

Air sampling instrumentation pump performance versus altitude

Jeff Kindall, Danielle Haverkamp, Jeremy Dyar, Jeffrey Page, John Sohl, Department of Physics,
Weber State University, Ogden, UT.

Most portable air sampling systems contain small air pumps to draw in sample air. Our group frequently flies instrumentation to high altitudes and we needed to select the best pump that was available to us. Four different pumps were tested on the lab bench (ambient pressure ~850 mb) and in a high-altitude environmental test chamber. The pumps tested were a standard ozonesonde piston pump, a diaphragm pump, and two rotary vane pumps. The pumps were controlled with pulse width modulation (PWM) while monitoring the flow rate in liters per minute and standard liters per minute. Measurements were made with and without an air sample chamber attached inline to simulate a load. We also measured flow stability vs. pressure.

Target pressures for measurements were 856 mb (1.4 km, Ogden, UT), 700 mb (3 km, top of the Wasatch Front mountains), 150 mb (13.5 km, tropopause), 30 mb (24 km, inside the ozone layer), and 10 mb (31 km, typical height of research balloons).