An examination of a localized high wind event at Avoca Pennsylvania

Michael Evans

NOAA/NWS Binghamton, NY

This study examines the environment associated with a localized-high wind event that struck the Wilkes-Barre / Scranton airport at Avoca, Pennsylvania (AVP) on April 16, 2011. Strong, gusty southeast winds affected all of northeast Pennsylvania during the afternoon and evening on the 16th. Damage was light across most of the area, however a localized wind gust of 62 mph was measured at the airport, which was strong enough to blow out windows in the control tower, forcing the evacuation of the tower.

Strong, southeasterly winds affected a large area of the eastern United States on the 16th, in response to a strong pressure gradient between high pressure east of New England and low pressure over the northern Great Lakes. The strongest winds in Pennsylvania occurred along and ahead of a cold front moving east across the state. Areas of heavy rain occurred along and ahead of the front, however an analysis of radar-estimated rainfall indicated a minimum of rainfall in the Wyoming valley, where the airport is located. The Wyoming valley is a long, narrow valley, oriented from southwest to northeast, and rimmed by mountain ridges rising approximately 1000 feet above the valley on both sides. A rain shadow in the valley in this case indicates that strong, southeasterly flow at ridge-top level was able to descend into the valley. These strong down-sloping winds indicate the potential, not only for precipitation shadows in the valley, but also enhanced winds due to possible mountain wave development.

Calculation of the Froude number (a function of wind speed, stability and terrain height) for this case indicated that the environment on this day was favorable for flow that would not be blocked by terrain, but would flow over higher terrain and into nearby valleys. A high-wind forecasting nomogram, derived from a local study for northeast Pennsylvania, is applied to this case, and indicated that the combination of strong southeasterly winds at ridge-top level and small stability in the valley was favorable for high winds reaching the valley floor. A comparison between model forecast soundings at AVP on this day, and conceptual models for environments favorable for mountain wave development, indicated the potential for mountain wave development. Model forecast cross-sections of stability and wind are also shown, confirming that the environment was favorable for the development of mountain waves.