Table 1 Atmospheric nuclear explosions used in the calculation for GST drop by country.

Country	Number of tests	Period (AD)	Yield (MT)	Test sites
US	8	1945-1957	0.264 (0.015-0.044)	Hiroshima (1) Nagasaki (1) Nevada (6)
USSR	88	1951-1962	242 (0.027-50)	Semipalatinsk (19) Totsk (1) Novaya Zamlya (67) Kapustin Yar (1)
France	1	1961	0.067	Algeria (1)
China	13	1966-1980	20.2 (0.04-3)	Lop Nor (13)

Table 2 Values used for the calculation of GST drop by limestone powder injection.

Average GST T	288 (K)
Density ρ	2711 (kg/m^3)
Diameter d	1×10^{-6} (m)
Surface area of the earth A_E	5.101×10^{14} (m^2)
Average duration t_s	3-30 (y)
Reflectivity μ (Kitada, 2010 in Japanese)	0.4-0.7 (-)
GST drop ΔT	0.6 (K)

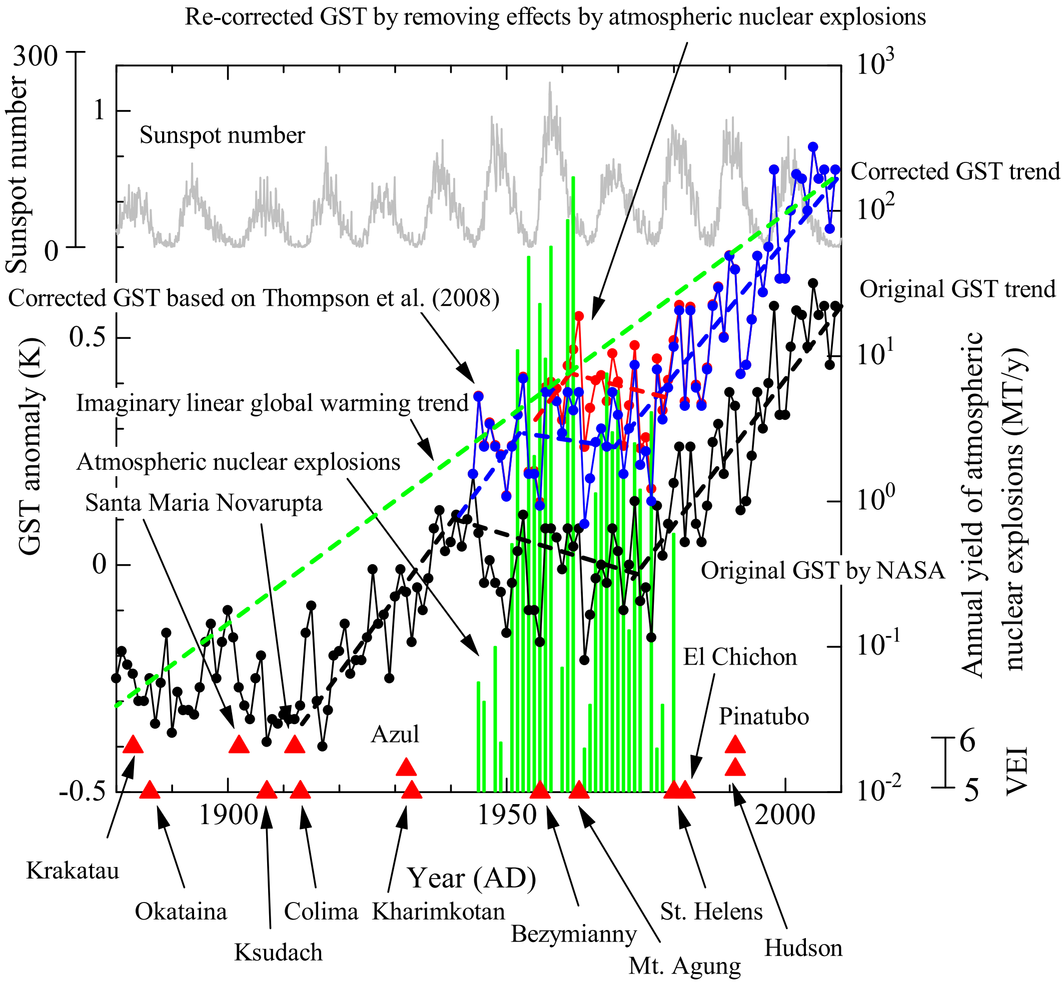


Fig. 1 Anomaly in global-mean surface temperature (GST) (source: http://data.giss.nasa.gov/gistemp/graphs/Fig.A2.txt) between 1880 and 2008. Black line: original data and their trend (the broken line). Red triangles: eruptions whose VEI (volcanic explosivity index) is equal or greater than 5 (source: http://www.volcano.si.edu/world/largeeruptions.cfm). Green vertical bars: annual yield of atmospheric nuclear explosions (UNSCEAR, 2000). Blue line: corrected GST (0.3K was added to GST data of 1945 and later) based on Thompson et al. (2008) and its trend (the broken line). Red line: re-corrected GST anomaly based on effects of atmospheric nuclear explosion (Δt was set at 3 years) and Thompson et al. (2008), and its trend (the broken line). Green line: imaginary linear global warming trend. Gray line: sunspot number (source: ftp://ftp.ngdc.noaa.gov/STP/SOLAR_DATA/SUNSPOT_NUMBERS/INTERNATIONAL/monthly/monthly.plt)

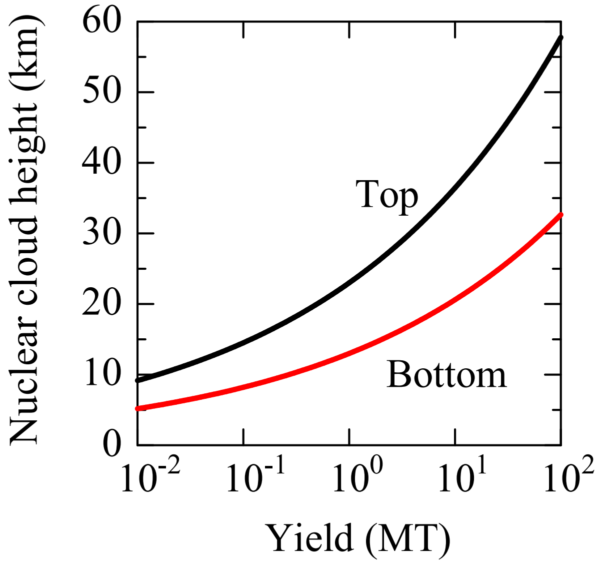


Fig. 2 Top and bottom heights of nuclear cloud

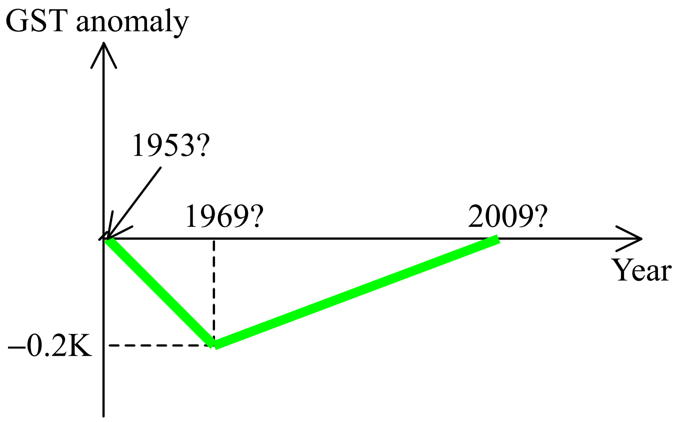


Fig. 3 Intuitive prediction on the effects of actual atmospheric nuclear explosions on GST. GST anomaly due to atmospheric explosions might be as the function starting around 1953 with the peak GST anomaly of 0.2K in 1969.

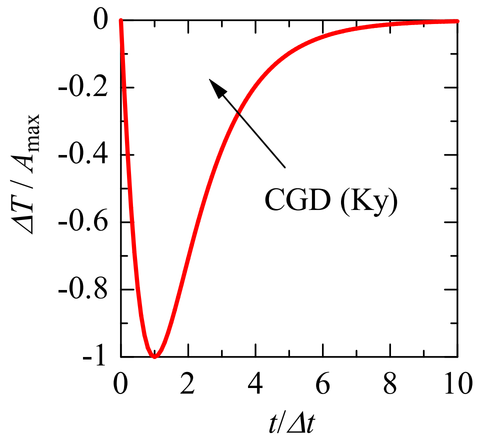


Fig. 4 Assumed GST drop-time function and the concept of CGD (cumulative GST drop).

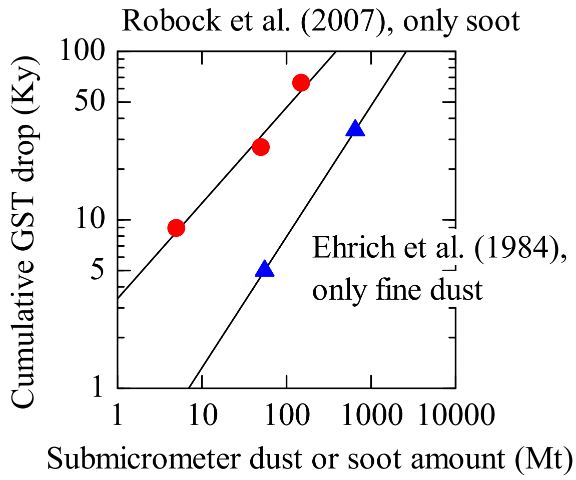


Fig. 5 Relationship between sub-micrometer dust or soot amount and cumulative GST drop (CGD) due to nuclear war based on Ehrlich et al. (1984) and Robock et al. (2007).

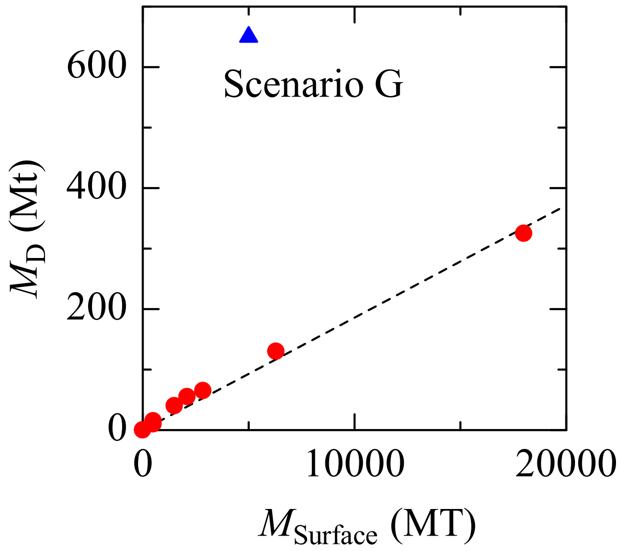


Fig. 6 Relationship between the amount of sub-micrometer dust M_D and the yield of surface bursts $M_{Surface}$ in the Table on p. 28 of Turco et al. (1984)

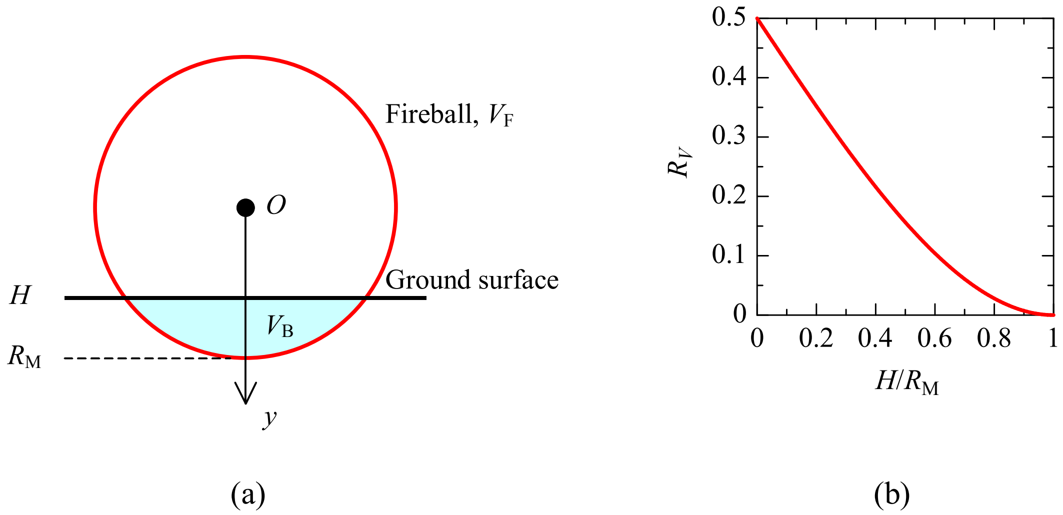


Fig. 7 The model to calculate the ratio R_V of fireball volume below the ground surface V_B to the entire volume V_F (a) and R_V vs. ratio of explosion height to the maximum radius of fireball (b).

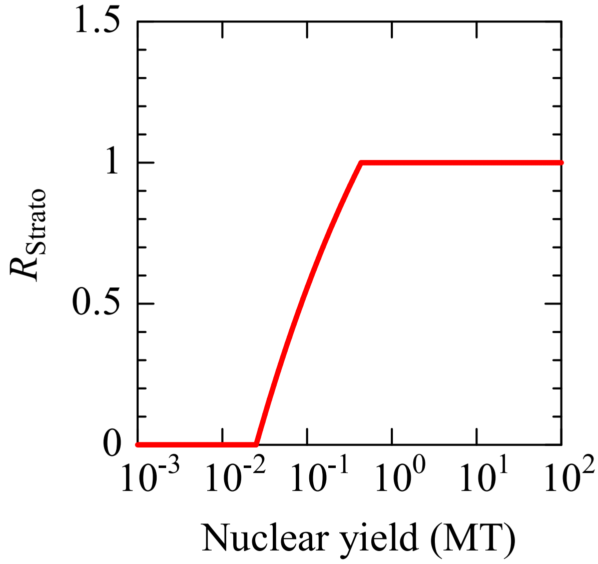
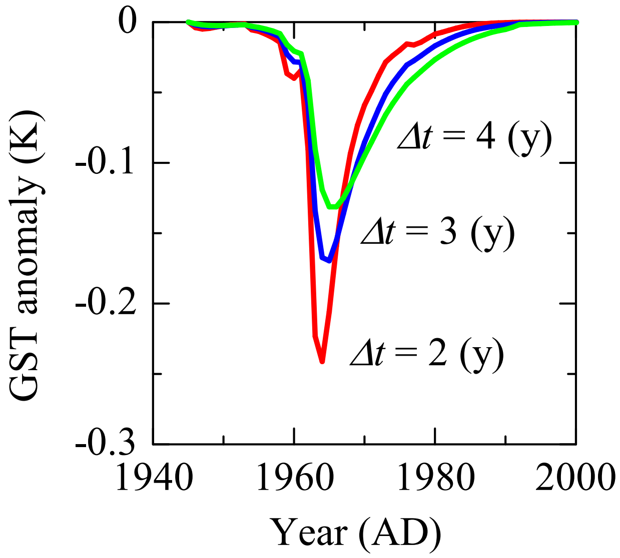
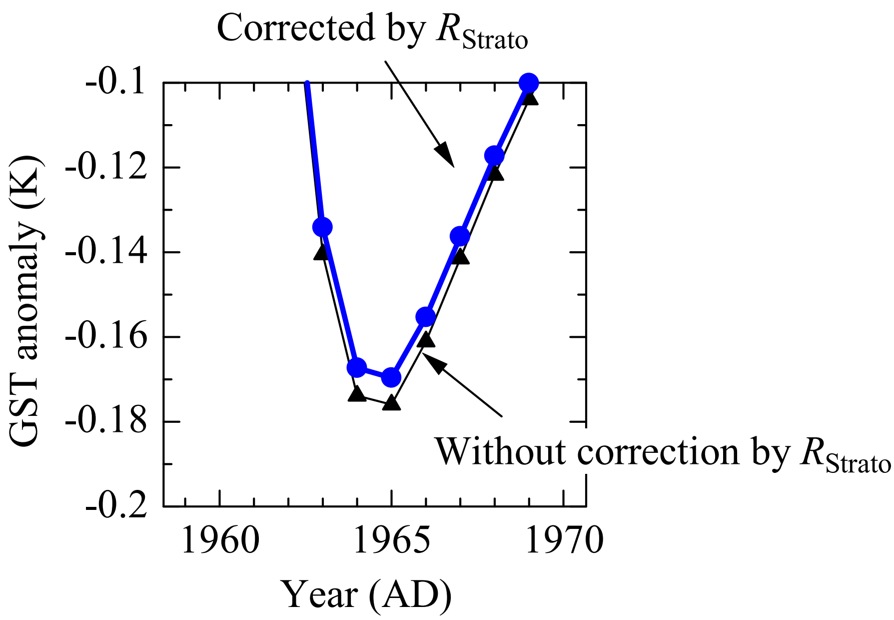


Fig. 8 Nuclear yield and R_{Strato}



(a)



(b)

Fig. 9 (a) GST anomaly by atmospheric nuclear explosions assuming Δt in Eq. 9 as 2, 3 and 4 years and (b) GST anomaly without correction for the stratosphere ratio for Δt = 3 (y) is added by the thin line to a magnified plot around the GST anomaly peak.

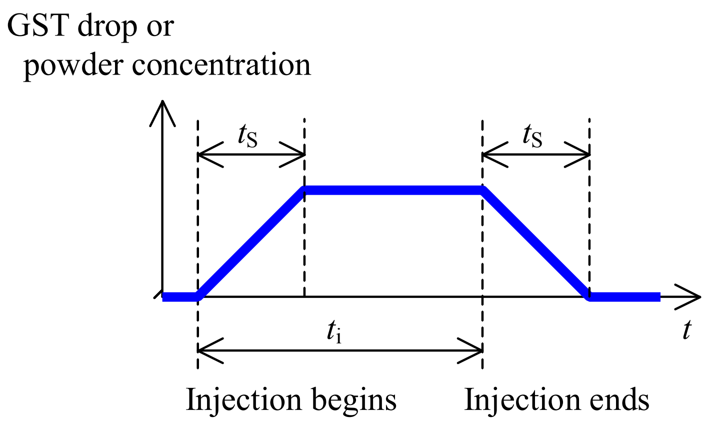


Fig. 10 Schematic figure showing GST drop or amount of limestone powder in the stratosphere by injection of fine limestone powder.