



MOUNT WASHINGTON OBSERVATORY

Winter Discussion Francis Tarasiewicz We are a private, nonprofit research and educational institution working to **advance understanding** of Earth's weather and climate.







MWOBS Norms & Means

- Annual average wind speed: <u>35 MPH</u>
- Annual average temperature: **28.0 F**
- Annual average snowfall: 281.8"
- Annual average liquid equivalent precipitation: **91.23**"
- Annual average days with fog: <u>220/365</u> (approximately 60%)



MWOBS Extremes

- Maximum Instantaneous Wind Speed: 231 MPH (April 1934)
- Maximum Air Temperature: <u>72 F</u> (Aug 1975, June 2003)
- Minimum Air Temperature: <u>-47 F</u> (Jan 1934, Feb 2023)
- Maximum Seasonal Snowfall Total: **<u>566.4</u>** (1968-69)
- Maximum Annual Liquid Equivalent: **<u>130.14</u>** (1969)



MWOBS – Winter Averages

Winter Averages on Mt. Washington





Information from internal data records

MWOBS – Snow So Far...

Average October Snow: 19.0"

2023: 13.6" 2022: 2.2"

Snowfall Departure: -5.4"

Record: 78.9" w/ 25.7" falling in 24 hrs!

Average November Snow: 35.6"

2023 (so far): 7.8" 2022: 23.9"

Snowfall Departure: -27.8"

Record: 86.6" w/ 25" falling in 24 hrs!



Information from internal data records

Temperatures So Far...





WeatherBell

Regional Snowfall So Far...





WeatherBell

Winter 2022-2023 In Review...



Last Winter's Forecast





Last Winter Verification December – March Temperature Anomalies





WeatherBell

Last Winter: December



Information from internal data records Image from WeatherBell **December:** Warmer and slightly less snowy than normal

Temperature Departure: +2.4°F

Total Snow: 46.1"

Snowfall Departure: -1.6"

Largest Daily Snowfall: 17.3" on the 16th/17th



Last Winter: January



Information from internal data records Image from WeatherBell January: Much warmer and snowier than normal

Temperature Departure: +10.3°F

Total Snow: 53.0"

Snowfall Departure: +11.6"

Largest Daily Snowfall: 14.6" on the 25th/26th



Last Winter: February



Information from internal data records Image from WeatherBell **February:** Warmer and much less snowy than normal

Temperature Departure: +3.4°F

Total Snow: 32.2"

Snowfall Departure: -11.1"

Largest Daily Snowfall: 9.5" on the 28th



Last Winter: March



Information from internal data records Image from WeatherBell March: Near average snowfall & temperature

Temperature Departure: +1.1°F

Total Snow: 44.8"

Snowfall Departure: -1.4"

Largest Daily Snowfall: 9.5" on the 4th



A Winter of Extremes

Daily Temperature Data - NORTH CONWAY, NH



Powered by ACIS



A Winter of Extremes



Temperature Anomalies WeatherBell

One Week Later...





Temperature Anomalies WeatherBell

February 3-4th 2023: The Arctic Comes Knocking...

- After an exceptionally mild January our attention turned to the potential for a truly historic event
- High in the Canadian Arctic the Polar Vortex was knocked loose & its only course was southward towards New England.
- A **quick but brutal** 2-day stretch of cold air accompanied this feature.





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GFS 850 hPa Air Temperature (°C, shaded), Isotherms (white), Wind (kt), and MSLP Centers (hPa) Init: 00z Feb 04 2023 [Analysis] valid at 00z Sat, Feb 04 2023 TROPICALTIDBITS.COM 48 40 35 30 45N 25 20 15 10 0 -5 -10 40 N -15 -20 -25 -30 -35 -41 -51 35 N 80W 75W 85W 70W

MOUNT WASHINGTON O B S E R V A T

February 3-4th 2023: Anatomy of an Arctic Outbreak





February 3-4th 2023: Perspectives from Mt. Washington

- Temperatures at or below -45 °F for 13 straight hours
- The -47 °F reading (rounded) is the coldest in 89 years, tying our record low.
- Wind chills below -100 °F for 15.5 straight hours
- -109 °F was the lowest wind chill noted on our current conditions page, on at least three occasions
- Sustained winds greater than 82 mph for 28 straight hours, with a top gust of 127 mph
- Zero hours of sleep while recording all of this extreme weather





Factors at Play For Winter 2023-2024

- ENSO
- Polar Vortex
- North Atlantic/Arctic
 Oscillation





El Nino Southern Oscillation (ENSO)

2 Distinct Phases:

La Nina

- **Cooler** than normal waters in the equatorial Pacific
- Dry than normal conditions across the southern US
- Active Polar Jet -> Colder wx in the northern US
- Weaker Subtropical Jet

El Nino

- Warmer than normal waters in the equatorial Pacific
- Wetter than normal conditions across the southern and eastern US
- Weak Polar Jet -> Less cold air into the northen US
- Stronger Subtropical Jet -> Stronger storms moving from the West Coast into the Southeast



El Nino Southern Oscillation (ENSO)







El Nino Southern Oscillation (ENSO) Temperature Anomalies El Niño and La Niña Anomalies





El Nino Southern Oscillation (ENSO) Temperature Anomalies El Niño and La Niña Anomalies





El Nino Southern Oscillation (ENSO) Temperature Anomalies







Every El Nino is DIFFERENT



El Nino 2023

CDAS Sea Surface Temperature Anomaly (°C) (based on CFSR 1981-2010 Climatology)

Analysis Time: 18z Nov 14 2023

TROPICALTIDBITS.COM





El Nino 2023: Notice Anything Different?







Polar Vortex & Arctic Oscillation

The Science Behind the Polar Vortex



Large area of lower pressure over the polar regions that extends all the way into the stratosphere!



Polar Vortex So Far



Near **record** strength for this time of year!



North Atlantic Oscillation



Changes on the scale of days to weeks

Can cause drastic weekto-week changes



NOAA Outlook



NOAA Outlook- Temperature



NOAA is favoring greater chances for **above normal** temps across Northern New England



NOAA Outlook- Precipitation



NOAA has **equal chances** for above or below average precipitation for Northern New England



NOAA Outlook Explanation & Key Takeaways

- Colors indicate the probability (percent chance) of below, near, or above average temperatures throughout the winter
- Areas that are shaded in red have a higher chance for above average temperatures during the winter
- **Extreme cold** can still happen in a warmer than normal winter!
- Periods of below average temperatures can still occur despite an overall warmer than normal winter
- Nor'easters and large snow snowstorms can still occur in a warmer winter
- Shades of red on the outlook do NOT mean no or less snowfall!
- **Expect surprises** with this year's unusual El Nino
- Be prepared to adjust operations for opportune snowmaking times



Questions?

