



High resolution measurement of precipitation for climate characterization

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Ground measurement of precipitation may be achieved through power requirement of a horizontally exposed plate maintained at constant temperature to evaporate on collection liquid or solid precipitation. The plate additionally loses heat by wind flow, measured separately by a sheltered lower compensating plate to 25cm/s, located beneath but thermally isolated from the exposed upper plate. A diameter of 15 cm provides a practical precipitation catchment area for a one minute time resolution, with an uncertainty of 1/100 inch per hour. The advantage of the system lies in collocation of precipitation and wind sensor providing a real time correlation, with an effective response time of about 30 seconds. Plates are ridged to reduce particle loss by splash, bounce and wind blow-off. Since temperatures are maintained near 100C, sensor icing does not occur and bird residence time is minimal. Calibration can be conducted for both variables with an upper and lower controlled water syringe. Measured air temperature serves as an indicator of the ice/water transition. Derived plots show precipitation rate, total precipitation and precipitation amount at different rates for a selected time interval. A separate instrument, the T probe, controlled on the same principle, provides aircraft measurement of liquid and ice content separately by differencing water collection by a cylindrical sensor and ice plus water collection by similar a collocated sensor having a forward facing re-entrant angled slot. Precipitation rate derivation requires a measurement of particle density and estimate of drag drag coefficient. Resolution is 0.1 seconds at 100m/s with mass concentration greater than 4g/m³. Characterizing a changing climate lies in evaluation precipitation process or the liquid/ice content and the rate process itself.