived $^7\text{Be}$ (54 days) and $^{35}\text{S}$ (87 days) provides tracers for the tracking of $\text{SO}_2$ in the atmosphere as it is oxidized and forms aerosols affecting climate. The long-lived isotopes $^{10}\text{Be}$ (1.5 my) and $^{14}\text{C}$ (5730 y) are modulated in their production in the atmosphere by changes in the magnetic field of the Earth over long periods of time. This variation in the Earth’s magnetic shield has a strong component due to solar coupled outputs of protons and photons. This modulation links the production rate of these nuclides to the intensity of solar photons. The solar modulation effect on climate variation can then be assessed from measurements of these long-lived radionuclides in suitable records. This has been successfully done for the past 10,000 years using climate records in tree-rings and deep-sea deposits and by inference extension to the history of mountain glaciation.

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