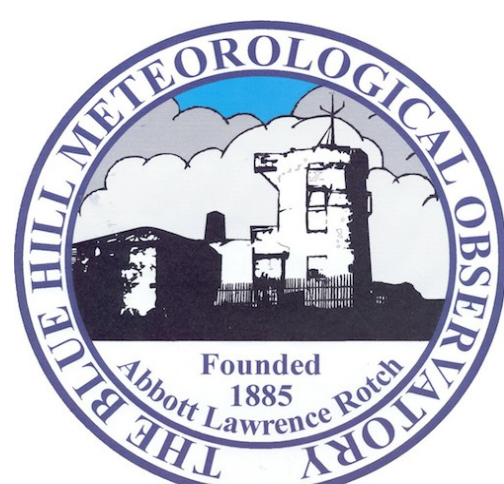


135 YEARS OF DAILY OBSERVATIONS AT THE BLUE HILL METEOROLOGICAL OBSERVATORY

MICHAEL J. IACONO^{1,2}, BENJAMIN TURNER¹, and DONALD McCASLAND¹

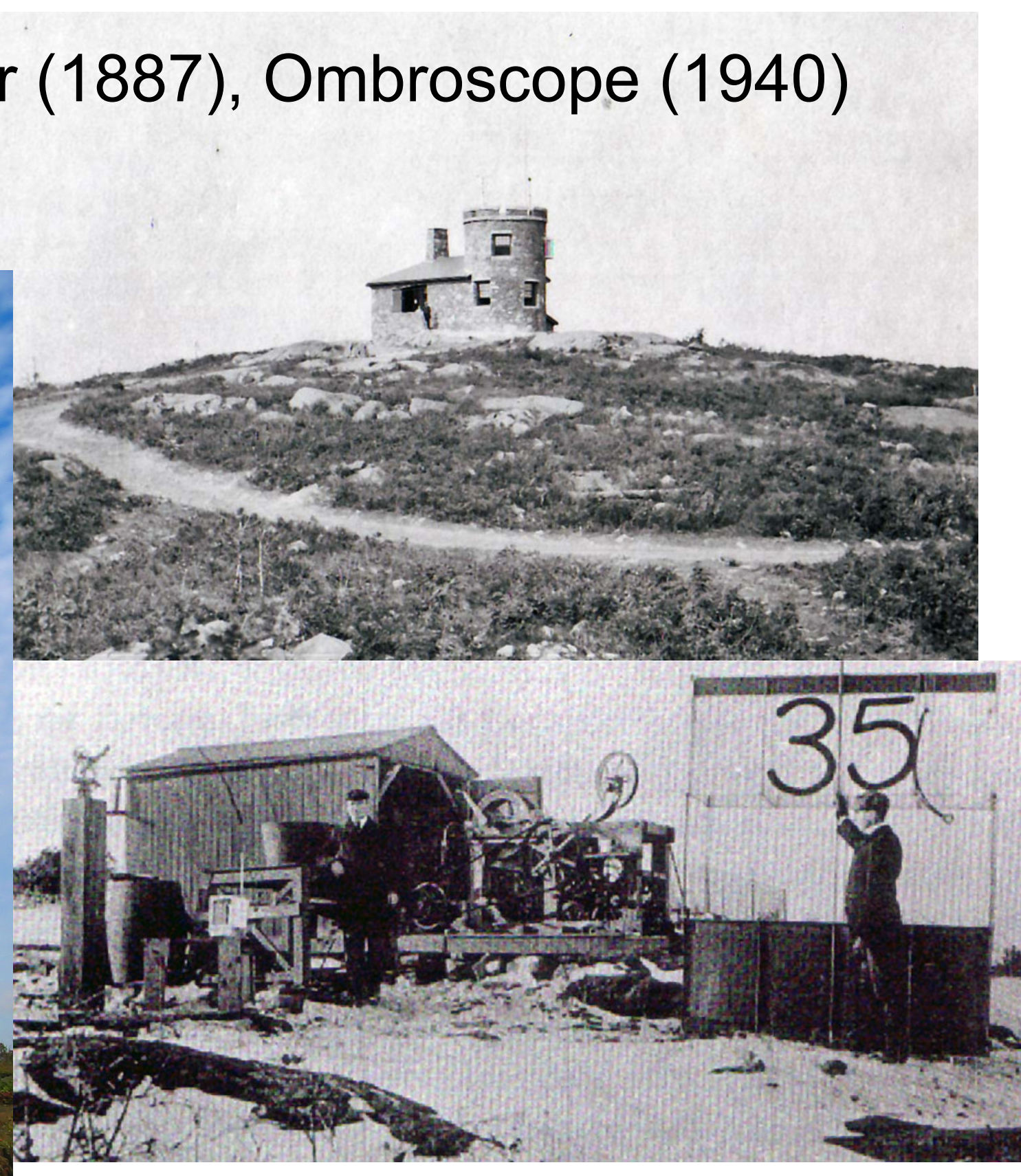
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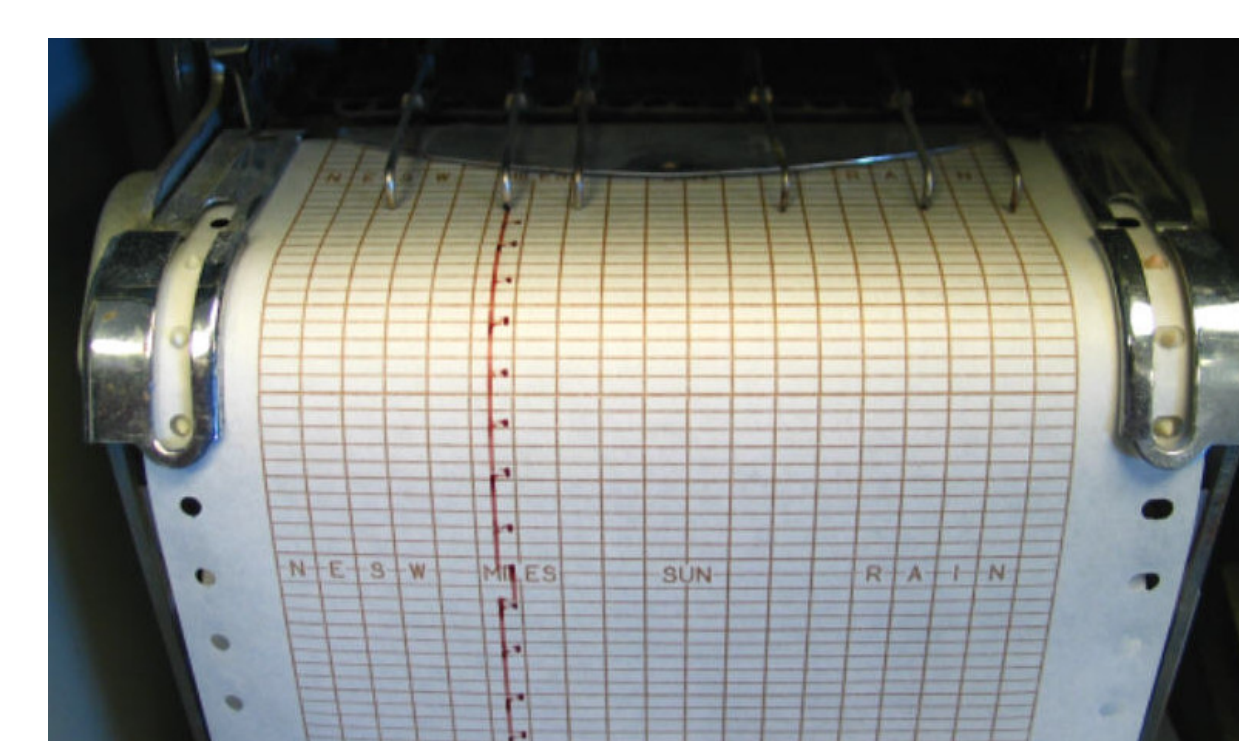


Blue Hill Observatory History & Background

- Location:** Summit of Great Blue Hill in Milton, Massachusetts (10 miles SSW of Boston, MA; 7 miles SW of Boston Harbor)
- Elevation:** 635 feet (194 meters) above mean sea-level
- Founded:** **February 1, 1885** by Abbott Lawrence Rotch
- AMS Connection:** Dr. Charles Franklin Brooks (co-founder of AMS) was Blue Hill Observatory Director from 1931-1958
- Climate:** Longest continuous weather records in North America (135 years)
- History:** Site of pioneering development of atmospheric sounding using kites, balloons, and radio transmissions (1890's to 1930's)
- Designations:** Centennial Observing Station (WMO, 2017); National Historic Landmark (NPS, 1989)
- Oldest Instruments:** Mercury Barometer (1887), Ombroscope (1940)
- Webpage:** www.bluehill.org

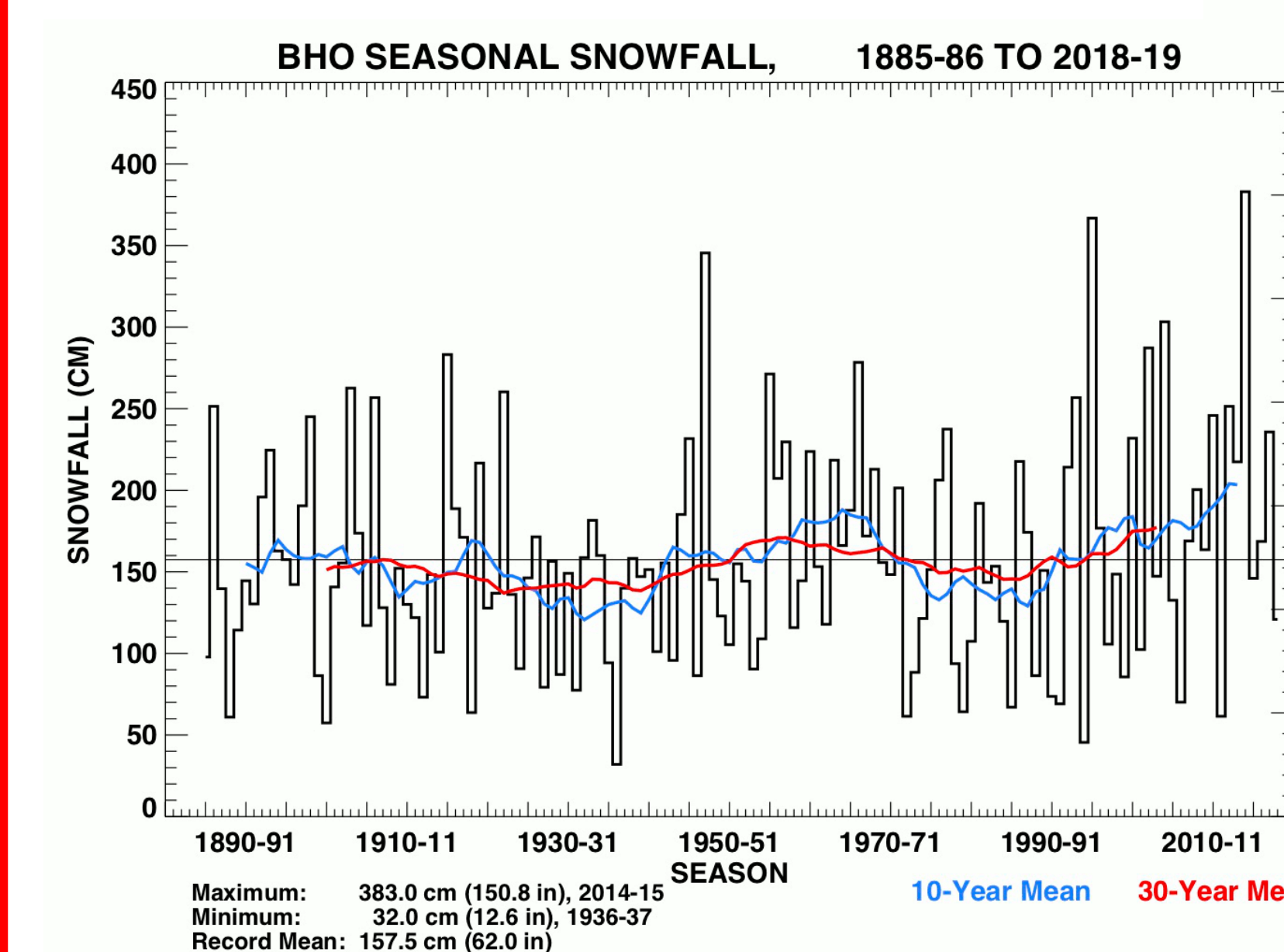
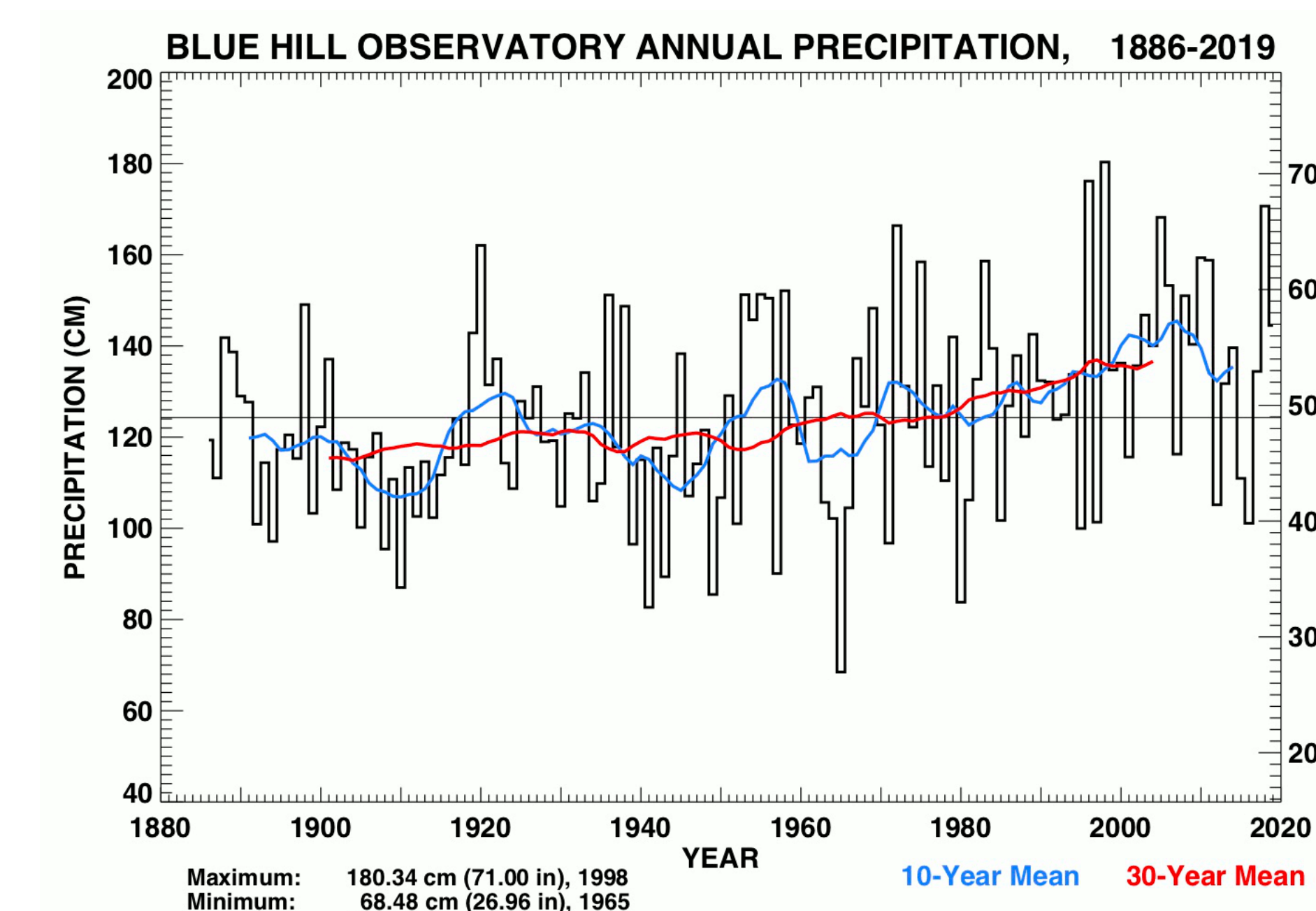


Historic Instruments in Use at BHO

Mercury Barometers:
Station PressureOmbroscope:
Time of PrecipitationContacting Wind Recorder:
Hourly Wind SpeedCampbell-Stokes
Sunshine RecorderClimate Changes at BHO since the 19th century

Annual Precipitation

- 30-year mean rising since mid-20th century
- Trend is statistically significant to 99.9%
- More rain expected in warmer climate
- Large inter-annual changes

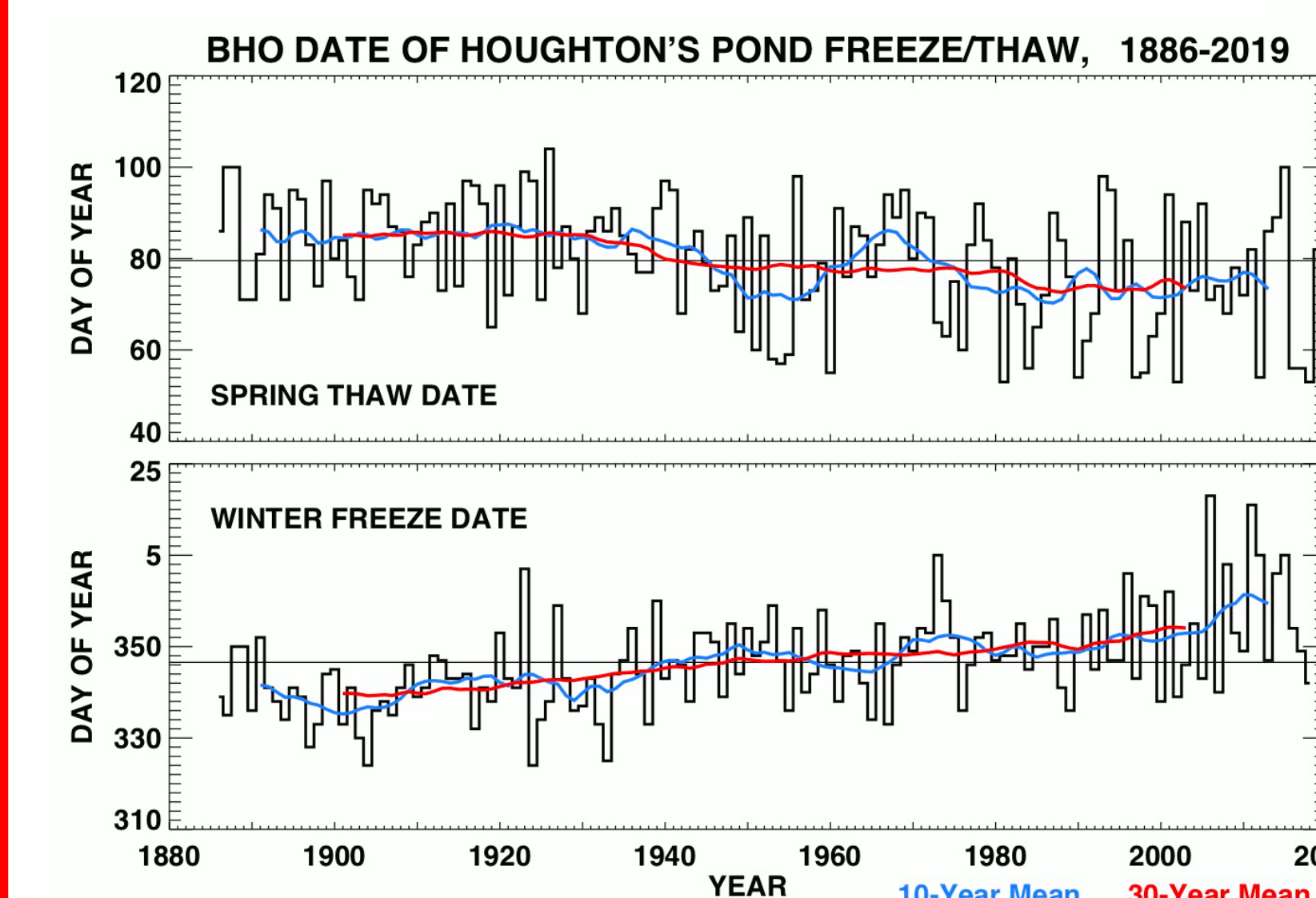
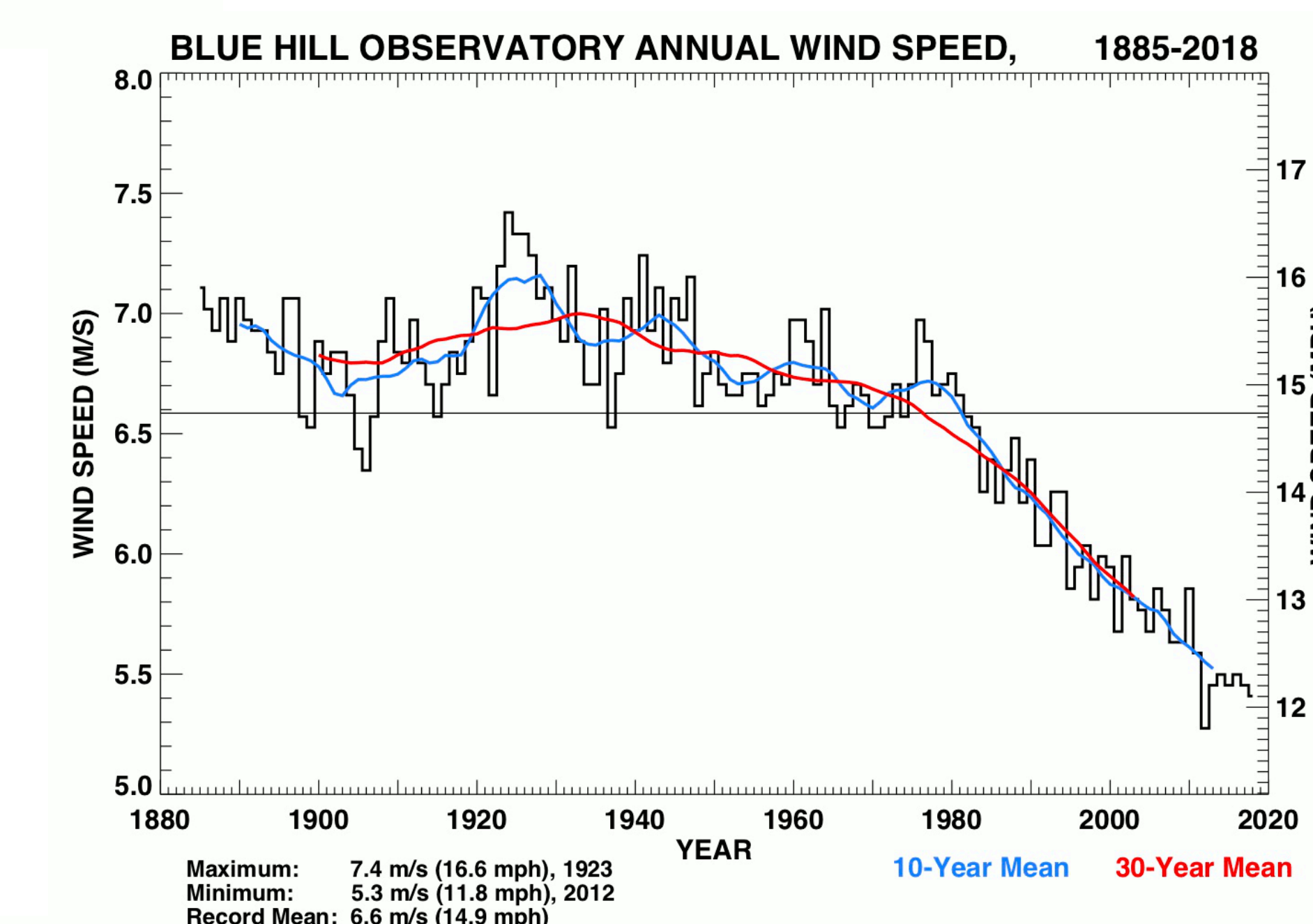


Seasonal Snowfall

- Little or no long-term trend
- Large inter-seasonal swings
- Decadal variations apparent
- Jan-Feb 2015 snowfall: 126.5"

Annual Wind Speed

- "Global stilling" apparent
- 30-year mean falling sharply since 1970s
- Possible causes: reforestation or global circulation changes

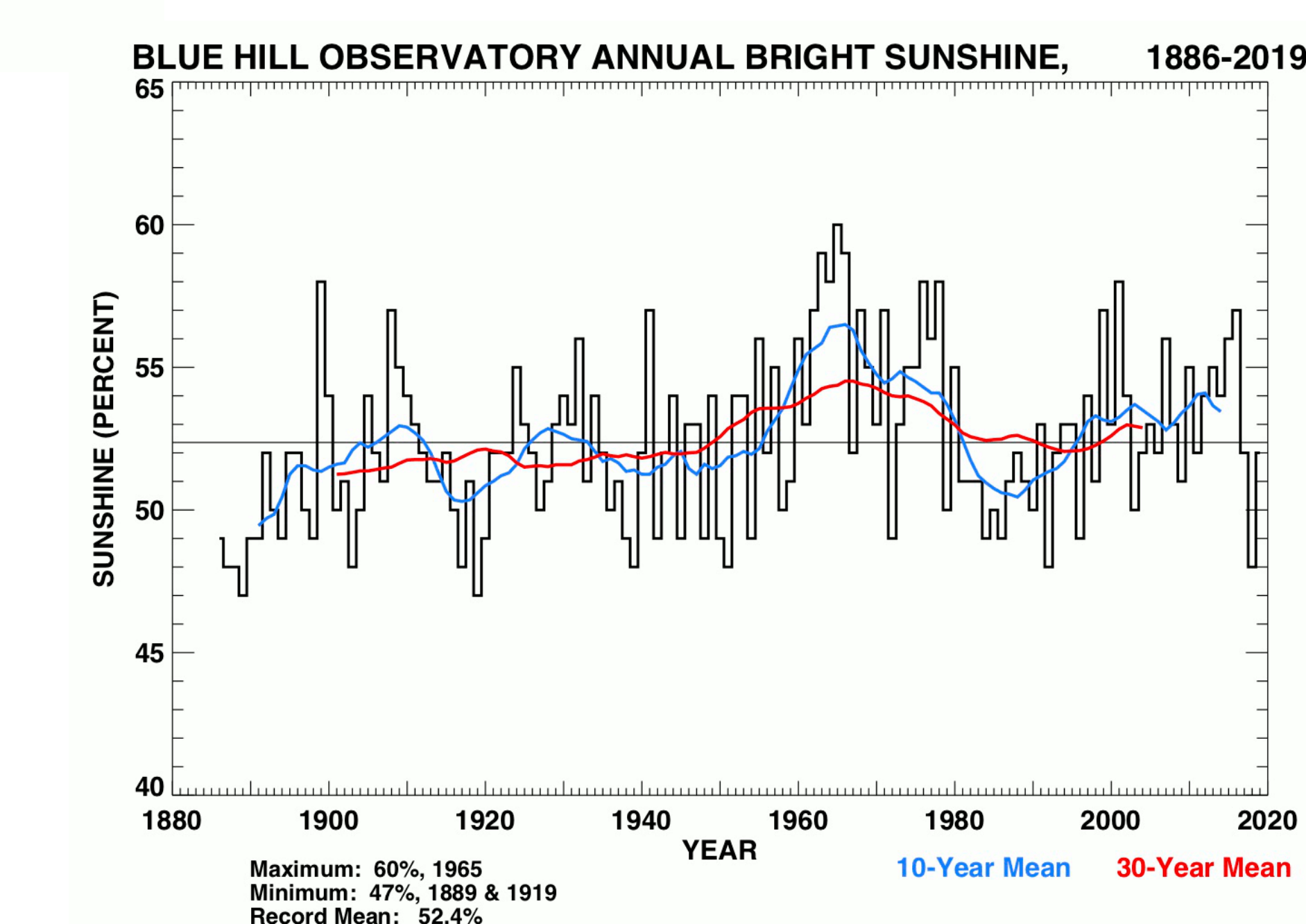


Pond Freeze/Thaw Dates

- Indicate temperature changes that are independent from thermometer measurements
- Interval pond remains frozen during winter nearly four weeks shorter than 100 years ago

Annual Sunshine

- Increase in 1950's-60's may have been due to cloud/ocean influences
- Decrease 1970's-80's due to air pollution
- Increase since 1990's due to fewer aerosols (less air pollution)



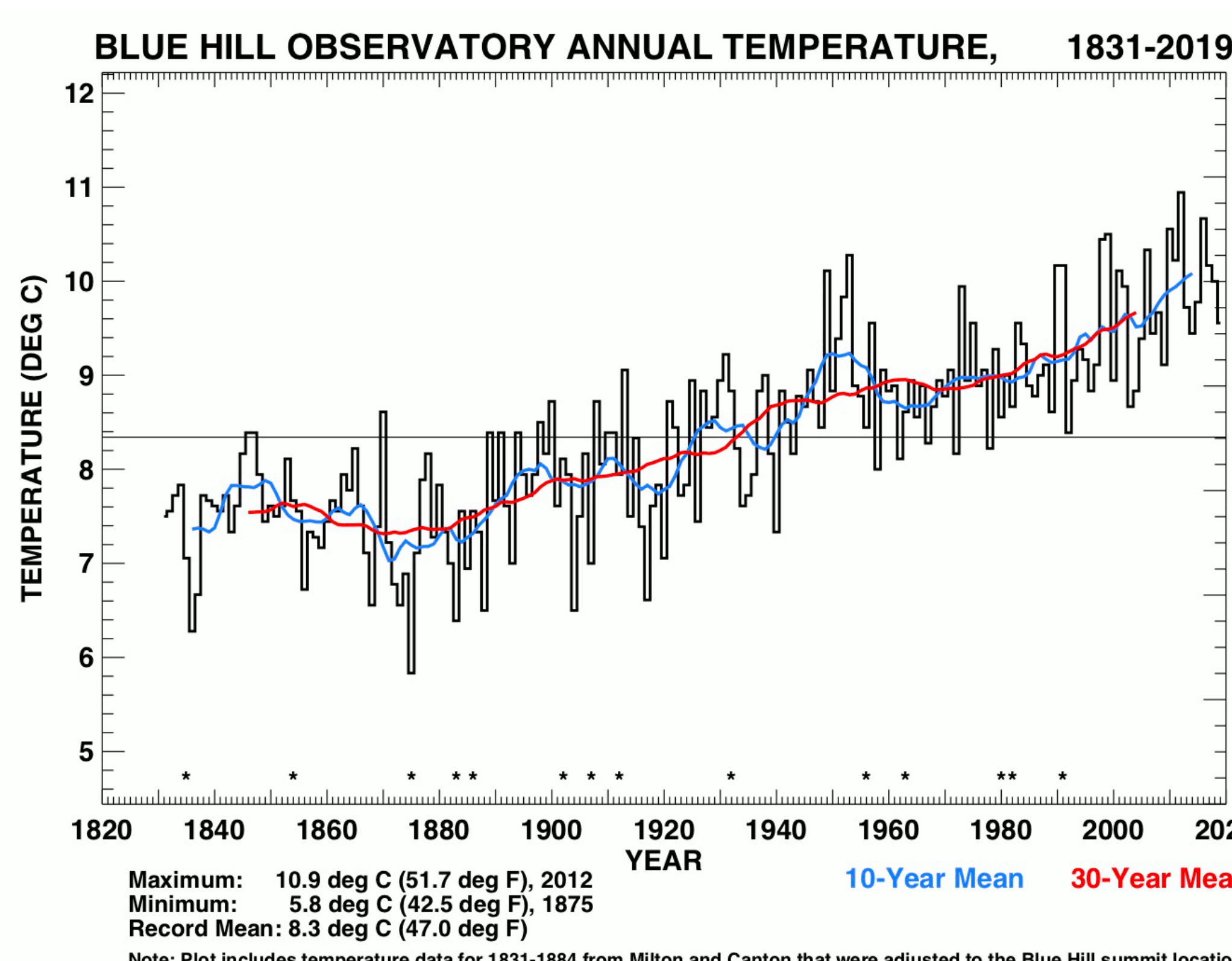
BHO Weather Observing Practices

- Objective:** Traditional observing methods and instruments are used to ensure high quality and long-term **consistency**

- Parameters:**
 - Temperature
 - Dew Point
 - Water Vapor Pressure
 - Precipitation
 - Snowfall
 - Snow Depth
 - Time of Precipitation
 - Wind Speed & Direction
 - Fastest Mile
 - Peak Wind Gust
 - Station Pressure
 - Sunshine Duration
 - Cloud Cover
 - Cloud Type
 - Visibility
 - Pond Freeze/Thaw Dates, Date of First Ripe Blueberries, etc.



- Observations:**
 - Three manual observations at 7 AM, 10 AM, 1 PM EST (12, 15, 18 UTC)
 - Continuous chart recordings of temperature, humidity, wind, precipitation and station pressure for derivation of hourly values

Climate Changes at BHO since the 19th century

Annual Temperature

- 30-year mean now warmer than 1870s by 4° F (2.2° C)
- Trend is statistically significant to 99.9%
- Large decadal swings
- Cooler in some years following eruptions (*)

Daily Temperature

- Distribution of trend by day of year for two 50-year means
- February warming trend much larger than January
- Smaller warming trend in October

