

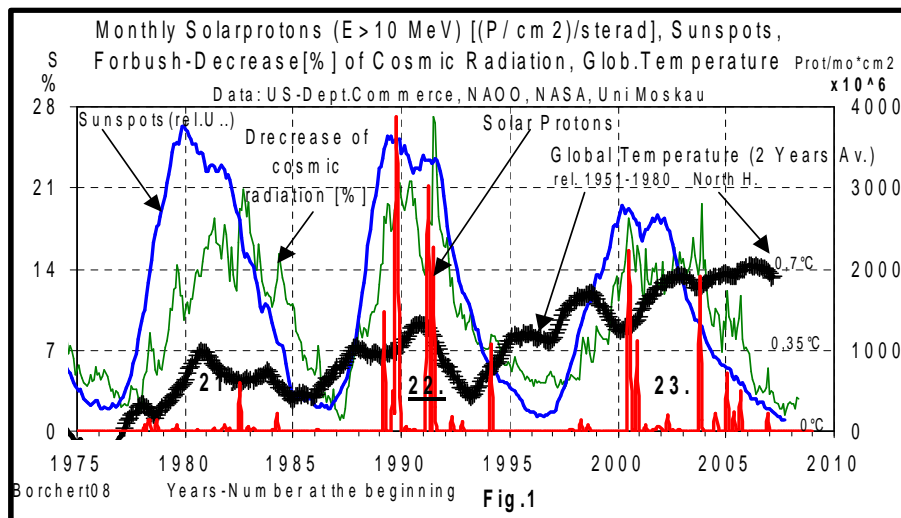
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Sun activities cause climate change

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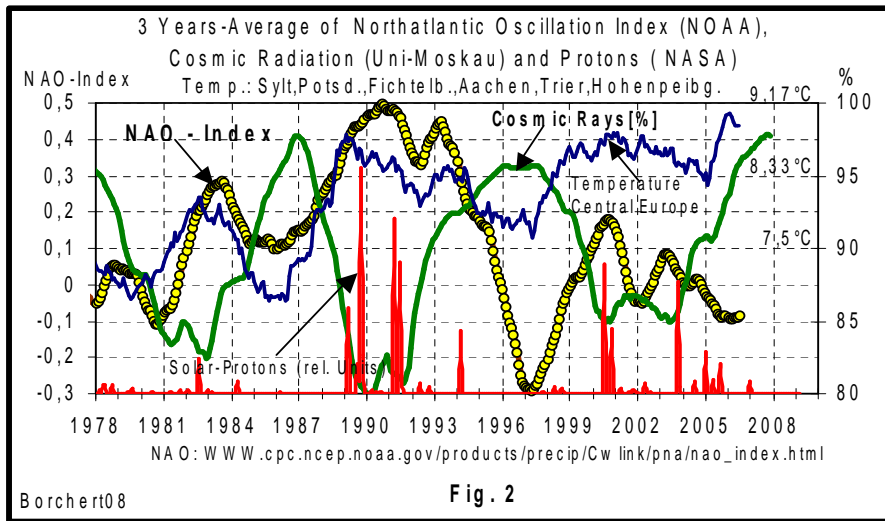
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Sudden strong increase of global Temperature in Europe and USA in the eighties after a long period of decrease since 1940 and in acquaintance with the observation that increasing global temperature is insufficient correlated with increasing CO₂, lead to the question, whether also extraterrestrial influences on earth cause climate change. Such extraterrestrial influences are secondary particles of cosmic radiation (Höhenstrahlung). Their time series are obtained by continuous measurements of their neutrons since 1958 in some nuclear physical Institutes world wide and published in the Data Centre C2 in Kyoto. So we have studied measured meteorological components in correlation with cosmic radiation during climate change since the eighties: Following the postulation of Svensmark (1989), that secondary particles of cosmic radiation produce clouds (“Svensmark effect”), we found a relatively good correlation between neutron flux and cloudiness in Germany. Cloudiness has continuously been measured and published by “Deutscher Wetterdienst” (DWD), the official weather prognosis institution in Germany. Correlation factors were found up to $K = 0,8$ in the time period from 1982 to 2008. The weakening of cosmic radiation, called “Forbush Reduction”, is caused by the magnetic field of solar proton flux from the sun wind: When Flares occur, that are solar emitted Röntgen rays (about 1nm), solar protons are emitted from sun spots. They reach velocities of 300 to 700 km/sec. Flares and solar protons have been measured by stationary satellites positioned between earth and sun. The results are in Internet published by the NASA too. By Svensmark effect modulated cloudiness modulates global radiation (sun shine) and finally ground near air temperature. On this way sun activity causes by Forbush reduction of cosmic radiation with Svensmark effect the increase of global temperature at ground level (Fig.1).



The strongest Forbush reduction of about 27 % in the northern hemisphere was measured in the year 1989 during the 22nd. Sun spot cycle. This event started a fast increase of global radiation in the following two years of about 1,2 mW/cm² (sun shine intensity in units of yearly averages) in the region of the 50 degree altitude in Central Europe. That are about 10 % of the yearly averages. This caused an increase of the ground level temperature of about 0,9 °C +- 0,2 °C in Central Europe and USA in this time interval, called “climate jump 2”. During the following 18 years cloudiness shows in Central Europe a long time reduction, while global radiation and ground level temperature slowly increase and remain at some higher levels finally constant nearly regardless of some extreme summer and winter month. In 2007 after a short increasing jump, we can observe a tendency of small decreasing ground near temperature at several measuring places f. i. at Säntis in the Alps. A similar behaviour shows the global temperature at the northern hemisphere (Fig.1). The period of extreme sun activity has started in the eighties and has finally stopped with the last sun spot in December of 2006. Looking for further influences of cosmic radiation on terrestrial weather components, we

find a relatively good correlation between Forbush modulation of cosmic radiation and North Atlantic Oscillation Index (NAO), ($K \sim 0,7$), since the beginning of the eighties (Fig.2).



The modulation of NAO is surely caused mainly within the whole region of the North Atlantic by Forbush modulated cloudiness. Therefore the observed delay of cloudiness modulation in relationship to cosmic radiation (as Neutron flux) on the European continent of about 7 to 12 months is plausible. The weather in the northern hemisphere, modulated by NAO, is steered by cosmic radiation and finally by sun activity too. The result of these investigations is: Climate change during the last thirty years was at least in the northern hemisphere mainly natural and not anthropogenic. There was no risk in the past, and it seems that in the future climate change is natural too without any human risk.

Key Words Sun Activities, Climate Change, Cloudiness, Global Temperature, Global Radiation, Cosmic Radiation, Sun Wind, Svensmark Effect, Forbush Reduction, North Atlantic Oscillation.