



Analytical and Atmospheric Instrumentation

Supercooled Liquid Water Content Sensor

Anasphere's Supercooled Liquid Water Content (SLWC) sensor is a device which can be used to measure the supercooled liquid water content of clouds. The sensor operates by measuring the buildup of ice on a thin vibrating wire. The mass of the ice changes the vibration frequency of the wire. The rate of change of vibration frequency can be used to quantitatively determine the supercooled liquid water content of the cloud.

Data Reporting. The SLWC sensor is designed to pair with any radiosonde capable of accepting the XDATA digital data format. The vibration frequency of the wire is reported to 0.02 Hz every 3 seconds.

Quantitative Measurements. The rate of change of vibration frequency (df/dt) is one part of the SLWC determination. Additional information which must be known or estimated includes the rise rate of the balloon (or airspeed of the platform) and the median volume diameter (MVD) of the cloud droplets. An example of complete data reduction is given by Serke et al.¹

Qualitative Measurements. Simply observing the rate of change of vibration frequency (df/dt) enables the detection of ice buildup on the wire. This can be useful for the sensitive and rapid detection of icing conditions which could adversely affect the operation of a UAV or icing-sensitive instruments. In typical clouds at low airspeeds (balloon ascent rates of 3-5 meters per second), the df/dt change is visible within several seconds. At higher airspeeds, the rate of change will be noticeably faster.

Specifications:

Mass: board alone 81 g; board plus battery holder with 4 x AAA lithium cells 138 g;
flight ready in housing 160 g

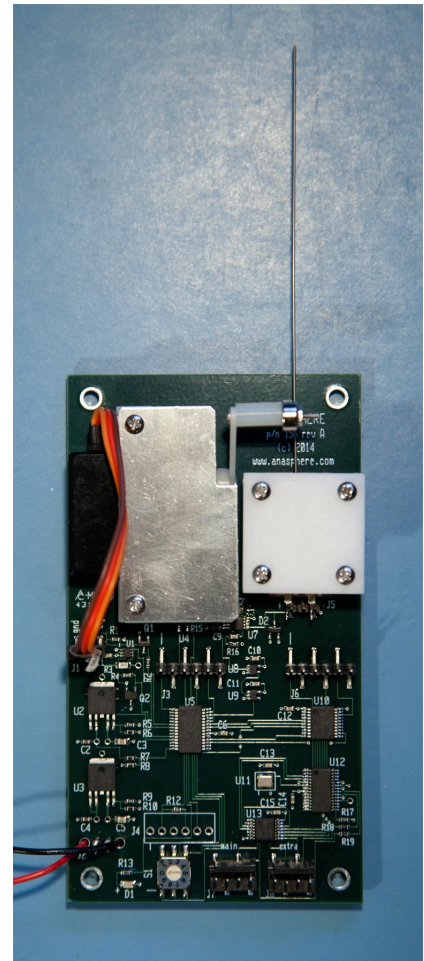
Dimensions: board 2.5 x 4 inches; height 1.5 inches maximum
housing 3.5 x 4 x 2.5 inches

Power supply: 4 x AAA lithium cells or an external supply of 5.3 – 14 volts DC

Current draw: average 25 mA at 6 VDC

Data interface: XDATA or serial, true or inverted polarity, mode switch selectable

Vibration measurement: resolution 0.02 Hz, sampling period 3 s



¹ Serke, D. et al. "Supercooled liquid water content profiling case studies with a new vibrating wire sonde compared to a ground-based microwave radiometer." *Atmospheric Research* **149**, 77-87 (2014). DOI: 10.1016/j.atmosres.2014.05.026.

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