Environ Risk Assess Remediat, Volume 3
DOI: 10.4066/2529-8046-C1-003

2nd International Conference on
Green Energy & Technology
April 08-09, 2019 | Zurich, Switzerland

The solar irradiance dictates the climate

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The climate system depends at an extremely complex set of long-term (≥ 20 years) physical processes in the ocean-land-atmosphere system, which, in turn, is influenced by diverse, mainly quasi-bicentennial variation of the total solar irradiance (TSI). If we take into account only by direct impact of variations TSI~0.4%, the resulting increment in the planetary temperature is ~0.3 K; however, it is 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. Their climatic influence may up to three times as strong as directly TSI variations do. 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 (≥ 20 years) equilibrium state of the average annual energy balance between the Earth and outer space determines stability of the climate. However, since ~1990, the Sun has been in the declining phase of the quasi-bicentennial variation in TSI. The observed practically proportional decrease in the average annual TSI portion absorbed by the Earth since ~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 ~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 gradual loss in the total amount of the solar energy accumulated by the oceans during the twentieth century has resulted in the beginning of a quasi-century epoch of a new Little Ice Age after the maximum phase of solar cycle 24. The warming ended in the 2016. The start of the solar Grand minimum is anticipated in the solar cycle 27±1 in 2043±11 and the beginning of the phase of deep cooling in the new Little Ice Age in 2060±11. Long-term changes in the Sun's energy output can to explain simultaneous climate changes on planets of the Solar system in the last quarter of the 20th century. The gradual weakening of the Gulf Stream power will result in even stronger cooling in the zone of its action. We have developing the special space project "Lunar Optical Observatory" on monitoring energy imbalance between the Earth and space.

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