



# THE ATMOSPHERIC RESERVOIR

*Examining the Atmosphere and Atmospheric Resource Management*



## UP, UP AND AWAY!

By Mark D. Schneider

Twice a day, at 00:00 and 12:00 UTC, approximately 800-900 weather balloons are released worldwide! The United States and its territories operate 92 of these sites that are essential for collecting real-time atmospheric data. The weather instrumentation device that each balloon carries is called a radiosonde and its flightpath creates an upper-air sounding with measurements of temperature, dewpoint, humidity, pressure, and winds. One intriguing part of the measurements is that wind speed and direction are calculated using the GPS positions of the radiosonde and not by actual instruments.

The data collected by radiosondes is used for understanding and accurately predicting changes in the atmosphere. The National Weather Service (NWS) relies on radiosonde data for: input into weather prediction models; local severe storm, aviation, fire weather, and marine forecasts; weather and climate change research, air pollution modeling; and ground truthing for satellite data. Until drones or other technologies are capable of gathering this large network of upper-air data in the future, weather balloons remain the most practical method for that purpose.

The NWS, formerly the U.S. Weather Bureau, began its network of radiosondes in 1937 and employees are dedicated to the preparation, launch, and tracking of radiosondes to altitudes of around 100,000 feet (approximately 20 miles). Bismarck is North Dakota's only upper-air site and Rick Krolak serves as the Observing Program Leader for that NWS Office. Krolak commended the staff at the Bismarck NWS Office explaining that, "unless there's a thunderstorm occurring at the time of a balloon launch, our employees are outside in rain, snow, strong winds, and 50-below wind chills making sure that the balloons are released. There is also a timetable that our balloon launches have to meet. Balloons must be launched sometime between one hour prior to 0:00 and 12:00 UTC or up to 29 minutes after the hour. This gives us a universal one-and-a-half-hour window of launch opportunity."

Besides the time window that a radiosonde launch must meet to be considered valid, data must be measured to a minimum pressure altitude of 400 millibars which equals about 24,000 feet above sea level. Reasons for not achieving a flight of this altitude may include a prematurely bursting balloon or radiosonde malfunction. Fortunately, these failures



Photo of Rick Krolak, Observing Program Leader, Bismarck National Weather Service Forecast Office.

aren't common, and equipment has become increasingly reliable through many decades of refinement. When a weather balloon is filled with either helium or hydrogen gas it measures about five feet in diameter, and then as it rises and the air pressure decreases, its diameter can reach 20 to 25 feet before it bursts. After a balloon bursts, the radiosonde is carried slowly back down to Earth by a small parachute.

Whenever there are days with severe weather forecasted (especially severe thunderstorms), the NWS routinely conducts special upper-air balloon launches to give forecasters a more accurate snapshot of what the atmospheric conditions between the 00:00 and 12:00 UTC soundings are. Krolak summed things up by saying, "upper-air soundings are an essential part of our office, and we need them to provide the public and our other partners with the forecast and warning services that they have relied on us for in the past."