SOLAR HEATING TO PREVENT FREEZING IN RECORDING RAINGAUGES

(NOTE)

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Winter freezing of field instruments is a common problem especially at high altitude. One method for alleviating freezing, particularly applicable to Lambrecht automatic siphoning raingauges which are prone to freezing in the siphon chamber with damage and loss of data, is the use of solar heating. The principles of solar heating make it especially suitable for isolated sites, and a simple closed-circuit design minimizes the need for servicing. Sufficient heat can be stored during a sunny winter day to slow the cooling and consequent freezing of the siphon chamber the following night.

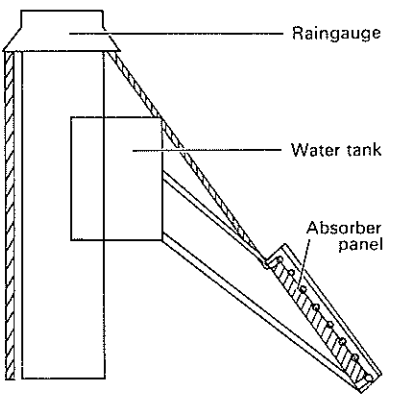

FIG. 1 — Lambrecht automatic raingauge with closed-circuit solar heater, side view.

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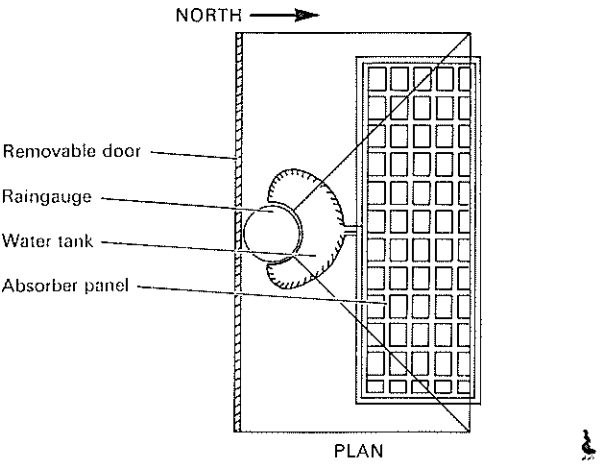

FIG. 2 — Raingauge solar heater system, plan view.

Water heated in the absorber panel is stored in a tank in close contact with the instrument and with an outer insulated surface. This ensures heat transfer from the tank towards the critical region of the instrument.

The basic design is shown in Figs. 1 and 2. The quantity of water storage required depends on the severity of freezing expected and the efficiency of the absorber and insulation used. For external air temperatures down to – 5°c, 27 litres of water storage with 1 m^2 of absorber panel has prevented the freezing that would normally be encountered with these air temperatures.

The absorber panel consists of a network of water pipes on a flat metal surface painted with non-reflective black paint for maximum energy absorption. Open-mat glass-fibre insulation is used to minimize heat loss from behind the absorber panel, and a double-glazed cover is used to minimize heat loss from the surface by air movement over the panel. The storage tank must be placed above the absorber panel to prevent reverse thermosiphoning during periods without solar radiation, when the absorber acts as a radiator and cools the water it contains. Provided that the absorber panel is below the storage tank, water cooled by the radiation from the absorber is trapped by its increased density and prevents the cooling of water in the tank; the reverse principle is employed in the heating of water by a solar water heater. The water tank is surrounded by glass-fibre insulation, and the raingauge/solar-water-heater complex is enclosed in a galvanized-iron tent, insulated with expanded-foam

polystyrene to produce a still-air capsule around the water-tank/raingauge union. The insulated tent has one removable wall for access to the raingauge.

The system described above is the method we found cheapest and most suitable for preventing damage and loss of data in our high-altitude meteorological station, but we feel the basic principles involved could have application in other areas and with different instrument installations.
