

What do we know about the link between cosmic rays and climate?

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Although there is a general agreement that the solar activity affects the Earth's climate, details are still missing. One of the potential mechanisms of the solar variability influence upon the Earth's climate is via the cosmic ray flux bombarding the Earth's atmosphere that can affect the cloud formation. Here we review different pieces of evidence relating the terrestrial climate variability to changes of cosmic ray flux in the Earth's vicinity on different time scales. On daily scales, there are hints on the instantaneous relation between short term variations of cosmic rays and either the cloud amount / vorticity indices. At inter-annual scales, impressing correlation between low clouds and cosmic ray induced ionization has been found but it appears significant only in some geographical areas. Although a link between solar activity and climate seems plausible on millennial time scale, only a marginal correlation between palaeoclimatic data and geomagnetic field variations supports the idea of cosmic ray influence. On very long time scales, a close relation was reported between the global climate and variations of cosmic ray flux expected from changes in the local galactic environment. However, large uncertainties make this result only indicative. Although none of these facts alone is conclusive, in the aggregate they support the link between cosmic rays and the Earth's climate. These results are based on phenomenological relations, and theoretical development and experimental investigation of this hypothesis is ongoing.