

The Oklahoma Dispersion Model

The Oklahoma Dispersion Model is a useful tool that can be used to estimate current and future conditions for the downwind dispersion of gases and small particulates released near the surface. Its applications include smoke dispersal from wildfires or prescribed burns, pesticide drift from ground or aerial applications, and animal odors associated with animal agriculture. The focus of the model is on concentrations at the surface (where people live and crops grow) at downwind distances up to several miles. Thus, the Oklahoma Dispersion Model can serve as an operational management tool for scheduling activities so as to minimize downwind concentrations to sensitive non-target areas.

The Oklahoma Dispersion Model can be accessed via the OK-FIRE web site. In the SMOKE section of the web site, click on "CURRENT Dispersion" or "RECENT Dispersion" to access products for current and recent dispersion; click on "FORECAST Dispersion" for products dealing with future dispersion conditions.

The Oklahoma Dispersion Model (ODM) breaks the atmosphere into six dispersion categories: "Excellent" (EX, category 6); "Good" (G, category 5); "Moderately Good" (MG, category 4); "Moderately Poor" (MP, category 3); "Poor" (P, category 2); and "Very Poor" (VP, Category 1). As one moves from excellent toward very poor conditions, dispersion (vertical and horizontal mixing) gets progressively worse and downwind surface concentrations near or at the plume centerline become higher.

Six Dispersion Categories

- **Excellent = 6.0 ("EX"; dark green)**
- **Good = 5.0 ("G"; green)**
- **Moderately Good = 4.0 ("MG"; light green)**
- **Moderately Poor = 3.0 ("MP"; beige)**
- **Poor = 2.0 ("P"; orange)**
- **Very Poor = 1.0 ("VP"; red)**

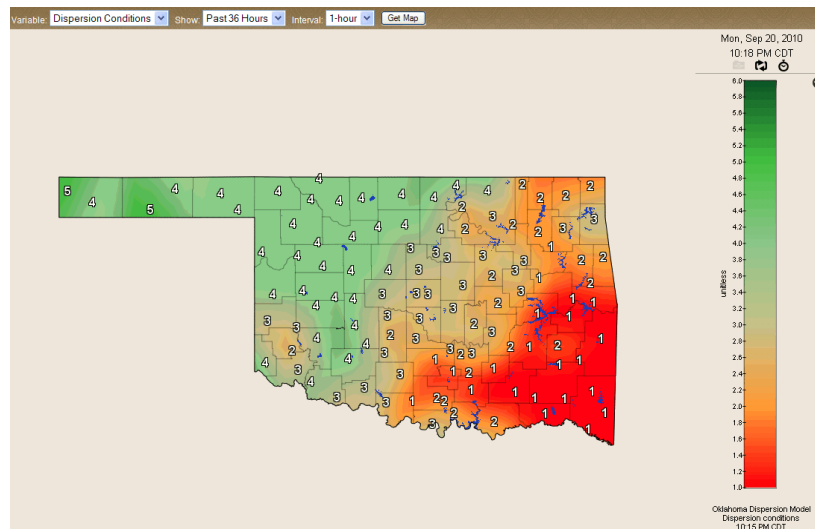


Dynamic Maps

Color-coded maps for both dispersion conditions (ability of the atmosphere to dilute a pollutant) and transport direction (where the pollutant plume is headed) are available. These products are created using data from the Oklahoma Mesonet, the state's automated weather station network of 120 stations. Maps can be animated going back 30 days in the RECENT section and through the 84-hr forecast period in the FORECAST section.

Dispersion Condition Maps

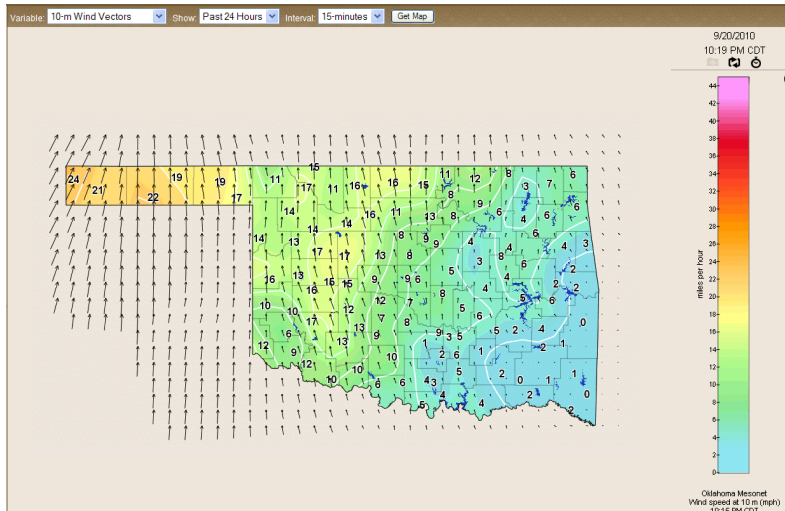
The dispersion condition maps are color-coded per the six dispersion categories. The current dispersion map is updated every 5 minutes using the latest 15 minutes of Mesonet data. An example of such a map from 10:15 p.m. on September 20, 2010 is shown below.



Dispersion conditions ranged from “Very Poor” (1) over much of southeast Oklahoma to “Good (5)” over parts of the panhandle.

Wind Vector Maps

In addition to the dispersion conditions, it's important to know the direction the smoke plume is headed, especially if there are any sensitive downwind non-target areas. For this purpose, wind vector maps are provided. These maps are updated every 5 minutes using the latest Mesonet data. The corresponding wind vector map to the map above is shown on the next page.

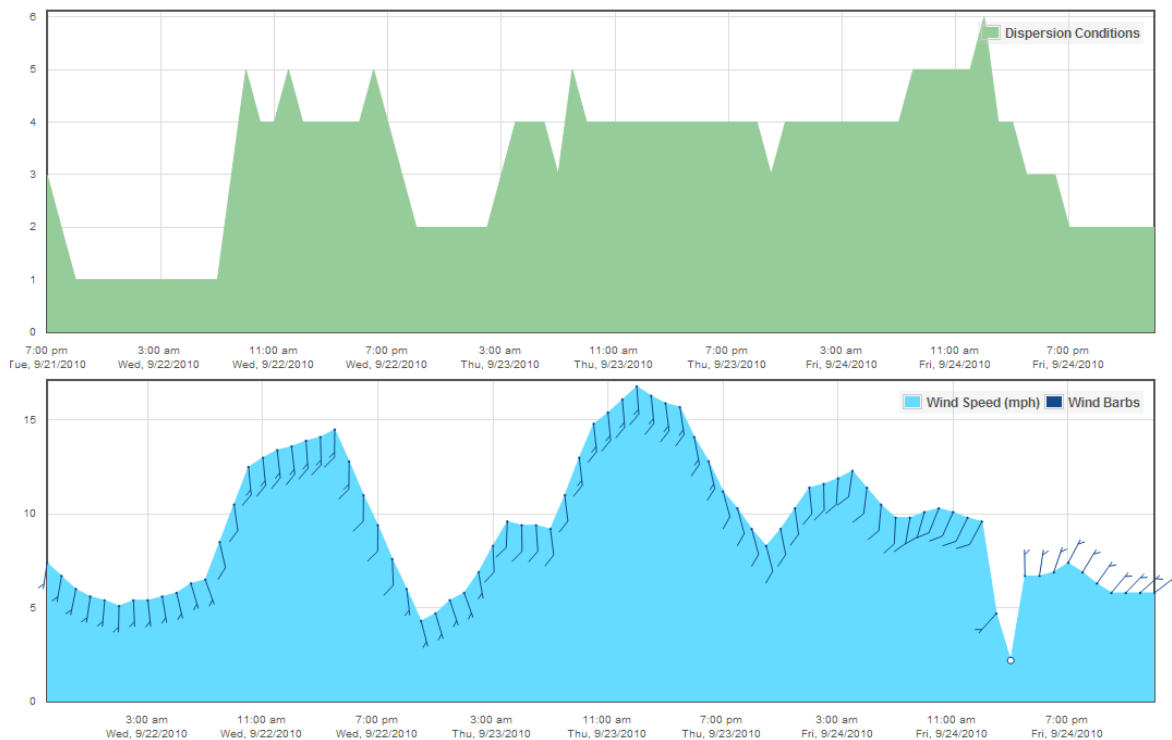


Light and variable winds (< 5 mph) were common over southeastern Oklahoma (associated with a surface temperature inversion which inhibits dispersion), while wind speeds (and better dispersion) increased as one traveled northwestward toward the panhandle.

Site-Specific Charts

Dispersion conditions and wind vector charts are also available for any Mesonet site; as with the maps, they cover periods up to 30 days in the past as well as through the 84-hour forecast period. A sample forecast chart product for Talihina is shown below.

Dispersion Chart for Talihina



The first chart, in green, shows the expected dispersion conditions (1-6 scale) over the forecast period. Note the day/night effect on dispersion during the earlier part of this period - good dispersion during the daytime, with poor dispersion the first two nights due to mostly clear skies and light winds (which result in temperature inversions not conducive to good dispersion). However, later in the period during the third night, due to stronger winds (and cloudiness), dispersion remains high; it becomes poor again during the start of the fourth night.

The second chart gives the wind information. The solid blue area shows the predicted wind speed. Again, note the higher wind speeds during the daytime and the lighter winds at night during the first half of the period. The forecast wind directions are portrayed by the staff/barb symbols. Winds blow from the barbed end along the staff toward the other end of the staff. Calm winds (under 2.5 mph) are denoted by circles. Note that are mainly from the south during the forecast period, switching to light northerly at the very end of the period.

Site-Specific Tables

Dispersion tables are also available for any Mesonet site; as with the other venues, they cover periods up to 30 days in the past as well as through the 84-hour forecast period.

A Note of Caution

One final note about wind directions is in order. For light wind speeds (under 10 mph), especially at nighttime under mostly clear skies, observed or forecast wind directions cannot be relied upon to estimate where smoke will drift. Under such conditions, temperature inversions tend to develop and topographically induced “drainage flows” interact with the general wind flow or dominate it. Thus, during poor (P) or very poor (VP) dispersion periods (which are associated with strong surface temperature inversions), the forecast wind directions will be unreliable, especially in complex terrain.