**Wasatch Front Ammonia and Chloride Observations (WaFACOs 2019)**

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Previous studies, e.g. the multi-agency Utah Winter Fine Particulate Study (UWFPS 2017), have examined the composition and formation mechanisms of local wintertime particulate matter. Consistent among all the studies is the predominance of ammonium nitrate as the main component of elevated PM2.5 across the Wasatch Front. The UWFPS pointed out that although the local airsheds appear to be slightly ammonia-rich in regards to NH4NO3 formation, during extended persistent cold pool capping events (inversions) the atmosphere switched to a more ammonia-limited regime. The UWFPS report also pointed out the current NH3 emissions inventory does not adequately replicate observed NH3 measurements, and concluded that the uncertainty in NH3 data are a significant deficiency in the current state of knowledge. Attempts by the Utah Division of Air Quality (UDAQ) to model atmospheric NH3 concentrations and subsequent photochemical reactions, as well as limited actual ambient NH3 observations, have suggested that current NH3 emissions inventory may be too low by a factor of about 4-6x. Additionally, very little information is known about the location or contributions of the potential NH3 source emissions. Limited studies found ammonia wintertime concentrations ranging from 5-30 ppb with varying spatial distributions.

Questions have also been raised about the influence of atmospheric chloride on particulate formation and oxidant photochemistry during both the wintertime pollution events and summer time ozone episodes. A small study during the summer of 2015 used 15 passive samplers to assess the hydrochloric acid (HCl) distribution along the northern Wasatch Front and the southern and southwestern edge of the Great Salt Lake. Overall average HCl concentrations were 0.95 ppb, not significantly different from other urban areas reported in the literature, but approximately 5x the values reported for rural/remote areas. A notable gradient was also found with higher values from west to east, likely owing to the large magnesium refinery on the western edge of the Great Salt Lake. As with NH3, a more complete understanding of the availability of gas-phase chloride, as represented by HCl, Is necessary to more fully understand the oxidative chemistry of the Wasatch Front airshed.

The Wasatch Front Ammonia and Chloride Observations (WaFACOs) study was initiated over the winter and summer of 2019 in which a dense network (40 sites) of passive NH3 and HCl samplers were deployed from Brigham City to Mona, UT, which include the population centers of Ogden, Salt Lake City and Provo. In addition, PM2.5 samples for mass and chemical analyses were collected at 10 collocated sites, real-time NH3 was measured at three sites, and during the winter, an EPA-NEIC mobile van collected on-road spatial NH3 data. Analyses show the average winter NH3 concentrations (≈5-10 ppb) were lower than the average summer values (20-30 ppb), with notable difference between the Salt Lake and Utah county airshed. During both seasons, locations near suspected “hotspots” were significantly (≈5x) higher than most of the other locations. The average HCl data showed little difference between the winter (≈0.9 ppb) and summer periods (≈0.8 ppb) and a similar west-to-east gradient was previously observed.