Station data

What does data from a station tell you?

What can station data not tell you?

What are some of the things you should look for in your particular station data record?

- Meta data
- Other stations with different station IDs
- Reconcile the number of days with the meta data
- Missing data – how much, what do you do with it?
- Can you fill in the data?

Station data

Causes of inhomogeneity

Station relocation – effect of buildings, vegetation cover

Changes in instrument housing

Changes in instrumentation

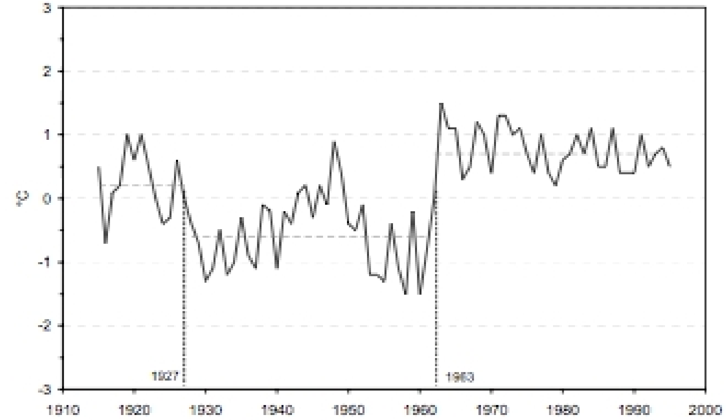


Figure 1. Difference between the annual mean of the daily minimum temperatures of Amos and a reference series computed from surrounding stations.

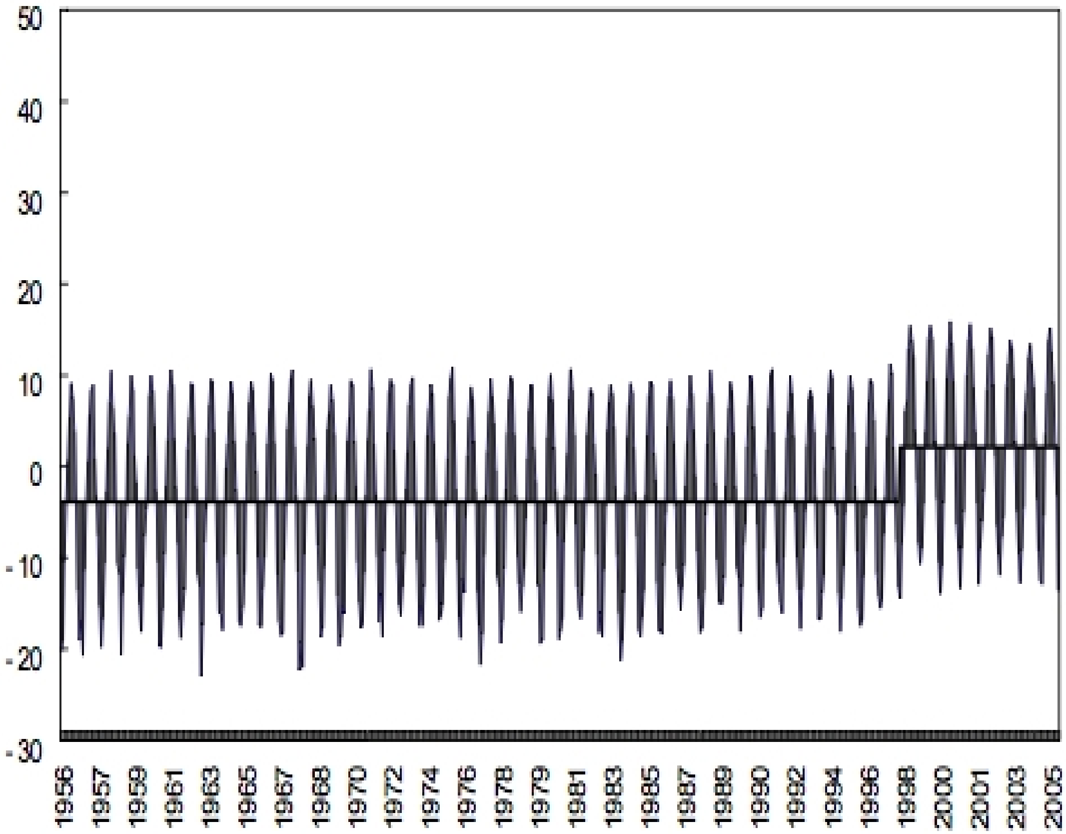


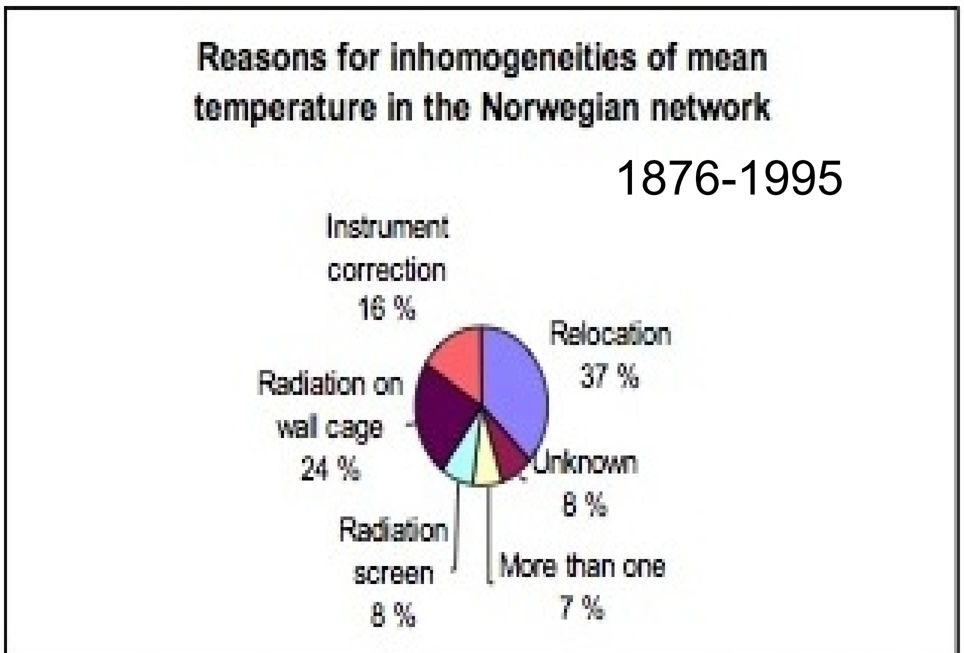
Figure 1. Step change (Jan 1998) in monthly mean surface air temperatures series on Wutaishan (53588)

Figure 2. Screen location before and after 1963.

Station data

Causes of inhomogeneity
Stations

Station relocation – effect of buildings, vegetation cover,
Changes in instrument housing
Changes in instrumentation



12. Impact of Site Exposure on Pan Evaporation in Australia

Blair Trewin, National Climate Centre, Australian Bureau of Meteorology

Pan evaporation measurements are highly sensitive to wind speed near the pan surface. In turn, wind speed near the ground is strongly influenced by local site exposure. Hence, any change in local site exposure, such as vegetation growth or building construction near an evaporation pan, can have a major impact on observed pan evaporation.

An example of the impact of vegetation growth on pan evaporation is the situation at Rabbit Flat (20°11' S, 130°01' E), one of the most remote observing locations in Australia, in the central west of the Northern Territory (Fig. 1). The old site became progressively more overgrown through the 1980's and 1990's, and was closed at the end of 1998. A new, much more exposed, site was established 198 metres to the west in late 1996, giving two years of parallel observations of pan evaporation, as well as of wind speed at the pan surface.

During the two years of parallel observations (Fig. 2), pan evaporation at the new site was 32% greater than that at the new site, whilst mean wind speed at the pan surface (not shown) was nearly three times that at the old site (6.0 km/h at the new site, 2.2 km/h at the old).

Figure 1. Rabbit Flat observing sites – new site (left, taken in 2006) and old site (right, taken in 1997).

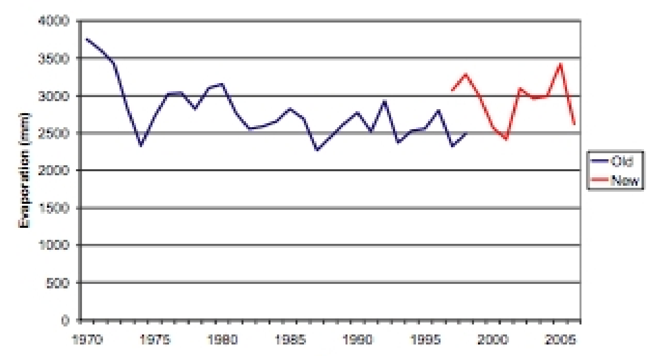
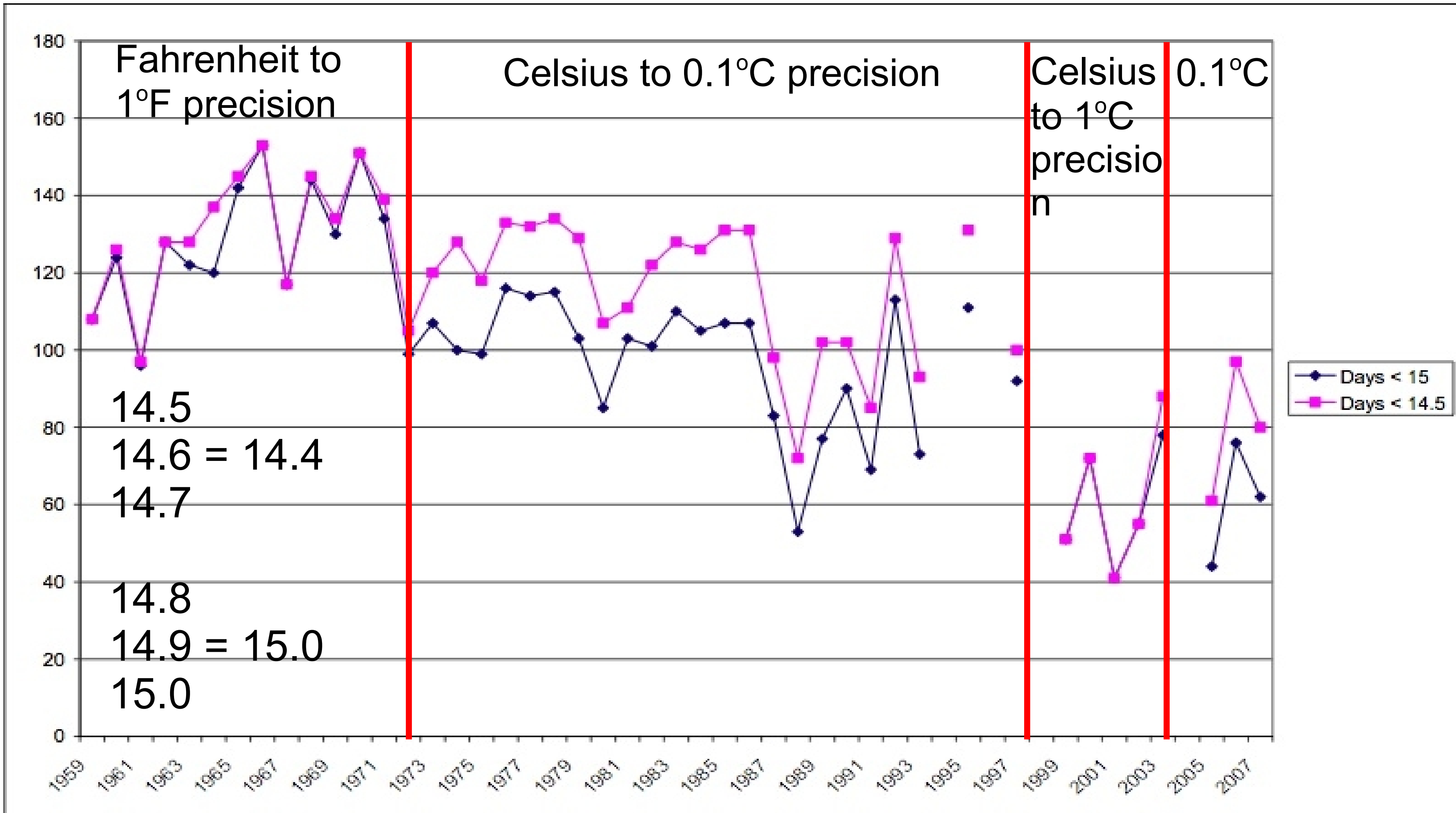


Figure 2. Rabbit Flat annual pan evaporation, old (1970-98) and new (1996-2006) sites.

Station data

Causes of inhomogeneity
Stations
Changes in recording procedures (precision)



Annual number of days with maximum temperatures below 15.0°C (blue line) and 14.5°C (pink line) at Eddystone Point. Note that the numbers closely or exactly match during the 1959-1972 and 1999-2003 periods.

<u>Station data</u>

Causes of inhomogeneity
Stations
Changes in recording procedures (precision)

Due to the low variability of winter temperatures at Eddystone Point the number of days with maximum temperatures in the 14.5-14.9°C range is substantial (a mean of 19 days/year over the 1973-1997 period).

As a consequence, measuring temperatures to a precision of 1.0°C results in a negative bias of approximately 19 days/year (16% of the 1961-90 mean annual total) in the number of days with maximum temperatures below 15.0°C at this location.

A negative trend in the number of days with maximum temperatures below 15.0°C would be expected given the trends in mean maximum temperatures (approximately +0.6°C over the 1960-2007 period over the year, and +0.8°C for winter), but the changes in data precision have exaggerated the recent decline.

Radiosonde data

Causes of inhomogeneity

Changes in sensor type and design

Changes in sensor housing

Changes in balloon type, balloon rate of rise, and the length of the cord attaching the sonde to the balloon

Changes in data correction methods for radiation and lag errors

Changes in ground systems, including balloon tracking methods and data processing techniques

Changes in ground station location

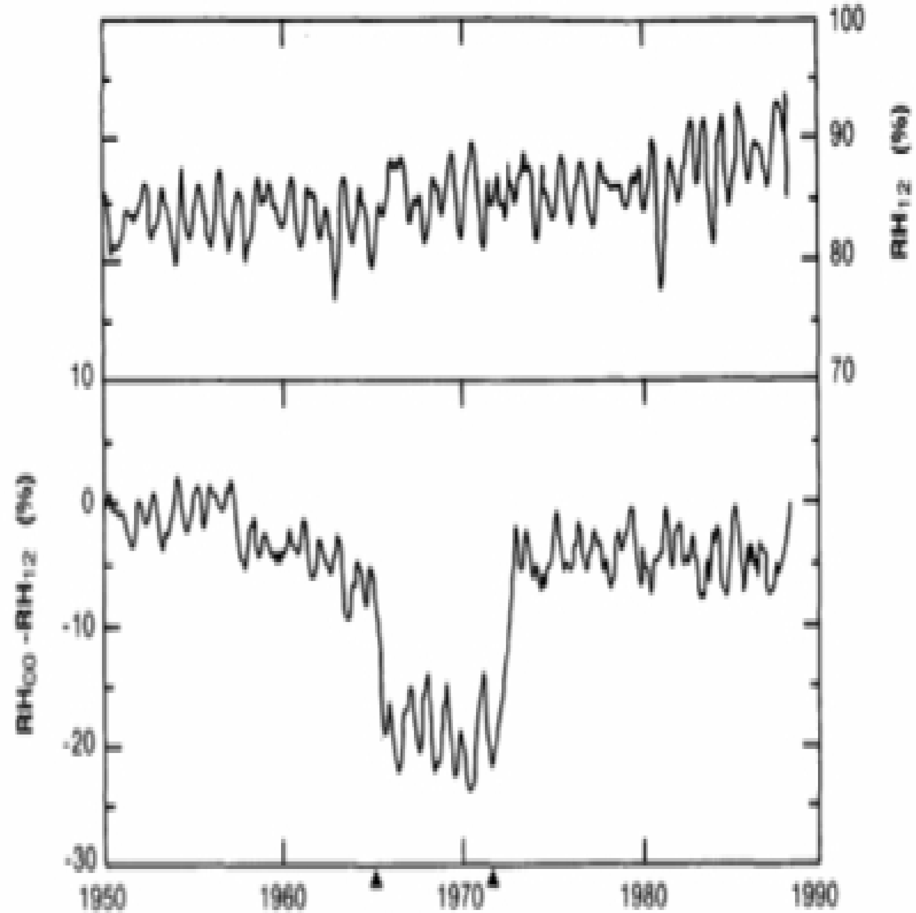


Figure 2. Monthly 850 hPa relative humidity anomalies at Hilo, Hawaii. The top panel shows nighttime (1200 UTC) observations, and the bottom panel shows the day/night difference (0000 minus 1200 UTC). Triangles show dates of a change in humidity sensor type in 1965 and a change in the housing of the humidity sensor in 1973. During the period 1965-1973, daytime relative humidity RH observations were about 15% RH lower than the preceding and following periods, but nighttime data appear unaffected. (Before 1957, soundings were taken at 0300 and 1500 UTC, but the data are plotted here as 0000 and 1200 UTC data.) (Taken from Elliott and Gaffen (1991), Figure 4.)

Station data

Some Quality control

Temperature

Missing data – minimum temp > maximum temp → missing data

Outliers – mean +/- 4-6 std dev → manual verification

Precipitation

Missing data – Any rainfall < 0 set to missing data

Outliers and accumulation

-mean +/- 4-6 std dev → manual verification

-Visual inspection

-Surrounding stations

RClimDex

Errors caused by change to station instrumentation, station location, observation procedure

Identify step changes in station temperature time series

Gradual changes in the record e.g. Rural station record reflects changes as it becomes more urban.

-Difficult to assess

Rhtest

Important to have metadata available for the stations

Caveats to keep in mind when generating statistics of station data

How to create a monthly time series with missing values?

Contrast missing values for T as opposed to PPT

No monthly average calculated if more than 90 % days missing

Trend analyses

Minimum of 30 years of data from a station

Allowed a maximum of 10 % missing data for precip. and 25 % for temperature