Development of temperature and relative humidity profiles from the Wasatch Front Ozone NAA for mobile source emissions modeling in MOVES

Mobile emissions modeling requires diurnal temperature and relative humidity (RH) profiles that are representative of the region of interest. Because the Wasatch Front experiences ozone exceedances sporadically throughout the summer months, a single profile is not representative of an ozone event, and many months of meteorological data must be analyzed. For future SIP demonstrations, the months of May, June, July, and August (MJJA) of 2017 will be used. All of the meteorological data used in this analysis was acquired from the MesoWest data archives. Mesowest ([mesowest.utah.edu](file:///%5C%5CCBWFP2%5CDAQ%5CSHARED%5CPLAN%5CREDIE%5Cten_year%5CCounty_by_county%5Cmesowest.utah.edu)) is a database of current and archived meteorological data from weather stations in the United States maintained by the University of Utah. The approach for developing temperature and RH profiles are described below.

To complete this analysis, the largest population center in each county was identified. Then, data from the nearest weather station was acquired from the MesoWest data Archives. The majority of the 29 counties had representative weather stations with data completeness >95% for MJJA of 2017. For counties that had incomplete or unreliable meteorological data, nearby stations of similar latitude and altitude were used to generate temperature and RH profiles. Table 1 indicates which counties are represented with meteorological data from stations > 50 km from the largest population center.

The meteorological data were then averaged to hourly time frequency to account for stations that reported data more frequently. Hourly data were grouped by month and averaged, creating an averaged diurnal profile for the entire month. Figures 1 and 2 show these profiles for July. Salt Lake City (lavender), Saint George (green), and Park City (plum) have heavier line widths for reference.



Figure 1: Temperature profile of an average day in July, 2017 for meteorological stations at each County's largest population center (or representative station as described in Table 1.)

Figure 2: Relative humidity profile of an average day in July, 2017 for meteorological stations at each County's largest population center (or representative station as described in Table 1.)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **MOVES zoneID** | **County** | **Largest City** | **City Elevation** | **Elevation of Station** | **Location of Station** |
| 90010 | Beaver | Beaver | 5860 |   |   |
| 490030 | Box Elder | Brigham City | 4301 |   |   |
| 490050 | Cache | Logan | 4446 |   |   |
| 490070 | Carbon | Price | 5813 |   |   |
| 490090 | Daggett | Manila | 6374 | 6731 | Near Dinosaur NM, Moffat County, CO |
| 490110 | Davis | Layton | 4789 | 4245 |   |
| 490130 | Duchesne | Roosevelt | 5171 |   |   |
| 490150 | Emery | Huntington | 5843 | 5843 | Castle Dale, Emery County |
| 490170 | Garfield | Panguitch | 6759 | 6200 | I-15 at Wildcat Ridge, Beaver County |
| 490190 | Grand | Moab | 4026 |   |   |
| 490210 | Iron | Cedar City | 5581 |   |   |
| 490230 | Juab | Nephi | 5002 |   |   |
| 490250 | Kane | Kanab | 4970 |   |   |
| 490270 | Millard | Delta | 4755 |   |   |
| 490290 | Morgan | Morgan | 5069 |   |   |
| 490310 | Piute | Circleville | 6066 | 5941 | 1-15 at Beaver, Beaver County |
| 490330 | Rich | Garden City | 5929 |   |   |
| 490350 | Salt Lake | Salt Lake City | 4226 |   |   |
| 490370 | San Juan | Blanding | 6001 |   |   |
| 490390 | Sanpete | Ephraim | 5500 | 5831 | Price Regional Airport, Price County |
| 490410 | Sevier | Richfield | 5299 | 5224 | Venice, Sevier County |
| 490430 | Summit | Park City | 7000 |   |   |
| 490450 | Tooele | Tooele | 4291 |   |   |
| 490470 | Uintah | Vernal | 5262 |   |   |
| 490490 | Utah | Provo | 4498 |   |   |
| 490510 | Wasatch | Heber | 5597 |   |   |
| 490530 | Washington | St George | 2872 |   |   |
| 490550 | Wayne | Loa | 7062 | 7151 | Ghost Rocks, Emery County |
| 490570 | Weber | Ogden | 4440 |   |   |