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## The climate is controlled by the solar irradiance

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The Earth's climate is a highly complex and non-linear system observed in the last quarter of the 20th century, simultaneously affected by numerous factors, dynamics and loops of climate changes on planets of the Solar system. The gradual feedback effects. The climate system depends at a weakening of the Gulf Stream power will result in an even stronger extremely complex set of long-term ( $\geq 20$  years) physical cooling in the zone of its action. All changes in the Earth's processes in the ocean-land-atmosphere system, which, in climate from the Little to the Big Ice Ages are due to cyclic turn, is influenced by diverse, mainly quasi-bicentennial change in the TSI, taking into account not only direct but also a variation of the total solar irradiance (TSI). If we take into more important subsequent secondary feedback effects. account only by the direct impact of Quasi-bicentennial variations. TSI order  $\sim 0.4\%$ , the resulting increments in the planetary temperature are small ( $\sim 0.3$  K); however, they are extremely important as a triggering mechanism of subsequent multiple feedback effects, which cause a significant change in the magnitude of the Earth's Bond albedo, the content of greenhouse gases in the atmosphere, and the transmission of the atmospheric transparency window. The climatic influence of these effects depends on the duration of the variation of TSI and may affect the climate up to three times as strong as directly TSI variations do. The direct effect of the quasi-bicentennial variations of the TSI accounts for about 25-30% of the observed change in the planetary temperature, and the remaining of the temperature change are determined practically by multiple influences secondary feedback effects. Quasi-bicentennial cyclic variations of TSI along with very important successive multiple influences of the feedback effects are the main fundamental cause of corresponding alternations of climate variation from warming to the Little Ice Age and by the main factor that controls the climate system. The impact of an increase in the area of the cloud cover, presumably caused by the growth of the cosmic rays flux, on climate is practically absent. The long-term ( $\geq 20$  years) equilibrium state of the Earth's average annual energy balance between the TSI coming into the outer layers of the atmosphere and the total energy radiation going out from the Earth into space from the entire atmosphere determines the practical stability of the climate. However, since  $\sim 1990$ , the Sun has been in the declining phase of the Quasi-bicentennial variation in TSI. The observed a practically proportional decrease in the average annual TSI portion absorbed by the Earth since  $\sim 1990$  has not been compensated by a decrease in the average annual energy radiated into space due to the thermal inertia of the oceans. Since  $\sim 1990$ , the Earth radiates more energy back to space than it absorbs. As a result, the Earth has, and will continue to have, a negative average annual energy balance and a long-term adverse thermal condition. Such a gradual loss in the total amount of the solar energy accumulated by the oceans during the twentieth century has resulted at the beginning of a new Little Ice Age after the maximum phase of solar cycle 24. In fact, the warming ended in 2016. The start of the solar Grand minimum is anticipated in the solar cycle  $27 \pm 1$  in  $2043 \pm 11$  and the beginning of the phase of deep cooling in the new Little Ice Age in  $2060 \pm 11$ . The solar irradiance defines the climate both of the Earth and other planets since long-term changes in the Sun's energy output can account for almost all.

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