Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

ACG034-01 Room:102 Time:May 27 08:30-08:45

Stagnation of global warming in the mid 20th century can be explained by atmospheric nuclear explosions

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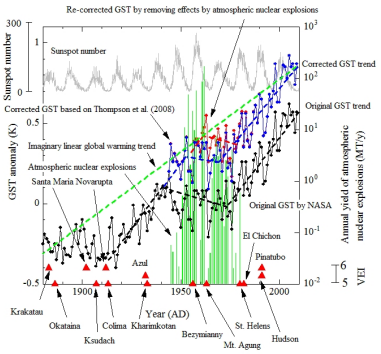
GST has been rising from 1880 to 2010. This phenomenon is, of course, called global warming at present. GST shows stagnation between 1880 and 1917 although GHG has been rising in this period. This stagnation would be due to the inactive sun and the giant eruptions with VEI rating of 6. It is known that sulfate aerosols from giant eruptions reach the stratosphere and shade insolation thereby lead GST drop. Stagnation of 0.5K can be seen between 1945 and 1976 and would not be explained by solar activity and eruptions because the sun was very active until 1965 and VEI ratings of eruptions of Bezymianny in 1956 and Mt. Agung in 1963 are only 5 and they occurred after the GST drop in 1945.

This stagnation in global warming in mid 20th century could not be simulated by the latest AOGCM. Hansen et al. (2007) suggested natural oscillations and soot blown to the Arctic from industrial activity at the outset of World War II as possible causes. Nagashima et al. (2005) suggested increase in organic aerosols and Schledinger & Ramankutty (1994) suggested AMO. AMO is, however, in the current author's opinion, not a cause but a result from some radiative forcings. Thompson (2008) suggested that the discontinuous 0.3K GST drop in 1945 was due to change in the measuring method for SST. The stagnation, however, can still be observed after adding 0.3K to GST after 1945 with smaller duration and GST drop of 0.3K.

It is known that 504 atmospheric nuclear explosions with total yield of 440 MT were carried out during 1945 and 1980. This period coincides with the stagnation period. It was predicted that submicron soot and dust which were generated by nuclear wars with 100-5000 MT yield inhibited insolation and caused GST drop which was large enough to exterminate human in some cases (well known as "Nuclear Winter" by TTAPS, Robock et al. 2007, etc.). GST drop by soot was considered to be the main cause of GST drop in the studies. The actual atmospheric nuclear explosions were ignored in those studies because nuclear weapons tests did not cause soot and Hiroshima and Nagasaki were very small yields although they generated soot. TTAPS also showed effects of dust as well as soot. GST drop by nuclear weapons tests was estimated based on TTAPS results. GST drop by Hiroshima and Nagasaki was estimated based on the latest AOGCM results shown in Robock et al. (2007). Tests on sea and at high altitude were not included in the calculation. Dust amount which was injected into stratosphere was estimated considering explosion altitude and nuclear yield which affected radius of fireball and the altitude of mushroom cloud. The estimated GST drop showed a peak value of 0.17K and was mainly due to the large yield Hydrogen bombs by Soviet Union. GST which was corrected again by the estimated nuclear explosion effect rises straight from 1917 to 1965 and then slightly dropped by 0.2K till 1976. This drop can be attributed to the inactive sun between 1965 and 1976.

Arakawa (1954) suggested that the extraordinary cold summer in Northern Japan might be due to the hydrogen bomb tests at Bikini atoll by US. Landsberg (1958) also pointed out possible effects of hydrogen bombs. Kondratyev (1988) suggested air temperature drop by NO2 generated by the hydrogen bombs. Hishida (2001 in Japanese), not quantitatively, but pointed out possible effects of the raids at the end of the World War II and atmospheric nuclear explosions afterwards on SST and GST.

Atmospheric nuclear explosions can be regarded as full-scale in situ tests for nuclear winter. This research first gives evidences to nuclear winter, which was just simulation before. It is expected that the nuclear deterrent would be strengthened. Mt. Agung eruption seems to be overestimated in the present climate simulations to mitigate contradiction between observation and simulation. The global climate can be more precisely predicted by adjusting parameters considering the effects of atmospheric nuclear explosions.



Keywords: global warming, atmospheric nuclear explosions, nuclear winter