The Windy Corner of the USCRN – Whitman, NE

When it comes to measuring wind speed, the USCRN is in a very unique position, literally. This network measures wind speed at about 5 feet (1.5 meters) above the ground, while most airport wind speed measurements are taken at about 33 feet (10 meters) above the ground. While the height of measurements at airports is very good for landing airplanes, the height of USCRN measurements is useful for examining the wind effects on our air temperature and precipitation measurements, which also take place at 5 feet above the ground. Due to friction with the ground, USCRN wind speed measurements will be 15-20% less than those at airports, depending on the vegetation around the station. In addition, the USCRN records maximum wind gust speeds over a 10-second period while wind systems at most airports record maximum gust speeds over a 3-second period. In turbulent flow the shorter the sampling period the higher the gust. Therefore, it is quite unusual for USCRN stations to record maximum 10-second wind gusts that exceed 65 miles per hour (29 meters per second).

Given these limitations, one might expect the highest wind speeds measured in the USCRN to be from coastal stations during tropical storm landfalls, or perhaps at the higher altitude stations. However, the station recording the fastest wind gust speeds in the USCRN is located near Whitman, Nebraska, in the Sandhills region in the central-north part of the state. A network record 10-second gust speed of 70.7 mph (31.6 m/s) was observed at Whitman during the evening of June 21, 2007. This record held across the entire network until earlier this summer, when a small but potent bowing squall line (Figure 1) moved from northwest to

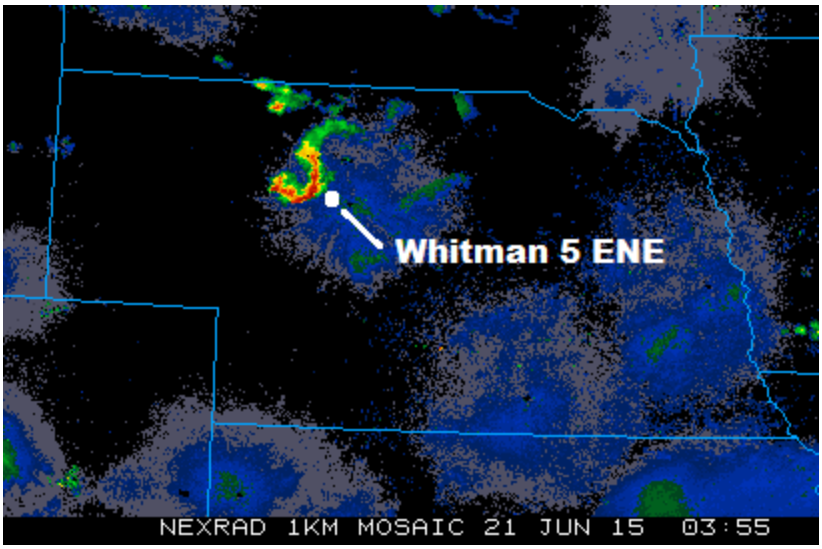


Figure 1. Composite radar image of small bowing squall line of thunderstorms approaching the Whitman, Nebraska, USCRN station early on the morning of June 21, 2015.

southeast through north-central Nebraska and yielded a new network record wind gust speed of 73.8 mph (33.0 m/s) early on the morning of June 21, 2015, at the Whitman station (Figure 2). If this wind gust was being measured with a 10 meter tower instrument and over only 3 seconds, it may have exceeded 85 mph (38 m/s).

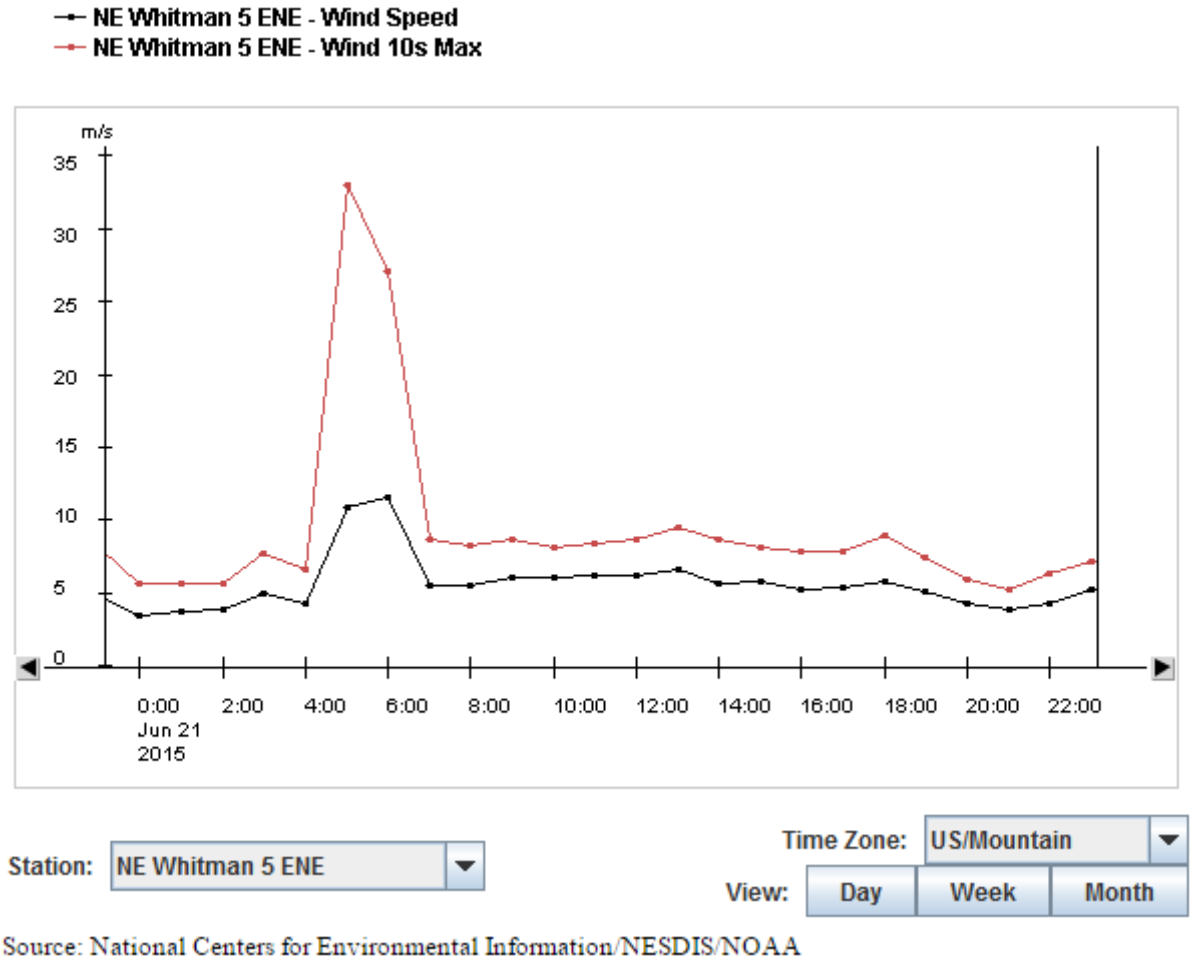
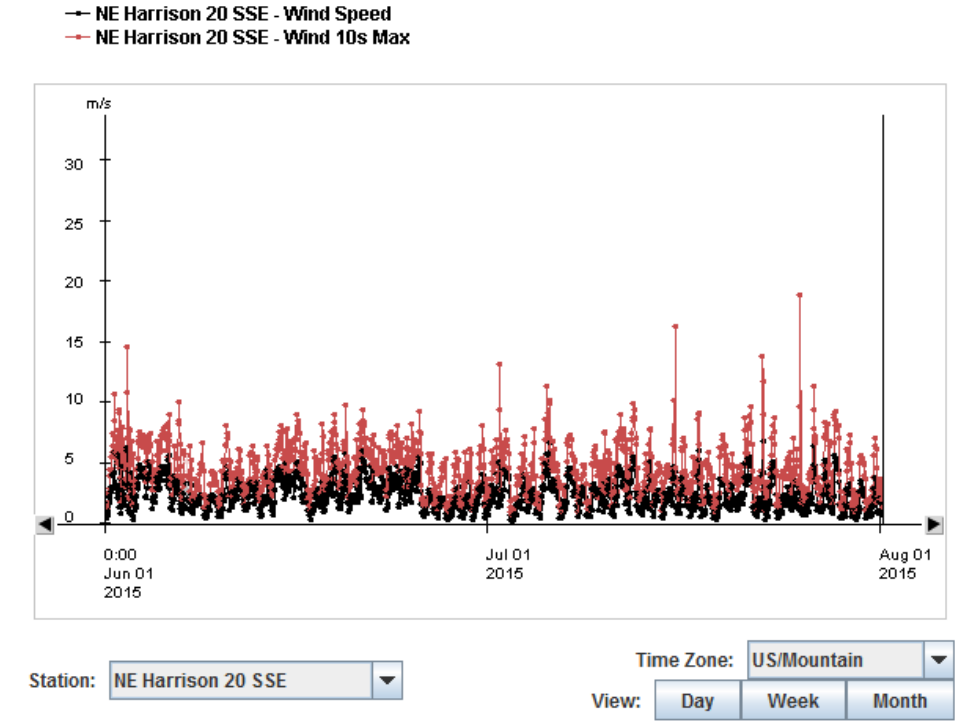


Figure 2. 10-second wind gust and hourly average speeds for the USCRN station near Whitman, NE, June 21, 2015.

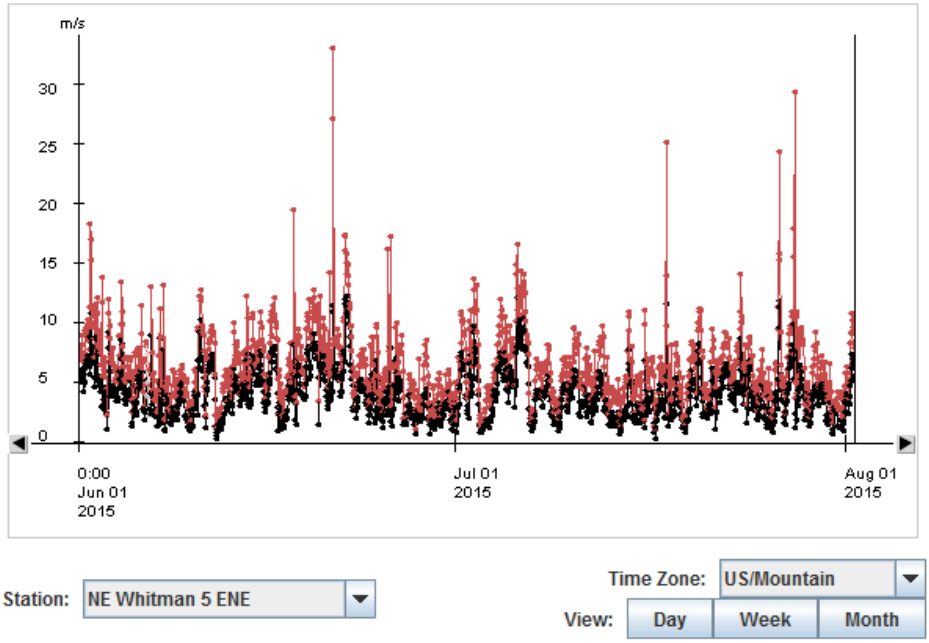
The USCRN station near Whitman is located in an unusual position for a USCRN station, at the edge of the top ridge of a massive stabilized sand dune (Figure 3). The Nebraska Sandhills cover a very large area, so the station is located in a representative place for the area, which consists of a series of uplands dissected by river valleys. It is this location at the edge of a steep rise, plus the additional factor of strong convective systems passing through during the summer, that causes the Whitman USCRN station to experience strong wind gusts on a regular basis.

Figure 3. USCRN station near Whitman, Nebraska, looking northwest. The slope down to the valley bottom (green swath to the right of the solar panel) is similarly as steep as the rise across the valley.

During the record wind gust speed event, the line of thunderstorms approaching from the northwest produced fast moving air both funneling up the valley wall below the station, and also hitting the station from the free atmosphere more than 165 feet (50 m) above the valley below, with little surface friction to slow the air in the latter case. One can compare the June-July 2015 wind records for the Whitman, Nebraska, station and the USCRN station near Harrison, NE, in the western panhandle of the state, to see that speedy gusts are far more common at Whitman (Figure 4). In fact, just a month after the new record was set, the Whitman station experienced a gust of 65.8 mph (29.4 m/s) on July 27, 2015, confirming its nickname as the Windy Corner of the USCRN.



Source: National Centers for Environmental Information/NESDIS/NOAA



Source: National Centers for Environmental Information/NESDIS/NOAA

Figure 4. June – July 2015 10-second wind gust and hourly average speeds for USCRN stations near Whitman and Harrison Nebraska.