Impacts of Sun and cosmic rays on global climate changes

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Global warming may be the most dangerous factor that threatens the human civilization in the 21st century. The Intergovernmental Panel on Climate Change (IPCC) concluded that anthropogenic green house gases such as CO2 are the major contributors of global warming. However, many recent studies show that solar variation also plays an important role. Sun supplies almost all the energy to Earth, but ~ 30% of sun light is reflected back to space. Although solar irradiance is quite steady (~variation of 0.1% in one solar cycle), the albedo by clouds can changed and introduce large variation in solar irradiance arrived on Earth. Recent studies show cosmic rays produce many ionization in atmosphere, those ionized particle become cloud condensation nuclei and promote cloud formation. It is well known by cosmic ray physicists that cosmic rays are anti-correlated with solar wind and sun spot numbers. Such mechanism provides a direct link from solar variation to cosmic ray flux, to cloud coverage area on Earth, then finally the global temperature. This talk will review this intricate network of Sun, cosmic rays, and climate.