

Climate Change and Its Impacts on the Korean Environment

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The concentrations of greenhouse gases have been measured at the Korea GAW (Global Atmospheric Watch) Center since 1998. During the period 1999-2006, the concentration of carbon dioxide increased at a rate of 2.6ppm per year. However, the concentrations of methane and nitrous oxide do not show any significant trend. A long time series (1911-2006) of annual mean air temperature at 14 stations in Korea reveals that the diurnal temperature range(DTR) has levelled off since the late 1970s, while there have been, during the period 1911-1970, nation-wide warming trends of 1.2, 2.1 and 2.8°C per 100 years for the mean annual maximum, mean and minimum temperatures, respectively.

In the past, most of the summer rainfall was accompanied with the Changma front (sub-stationary polar front) which tends to persist for about one month from late June to late July. However, after the 1970s, the summer heavy rainfall tends to occur from late July through August (often up to early September) with increased frequency of heavy precipitation. Furthermore, the recent rainfalls frequently show a pattern of irregular heavy rainfall under the influence of strong atmospheric instability, topographic effect and so on, rather than the continuous and systematic nature of rainfall accompanied with the Changma front in the past

To assess possible influences of wind speed on climatological value of the DTR, annual normals of both maximum and minimum temperature as well as wind data at 14 stations are used. A tentative result shows that the DTR seems to be inversely proportional to the wind speed at non-urban stations. A trend analysis on the climatological characteristics of tropical cyclones (TCs) shows a northward shift of their genesis latitude, and a noticeable increase of the occurrence frequency of TCs whose intensity is greater than tropical storm.

There were four distinct seasons in Korea. Recently, however, the length of winter has become shorter with longer summer than the past. Based on current model simulation, it is very likely that the flowering dates of Japanese Cherry is expected to be earlier by 9, 21 and 29 days, compared with the current normal (1971-2000), in the future normal years 2011-2040, 2041-2070 and 2071-2100, respectively. (Five days earlier flowering than normal was recorded in Seoul this year). Studies on the relationship between temperature rise and changes in the northern limit of vegetation growth in Korea show that the northern limit of bamboos (*phyllostachys*) moved northward about 60-100km during the period 1907-2003. The boundary between the northern type and the southern type of garlic also moved northward about 40-140km

since the early 1980s. Northward shifts of main producing districts of several agricultural products (e.g., rice, winter potato, winter Chinese cabbage, apple, etc.) are also reported.

The average rise of SST(Sea Surface Temperature) during the last 39 years is 0.93°C (the East Sea and the Yellow Sea: 0.97°C , the South Sea: 1.11°C) and its annual rising rate is 0.067°C during the last decade (1995-2004).

The average rising rates of sea level in the Yellow Sea and the East Sea are 1.0-2.0mm per year over the last 49 years (1960-2006). There are some evidences that the sea level rise is quicker in the South East than other two Seas. Northward shift and widening of fishing ground, during winter season in particular, in the Korean Water are good examples of global warming and its impacts on major fisheries in Korea. All evidences above suggest that global warming could alter the plant phenology and marine ecosystem of the Korean Peninsula with unpredictable consequences.