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Changes in Japanese sunshine duration during the 20^{th} century correlate with the Northern Hemisphere temperature anomaly

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Widespread significant changes in global radiation at the earth's surface during the past half century have been documented for many places on the globe. The data series showing the largest change are those measured with thermopile pyranometers in standard weather stations, while the changes are less apparent in the shorter term satellite estimates of surface irradiance. One way to increase our understanding of these changes is to extend the global radiation records by using proxy climate measurements. This study is based on two studies that established century long series of global radiation from proxy measurements of sunshine duration in the US and Japan. In the USA, sunshine duration was lowest at the beginning of the 20^{th} century, rose to a peak in the 1930's, then declined until 1945, increased to 1958 and then decreased to intermediate values by the late 1960's followed by a period of small changes until the end of the series in 1982. For Japan, the national average from 1890 to 2002 showed a steep rise in the first half of the 20^{th} century followed by a decline between 1945 and 1955, recovering steeply to a secondary peak by the end of measurements in 2002. The decadal trends of normalized anomalies of SS in Japan showed some similarity with those in the USA but with a somewhat greater range and a ten year lag in peaks and troughs. After 1960 it differed markedly from that in the USA in that it showed no evidence of a subsequent decrease. Both time series show a high degree of autocorrelation for a one year lag, presumably reflecting the sustained nature of climate patterns that influence global radiation. The pattern obtained for Japan most resembled that of surface air temperature in the Northern Hemisphere (Jones and Moburg, 2003). Concurrent annual values showed a very highly significant linear correlation (R^2= 0.708 , P= 0.0001) rising to R^2= 0.781, (P= 0.0001) for the correlation of global radiation in

Japan and Northern Hemisphere surface air temperature anomaly (NHA) in the preceeding year. Stepwise regression of NHA on year and Japanese sunshine duration showed that the correlation is significant even after the linear time trend component is removed. Other reports of a correlation between global radiation in North East Asia and Northern Hemisphere temperature are cited.