Innovative instrumentation derived from desire to solve problems of scour monitoring

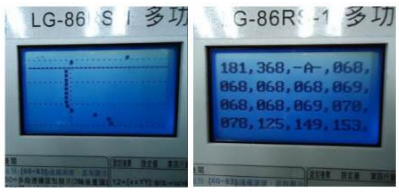
Taiwan Water & Soil Instrumentation, Inc. A company based on the integration of microelectronic and water measurement has devoted in designing and manufacturing instruments for water measurement and environmental monitoring system over 30 years.

By a lucky chance, in order to solve the problem of on-line bridge scour monitoring, TWSI have developed a revolutionary instrumentation and precision monitoring systems for most water environment. It should be a breakthrough in most applications for monitoring scour and erosion both in river and sea.

The multi-layer EC monitoring staff is an innovative sensor system to identify precision position or interface of soil and water with 4 cm resolution automatically. It could be cascaded to monitoring up to 200 layers for 8m or more measuring span as a single sensing station. With low power consumption, the monitoring system could be installed along a pile and wireless transmitter on the top to build the Remote Monitoring System.

Placing multiple stainless steel sensing electrode-pairs on the surface of PE/ABS bar and connected to an innovative circuit adhesive sealed as a waterproof sensing staff. This marvelous sensor system can provide digital conductivity or resistivity values directly with high precision for each layer of water and soil body. The interface of water and soil hence is indentified clearly.

With no moving parts and free of conventional signal conversion circuit, this sensing staff will be of minimum failure rate and no need to calibration. Moreover, the advanced models with EC profile output would be applied on concentration monitoring in flood and pollution reduction in water and wastewater industrial.



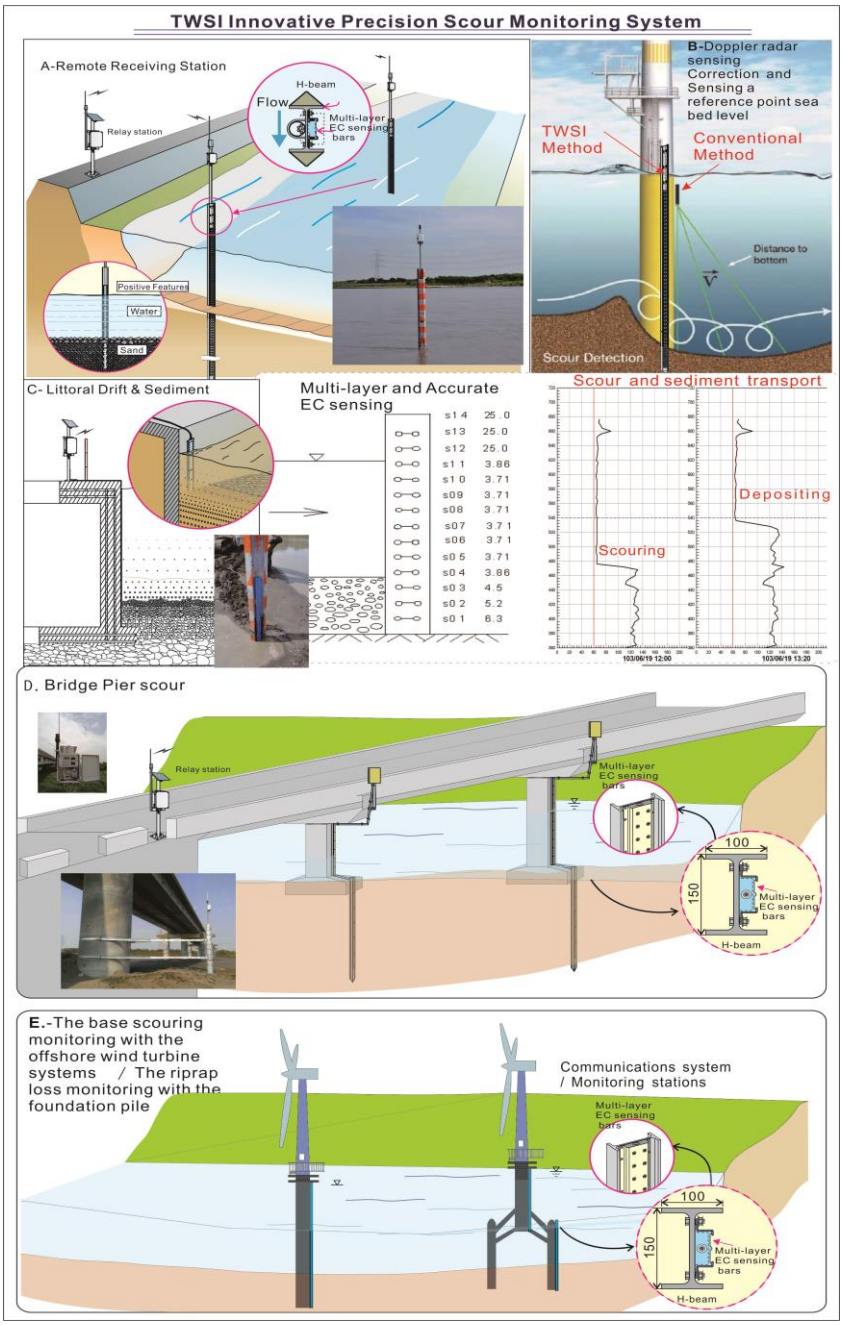
Products & Applications:

- ◎ **Precision real time Scour Monitoring system for bridge pile, riverbed and seabed**
- ◎ **Dynamic monitoring system for port siltation and bank erosion from scouring**
- ◎ **Early Warning System for Flood, Landslide, Debris-flow, and Water Pollution.**

TWSI Innovative Precision Scour Monitoring System

Applications

- ◎ **Real time Scour Monitoring system for bridge**
- ◎ **Sediment transport & Underflow density current**
- ◎ **The base scouring monitoring on hydraulic construction / coastal & offshore engineering**
- ◎ **The riprap loss monitoring with the foundation pile**
- ◎ **Erosion and Land Loss on the Sandy Coasts**
- ◎ **Correction for Doppler Radar seabed monitoring system**



Principle

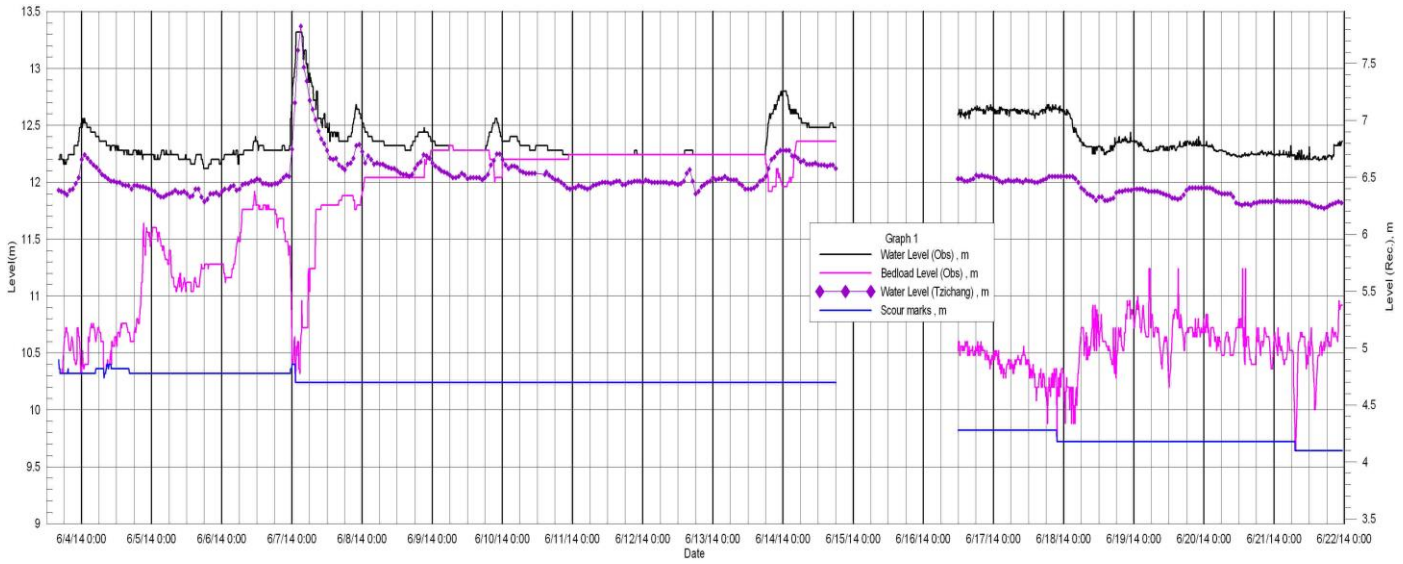
TW-WS08 dynamic scour and erosion monitoring systems, including cascaded TF-284S multi-layer EC sensing staffs for level and sediment position, wire or wireless transmitter, and smart monitoring system, was developed to monitor the interface between water and soil in most water environment. The sensing principle is that there has been different of the electrical conductivity (EC) in water and sand, and through multi-layer sensing synchronously can find out the interface between the water and sand, that is the level of river bed. This also can show the water level at the same time.

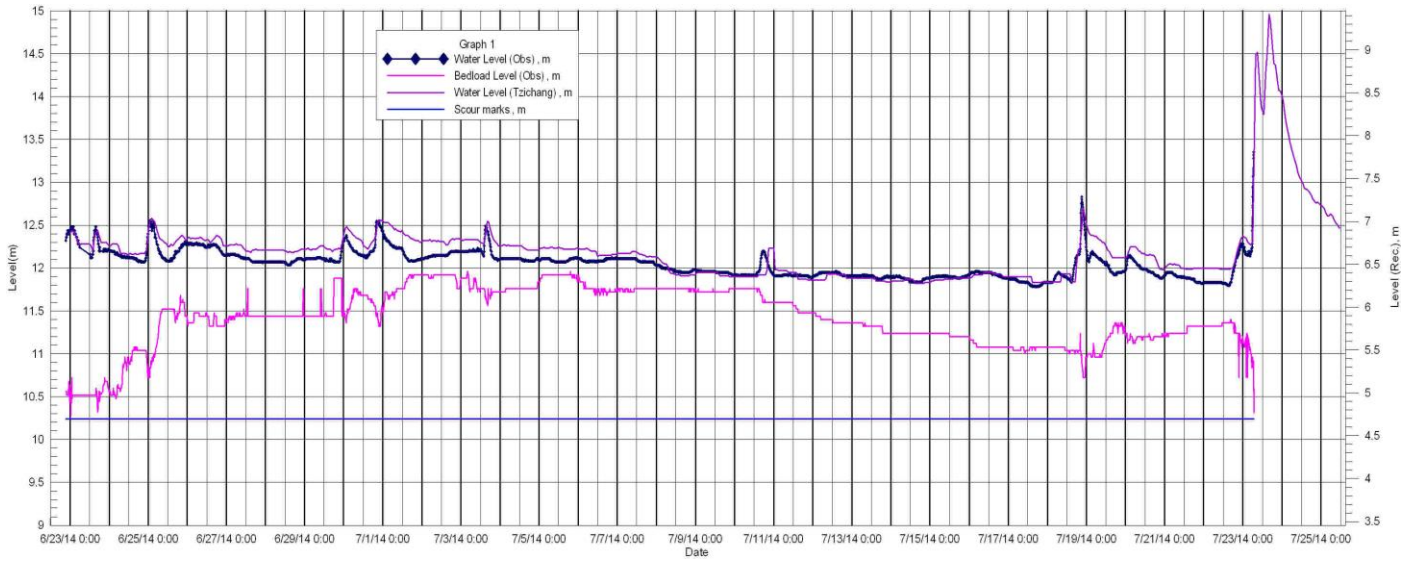
Except for real-time transmission of values of level and sediment, the monitoring system will provide the EC profile with all values of every layers of water body. With high precision and profound layers, this EC profile will be used in many hydrological and environmental applications.

Specifications:

- Flexible application : cascaded per 1/1.5m, up to 7.8m and more
- High resolution : 2cm
- High precision : 2cm for level and 4cm for sediment.
- Low power consumption: DC 3.6~6V.
- Easy installation : wireless with Li-cell.
- Long-life : no moving parts and high immunity to fail.
- Fast scan time : 1~5 seconds per cycle;
- Smart acquisition : 1~10 minutes transmission

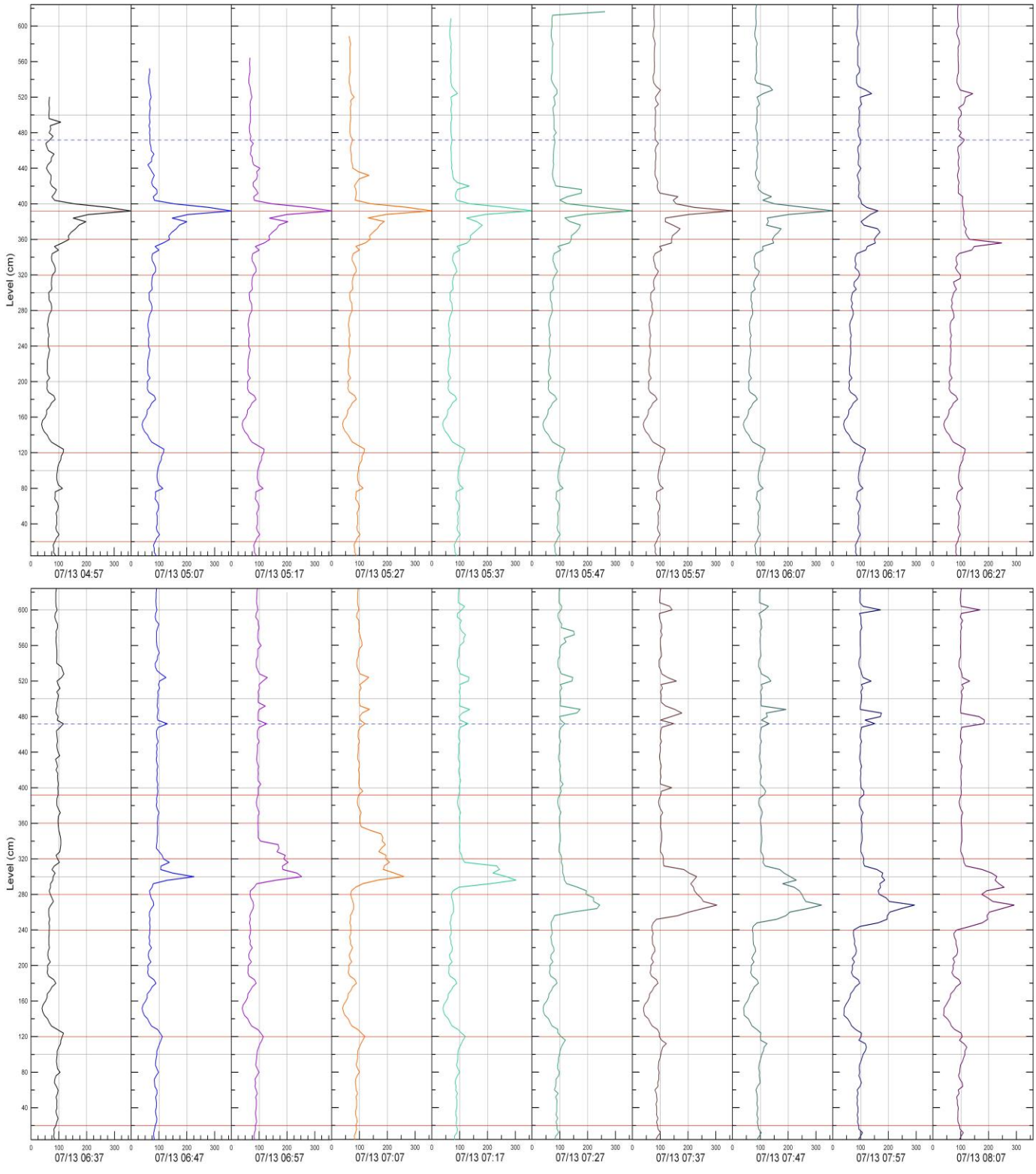
TWSI Innovative Precision Scour Monitoring System used on Jhuoshuei River (2014.06.01-2014.07.25)



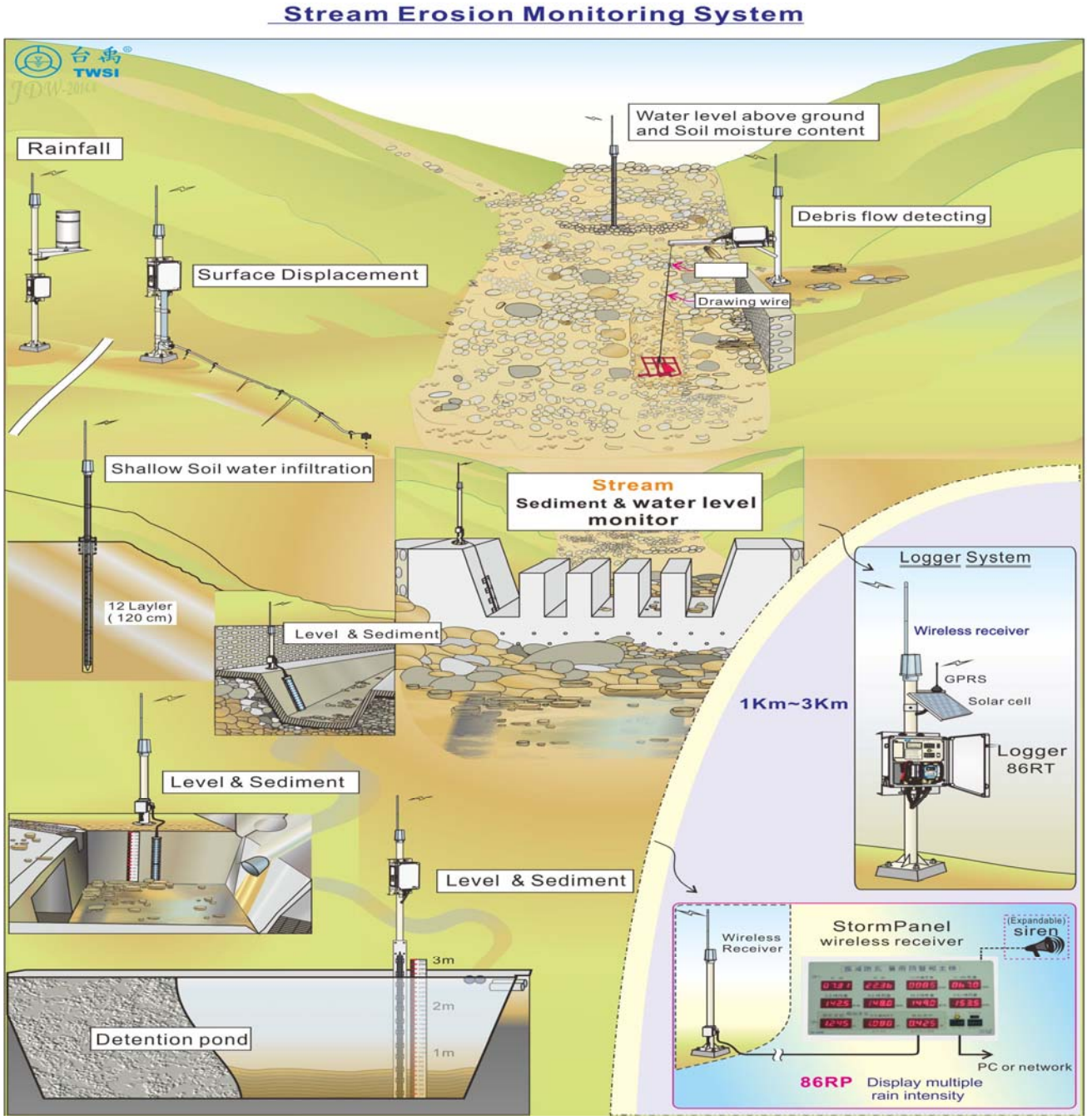


https://www.youtube.com/watch?v=5HOxgNg9wUY Link of the dynamic measurement value

Scour Sectional Graph with Resistance in Jhuoshuei River during Typhoon Soulik (2013.07.13-07.15)



Runoff & Surface erosion dynamic monitoring · Scour · Sediment Concentration



Application Overview

- ◎ Multi-layer Soil Saturated Monitoring
- ◎ Runoff & Surface erosion dynamic monitoring
- ◎ Rainfall monitoring on Upstream
- ◎ Event-triggered Crack & Surface Displacement monitoring
- ◎ Digital Wire Extensometer
- ◎ Detention Pond Sediment Monitoring
- ◎ Regional Disaster Warning System of Debris Flow
- ◎ Sediment Concentration Monitoring

Multi-layer EC sensing Staff (TF-284S)

1. measuring span : cascaded per meter, up to 7.8m and more
2. high resolution : 2cm
3. high precision : 2cm for level and 4cm for sediment
4. low power consumption: DC 3.6~6V
5. easy installation : wireless with Li-cell
6. Data transmission：RS-232 /RS-485
7. long-life : no moving parts and high immunity to fail
8. fast scan time : one cycle per minute or less
9. Housing Material：PC+ABS

Multi-layer Soil moisture probe (TP-285S)

1. application: concerning soil water infiltrations and helpful to on-line monitoring of landslide and investigation on unsaturated soils.
2. monitoring span : basic 12 layers for soil moisture and 2 sets for temperature
3. cascading :4 probes for 4.8m
4. low power consumption: DC 3.6~6V, 3mA at scan / 0.1mA at standby
5. Housing Material：PC+ABS
6. sensing electrodes. SUS304

Distributed Multi-point Moisture Monitor

1. Measuring method：14 sensing electrodes.
2. low power consumption: DC 3.6~6V, use the U2 lithium battery can run for more than one year with data transfer per minute
3. Data transmission：RS-232 /RS-485
4. long-life : no moving parts and high immunity to fail
5. fast scan time : one cycle per minute or less
6. Housing Material：PC+ABS

Data Acquisition and Repeater (TW-86RT)

1. Input：Contact closure for Rain and RS-232 for wireless Receiver
2. Power：Solar with built-in battery
3. Display：4x16 LCD data display
4. Output：RS-232 to GPRS and FSK to VHF Transmitter
5. Data logger：1M Flash memory
6. Data intervals： 1/5/10/60 minutes

Tipping-bucket Rain Gauge (TW-210S)

1. Type：Tipping-bucket
2. Orifice：200±6 mm
3. Resolution：0.5 mm/pulse & 1 mm/pulse
4. Accuracy：≦3 %
5. Material：SUS304 stainless steel
6. Rainfall intensity：0.01 ~ 4 mm /min
7. Contact time≦ 0.1sec
8. Contact life≧1,000,000 times

Digital Wire Extensometer (TW-231S)

1. Type： Constant torque spring loaded.
2. Measuring Range：4m
3. Resolution：1 mm.
4. Accuracy：± 0.1 % F.S.
5. Pulse signal：20 ms pulse for every 1mm increment / decrement.
6. Output：Absolute Serial Data String.
7. Wire tension：1.5kg
8. Measuring Cable：Diameter 0.9mm nylon-coated stainless steel
9. External tension wire：30m length Maximum.