The introduction of a new type of intelligent tipping bucket rain sensor

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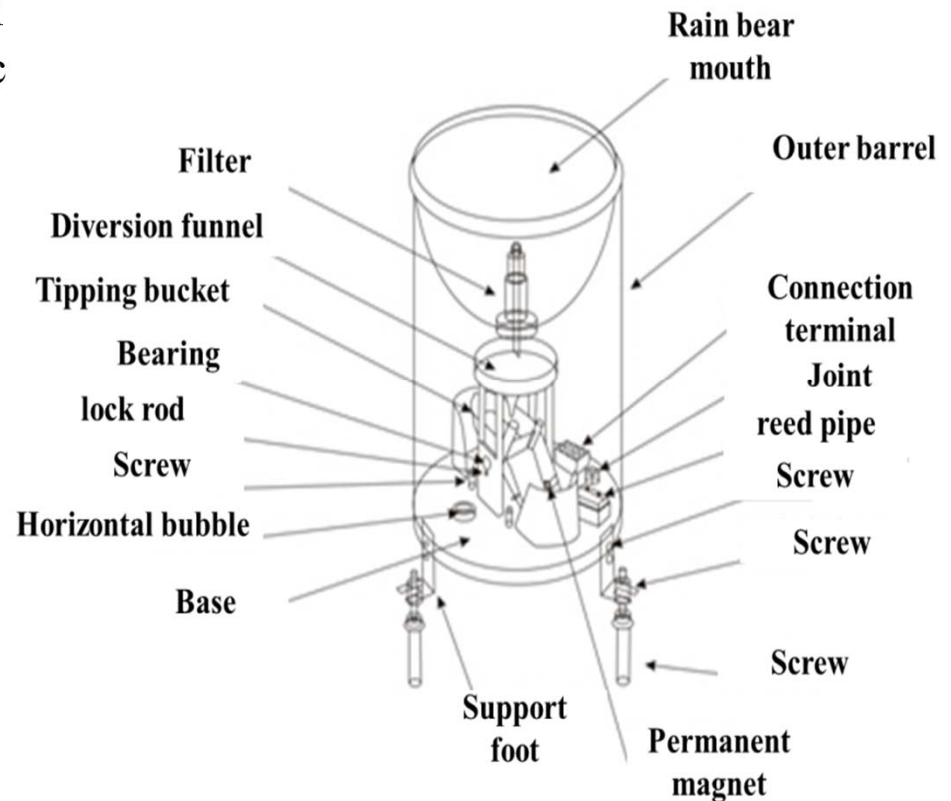
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Background

Chinese meteorological administration has built **over 50 thousands** automatic weather stations that use the tipping bucket rain gauges for rainfall measurements.

3 disadvantages :
(1) easily jammed,
(2) the reed pipe damage,
(3) the reed pipe suffered from disturbance.

Rain bear mouth

Outer barrel

Filter

Diversion funnel

Tipping bucket

Bearing

lock rod

Screw

Horizontal bubble

Base

Connection terminal

Joint

reed pipe

Screw

Screw

Screw

Support foot

Permanent magnet

Can not to be discovered easily, especially at unmanned stations

Design of the gauge

The new component for status check (CSC) can produce 5 different statuses:

(1) **Normal:** when only check point 3 shows there is rain, and the tipping bucket keeps "tipping"

(2) **tipping bucket disturbance:** tipping bucket produce rain information but at the same time check point 3 shows none

(3) **tipping bucket stuck:** check point 3 shows there is rain for a period of time but tipping bucket shows none

(4) **rain gauge half jammed:** check point 3 shows rain, check point 2 shows the water level has reached its place and tipping bucket show the rain is not heavy enough(does not reach the threshold

(5) **rain gauge fully jammed:** check point 3 shows there is rain, check point 1 shows the water level has reached its place and tipping bucket show the rain is not heavy enough(does not reach the threshold)

Check point 1
Check point 2
Check point 3
Filter
CSC inserted in

Component for status check (CSC)
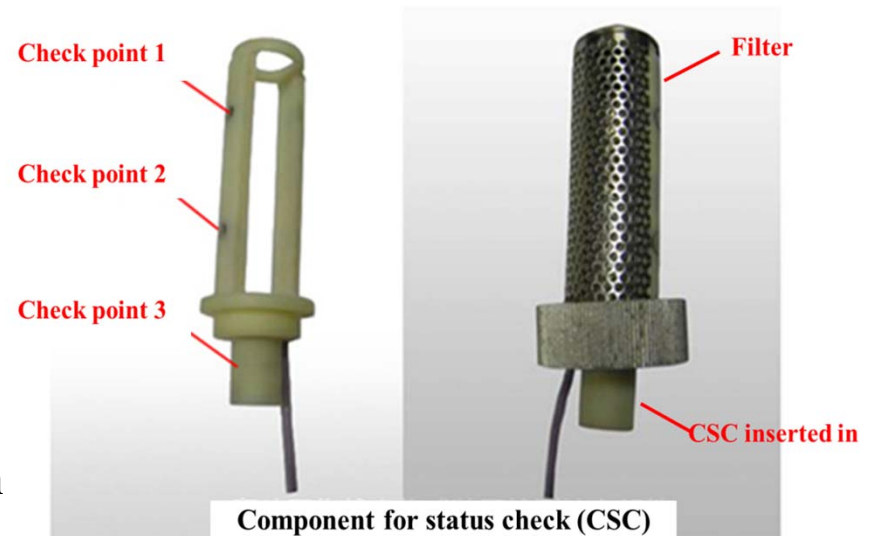
Test of the gauge

Lab and field test

Station No.	Station name	location	Main pollution source
F8690	LIE XI	Lie xi street	dust
F8691	JING XI	Jing xi street	dust
F8692	LIN XIAO	Forestry school	Fallen leaves
F8693	JI XIAO	Technical school	Fallen leaves, dust
F8694	MET OFFICE	Met office building	dust
F8695	machinery plant 1	machinery plant of Sanming	dust
F8696	machinery plant 2	machinery plant of Sanming	dust
F8697	Steel plant 1	Steel plant of Sanming	Coal ash, dust
F8698	Steel plant 2	Steel plant of Sanming	Coal ash, dust
F8699	Steel plant 3	Steel plant of Sanming	Coal ash, dust

Eg: Station F8697：Generated fully jammed status on 3 PM, 12th, December and status turn to half jammed on 11 AM, 17th, December. Figure 6 shows the gauge appearance before and after cleaning on 21th December.

Thank you for your attention