

GHE024-10

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Different views on warming and cooling phases appearing in the secular trend of global mean atmospheric temperature

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Callendar, G.S. (1938) first compiled a temperature curve representative of the globe from 1881 to 1935 on the basis of 150 stations records. He obtained a global warming of 0.5 degrees centigrade per 100yr. The title of the paper was 'The artificial production of carbon dioxide and its influence on temperature'. It is noteworthy that researchers in those days were focusing their thoughts on the anthropogenic influence on climate. From the beginning of the twentieth century to around 1940, the global average air temperature had shown an apparent, near linear with time, increasing trend. The rise in temperature was up to 0.6 degrees centigrade, which seemed to be interpreted in terms of anthropogenic effects. The following description quoted from Ellsaesser H.W. et al.(1986) could help provide a better understanding of the situation in those days, 'The collection and archiving of worldwide weather records began in 1881, near the apparent temperature minimum of 1883. If the present temperature curves extending back to 1850 or beyond had always been available, it is unlikely that there would now be the present degree of concern over the climatic effect of CO₂'.

This rapid increase in temperature was followed by a phase of gradual cooling at around 1940. Though they were addressing themselves to problems of climate change caused by human activity, researchers admitted the observations. Mitchell(1975) stated 'It appears that the cooling trend which first set in during the 1940s has continued essentially up to the present time, and that the net temperature drop in the last quarter-century has now accumulated to almost 0.3 degrees centigrade. To date, then, roughly half of the warming that occurred during earlier decades of the century has been erased by subsequent cooling. One cannot say offhand whether or how long this cooling will continue in the future'.

For the cause of variations of this nature, the upward swing in air temperature due to the increase in anthropogenic carbon dioxide can not be the solution. Various external forcings such as volcanic eruptions and changes in solar radiation were considered. It is special importance to note that E. Lorenz(1968, 1970, 1976) and others developed the theory of internal causation of climate change.

At around 1970, a transition from the cooling phase to the phase of remarkable warming occurred. Discussions had tended to focus on overall rise in global mean temperature, with little consideration on observed phase transitions. Hansen, J. and S. Lebedeff(1987) presented a typical view. This forms the basis of IOCC's approach.

Keywords: Climate change, Global warming, Global mean atmospheric temperature, Edward Lorenz, IPCC, G.S. Callendar