

Link between Cosmic Rays and Climate on Different Time Scales

ILYA G. USOSKIN

Sodankyl'a Geophysical Observatory (Oulu unit), POB 3000, FIN-90014 University of Oulu, Finland (e-mail: Ilya.Usoskin@oulu.fi)

Recently, a new mechanism of solar variability influence upon the Earth's climate has been suggested, which links the cosmic ray flux bombarding the Earth's atmosphere with the cloudiness. Different pieces of evidence were presented relating the terrestrial climate variability to the changes of the cosmic ray flux in the Earth's vicinity. On the short time scale of few days, a statistical indications were presented that major Forbush decreases can affect the cyclogenesis in sub-polar regions. On the scale of 11-year solar cycle, a significant correlations between the latitudinal and time profiles of low clouds and cosmic ray induced ionization has been found. Longer-time scale offers more opportunities to check the validity of the cosmic ray climate links. It has been shown that different global and regional climate reconstructions depict a correlation with variations of the geomagnetic filed intensity throughout the last millennia, providing an additional support to a systematic effect of cosmic rays. On the very long time scales, a close relation was reported between the global climate and variations of the cosmic ray flux expected from the change of local galactic environment. Although none of these facts alone can pretend to make a solid prove, in the aggregate they provide quite a strong evidence confirming the link between cosmic rays and the climate on the Earth. These evidence are based on phenomenological relations, and the theoretical and experimental support to this hypothesis is in progress. Several possible mechanisms affecting the cloud formation are considered.