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prof. Alan Cooper (Gulbali Institute, Charles Sturt University, Australia):
Cosmic Radiation and the Earth's Magnetic Field: A History of Environmental and Archaeological Transitions

Abstract:

The inability of humans to sense magnetic fields potentially explains the relatively limited amount of mainstream scientific interest in the history of earth's geomagnetic field, and the central role it played in allowing life on earth. The importance of this protection becomes obvious during periodic collapses in geomagnetic field strength (excursions) that occur regularly throughout the past, when the ionising impacts of cosmic radiation (solar and galactic) on the upper atmosphere are recorded as increased rates of cosmic nuclide production (eg. 14C, 10Be). Modelling studies of this radiation predict considerable impacts on climate, ozone distribution and UV radiation levels among myriad other effects. The best known recent large geomagnetic excursion (Laschamps, 42-41ka) saw a vast increase in 14C production correlated with Grand Solar Minima, alongside many global environmental and archaeological transitions (eg. Neandertal extinction/arrival of Aurignacian populations) - although precise modes of action remain unclear. However, there are many other major geomagnetic excursions throughout the Late Pleistocene, raising questions about their potential role in paleoclimatic and paleoanthropological records. Preliminary analysis of global ice, sediment 10Be and geomagnetic records over the past 130ka reveals a wide variety of unexpected patterns and associations, confirming the need for finescale analysis of the impacts and events during an excursion. This information is also required to allow planning for major solar weather events that will inevitably occur this century, and have the potential for destructive impacts on modern life.