

# Weather at Fermilab

Welcome to Fermilab's weather data site (provided by the Safety & Environmental Protection Group of the ES&H Section). Fermilab's meteorological (met) station first became operational in 1992. Located in an open field, the station is completely solar powered and consists of a 30-foot tower (as of September 2002) to which the following instruments are attached: temperature and relative humidity sensor, tipping-bucket rain gauge, wind vane, anemometer, and pyranometer. The station's geographical location is North 41° 51' 22.5", West 88° 14' 19.0" at an elevation of 740.7 feet above Mean Sea Level (MSL). See an [aerial photo](#) of its location (near New Muon Lab) on site.



An electronic data logger at the station is programmed to record measurements from each sensor once a second and report current conditions with hourly and daily summaries including selected maximums, minimums, and averages. Monthly summaries are generated from these. The Current Conditions frame (left) displays these measurements updated each minute. In addition, heat index and wind chill are calculated and displayed, as applicable. The average wind direction is an average of the previous 10 measurements. Similarly, the wind speed RMS is the root mean square of the previous 10 measurements. The current hour precipitation is reset at the top of each hour. To view the archive data select a year from the drop-down menu and click Submit. This will display the monthly summaries for that year. View daily data by clicking on a specific month. To view hourly data for a certain day, click on that day.

Precipitation data are collected by the tipping-bucket rain gauge. Previously a weighing-bucket rain gauge (installed May 1993) provided analog precipitation data for the snow-producing months. That gauge recorded events on a paper chart requiring replacement and manual database entry on a weekly basis. In January 2002, the tipping-bucket rain gauge was upgraded to include the capability of providing precipitation data during the snow-producing months. At that time the weighing-bucket rain gauge was taken out of service. Depending on the air temperature and the intensity of sunlight, some delay may exist between a snow event and the data recording.

The temperature and relative humidity sensor measures the air temperature and relative humidity. Using those two parameters, the dew point temperature is calculated. Relative humidity is the ratio of the amount of water vapor in the air to the maximum amount of water vapor the air can hold (for a given temperature), expressed as a percentage. Dew point temperature is the temperature at which the relative humidity equals 100% and moisture in the air can condense to create fog.

The pyranometer measures solar radiation (sunlight) for the hemisphere of sky above the sensor, and reports it as an average flux density in W/m<sup>2</sup>.

[See the relationship between solar radiation and air temperature throughout a year.](#)

[View data recorded during a solar eclipse.](#)

The anemometer measures wind speed. The "Maximum Wind Speed" measurement is an average recorded over the span of one second.

The wind vane measures the wind direction in degrees. If the measurement is 0°, the wind is from the north. If the measurement is 90°, the wind is out of the east. The met station is oriented where

0° is “true” north. True north is the Earth’s northern rotational axis, as opposed to magnetic north, which varies through time.

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### **Questions, Questions, Questions**

Q. Why does Fermilab have a meteorological station?

A. The primary purpose of the met station is to provide data for compliance with 40 CFR 61.93(a) Emission Monitoring and Test Procedures. Additionally, it provides precipitation information to construction managers for post-storm erosion control inspection requirements at on-site construction projects. Over the years people have found various other uses. Aside from regulatory purposes: it assists the physics mission of the Lab by providing data to Accelerator Division for correlation of expansion/contraction of accelerator components to environmental conditions. Providing wind conditions can aide Roads and Grounds in prairie burn safety with respect to smoke dissipation. Meteorological data also can support recreational activities by providing on-site conditions to model-aircraft enthusiasts ([The Fermilab Barnstormers](#)) at the Frelø Flying Field.

Q. Why isn’t the time adjusted for daylight saving?

A. Adjusting the time would create a one-hour data gap in spring while in autumn one hour would be repeated. This complicates the importation of data into software modeling programs and can create unexpected issues for assorted automated systems using the data. Additionally, by leaving the time as Central Standard Time (CST) an entire data set can easily be converted to Universal Time (UTC) if desired.

Q. Why is there no barometric pressure measurement?

A. There have been several requests for barometric pressure (to aid in instrument calibration among other reasons), but because no regulatory requirements exist there are presently no funds allocated to purchase the necessary sensor.

Q. What was the highest wind speed, coldest temperature, etc. recorded at Fermilab?

A.

## *Weather Extremes at Fermilab*

Air Temperature			
<b>Maximum</b>			
Date	Time	°C	°F
07/24/2005	~14:00	38.08	100.54
<b>Minimum</b>			
Date	Time	°C	°F
01/05/1999	6:16	-29.99	-21.98

Wind Speed			
<b>Maximum Burst</b>			
Date		m/s	mph
03/31/2007		35.65	79.75
<b>Maximum Daily Average</b>			
Date		m/s	mph
05/11/2003		11.42	25.55

Heat Index			
<b>Maximum</b>			
Date	Time	°C	°F
07/31/2006	13:27	43.93	111.08

Precipitation			
<b>1-Month Maximum</b>			
Date		cm	inches
07/1996		26.52	10.44
<b>1-Month Minimum</b>			
Date		cm	inches
02/2003		0.43	0.17
<b>24-Hour Maximum</b>			
Date	End Time	cm	inches
07/18/1996	2:00	15.14	5.96

Wind Chill			
<b>Minimum</b>			
Date	Time	°C	°F
02/18/2006	7:52	-35.21	-31.38

Air Temperature, Precipitation, and Wind Speed data are since April 1994.  
Heat Index and Wind Chill data are since August 2003.

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Weather Photos



Mamma (formerly Mammatus) cloud formations photographed 13 July 2004. The images really don't do justice to these unusual formations. (Click on images for larger versions.)

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### **Weather Links**

[Current Conditions & Forecast at Batavia, IL \(weather.com\)](#)

[Current Weather Conditions at Aurora Municipal Airport \(National Weather Service\)](#)

[Heat Warning for Illinois \(National Weather Service\)](#)

[Illinois State Climatologist's Office –  
Illinois State Water Survey \(ISWS\)](#)

[National Oceanic and Atmospheric  
Administration \(NOAA\) Home Page](#)

[National Weather Service Forecast  
Office for Chicago, IL](#)

[NOAA Weather Radio for  
Northeastern Illinois live on the Web!](#)

[Ozone Action Day Forecast \(U.S.  
Environmental Protection Agency\)](#)

[Severe Weather at Fermilab \(.pdf file\)](#)

[Subscribe to receive National](#)



[Weather Service \(NWS\) alerts \(for Northeastern Illinois\) via email.](#)

[United States Geological Survey \(USGS\) Real-Time Precipitation Data for locations throughout Illinois](#)

[Wind Chill Chart](#) or [Heat Index Chart](#) (.pdf files) (provided by NOAA)

[ES&H Section home page](#)

[Return to Fermilab Today](#)

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**Disclaimer:** Data provided pertain exclusively to the Fermilab Meteorological Station and do not constitute “official” measurements. All data are provided “as is” for general informational purposes only. Any other use is at your own risk.

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Please contact [Geoff Eargle](#) with any questions or comments.