THE COASTAL INFLUENCE ON LOCAL CLIMATE CHANGES AT THE BLUE HILL METEOROLOGICAL OBSERVATORY

MICHAEL J. IACONO1,2, DON McCASLAND1, and JONATHAN O’BRIEN1
(1) Blue Hill Meteorological Observatory, Milton, MA, USA (miacono@bluehill.org)
(2) Atmospheric and Environmental Research, Lexington, MA, USA

Blue Hill Observatory Background
- **Location:** Summit of Great Blue Hill in Milton, Massachusetts (10 miles SSW of Boston, 7 miles SW of Boston Harbor)
- **Founder:** Abbott Lawrence Rotch on February 1, 1885
- **Elevation:** 635 feet (194 meters) above mean sea-level.
- **Climate:** Longest continuous weather records in North America (1885 to present). Observer on duty every day of the year.
- **Designation:** National Historic Landmark (1989)
- **Webpage:** www.bluehill.org

Climate Changes at BHO Since 19th Century

**Annual Temperature**
- 30-year mean now warmer than 1870s by 4°F (2.2°C)
- Large decadal variations
- Global and local influences

**Annual Precipitation**
- 30-year mean rising since mid-20th century
- More rain expected in warmer climate
- Large inter-annual changes

**Annual Wind Speed**
- 30-year mean falling sharply since 1970s
- Due to vegetation growth or global circulation changes

**Annual Sunshine**
- Increase 1950s-60s may have been cloud/ocean influence
- Decrease 1970s-80s due to air pollution
- Increase since 1990s due to fewer aerosols (less air pollution)

Coastal Influence on BHO Climate Changes

**Sea-Breeze/Backdoor Front Climatology**
- Percent wind speed decreases from 1970-1982 to 2000-2012 are larger for overland directions (S, SW, W, NW and N), than onshore directions (NE, E and SE).
- May indicate larger impact from reforestation over continental US or shifts in circulation rather than intensity of ocean storms.

Weather Observations
- **Quality:** Traditional observing methods and instruments are used to ensure long-term consistency
- **Parameters:**
  - Temperature
  - Dew Point
  - Precipitation
  - Snowfall
  - Snow Depth
  - Wind Speed / Direction
  - Peak Wind Gust
  - Station Pressure
  - Sunshine Duration
  - Cloud Cover
  - Cloud Types
  - Visibility, etc.
- **Historic Instruments:**
  - Outdoor Instrument Enclosure: Temperature and Precipitation
  - Hazen Shelter: Thermometers
  - Ombroscope: Time of Precipitation
  - Campbell-Stokes Sunshine Recorder

Winter Temperature Trends by Wind Direction
- Largest increases from NW-E
- Decreases or smallest increases from SE-SW
- May indicate larger influences from land than ocean

Annual Wind Speed Trends by Wind Direction
- Annual mean wind speed by wind direction for 1970-1982 (blue) and 2000-2012 (red)
- Percent wind speed decreases from 1970-1982 to 2000-2012 are larger for overland directions (S, SW, W, NW and N), than onshore directions (NE, E and SE).
- May indicate larger impact from reforestation over continental US or shifts in circulation rather than intensity of ocean storms.