Weather Date Information

The water quality models require daily weather data as model input, which includes **daily** *air temperature* (^{o}C), *dew-point temperature* (^{o}C), *wind speed* (m/s), *wind direction*, *solar radiation* (langely = cal/cm^{2}), *cloud cover*, *rainfall* and *snowfall* (precipitation). The 1961-1990 data are obtained from SAMSON (Solar and Meteorological Surface Observation Network), developed by the National Climatic Data Center (NCDC) of the U.S. Department of Commerce and the National Renewable Energy Laboratory of the U.S. Department of Energy. The 1990-1995 data are obtained from the Hourly United States Weather Observations, developed by the National Climatic Data Center (NOAA - National Oceanic and Atmospheric Administration) of the U.S. Department of Commerce and the U.S. Environmental Protection Agency.

The data format obtained from NCDC can be found from the following URLs for 1961-1990 and 1990-1995 data, respectively.

http://www.ncdc.noaa.gov/pub/software/cdrom/samson/format.txt
http://www.ncdc.noaa.gov/pub/software/cdrom/huswo/format_m.txt

The data used from NCDC are direct radiation, total sky cover (amount of sky dome covered by clouds), dry bulb temperature, dew point, wind direction (in degrees, N = 360, E = 90, S =180, W = 270), wind speed (m/s), and hourly precipitation. Snowfall was converted from equivalent water (precipitation data) if air temperature was below 0^{o}C (32^{o}F).

Missing Weather Data Replacement

I. Missing Data Description:

According to the missing data pattern, the weather data from 1960-1995 can be categorized into three cases:

1. 1960-1979 (having 209 weather stations in contiguous U.S.):
   There is no missing data.

2. 1980-1990 (209 weather stations):
   There are some missing data.
   Characteristics: all kinds of missing data are spraying into 209 weather stations in the contiguous U.S.

3. 1990-1995 (having 261 weather stations):

There are lots of missing data.

Characteristics: missing data concentrates on *cloud cover* and the corresponding *solar radiation*.

II. Replacement Strategies:

According to the different missing data pattern, there are four replacement strategies used:

a. If the number of continuous days with missing data is less than four continuous days, we estimate the weather data by interpolation.
b. If the number of continuous days with missing data are more than 4 days and less than 15 days, we calculate the yearly average of the previous two years first; then estimate the data from previous year's data according to the ratio of annual average.
c. If the number of continuous days with missing data is more than 15 days, we replace the data with the data of the closest weather station.
d. If cloud cover is known, but solar radiation is missing, then solar radiation was estimated from cloud cover, geographic location of weather station, date and time of a year.