AppNotes:
Design and set up of a network of disdrometers

Motivation

Rain still remains as one of the most difficult meteorological variables to measure. There are several ways of performing point measurements, and for some applications precision obtained compared with manual and human driven techniques is more than reasonable.

"The spatial variability of rain makes it difficult to have measurements of daily precipitation fields"

However, one of the problems with rain is its inherent spatial variability. In a daily basis important differences are found between close locations, although, obviously, these differences dilute when compared in a climatic basis, long periods, since they tend to compensate.

Nevertheless for certain applications is necessary to have daily precipitation fields and unless a huge number of point measurements are taken, other techniques such as RADAR and Satellite measurements need to be used. With some obvious differences, these techniques estimate the rain curtain falling or not falling to ground from the echo of an electromagnetic wave on the drops. Since this is not a direct measurement and considering that sometimes not all these drops end in the ground, some calibration exercises are needed.

"In-situ measurements of daily precipitation fields are needed to calibrate remote sensing techniques"

Two factors affect in the kind of echo that a curtain of rain produces when a radio beam hits it, one is the size of the droplets, other is the velocity they have. Knowing these two factors for an enough time and at the right place are valuable information for RADAR and satellite rain detection calibration.

Objective

The objective of this project was to have 1 minute samples of size and velocity droplets at 8 locations with redundant information all in an area of less than 8 Km2 and have this information in a central server at 250 Km away.

Case Study Summary

Services:

Location:

Finca de Investigación Agraria de la Universidad de Castilla-La Mancha "Galiana", Ciudad Real, Spain.

Products Used:

OTT Parsivel disdrometer

Measured Parameters:

Particle size and velocity of all liquid and solid precipitation

Methodology

For this project we used OTT Parsivel disdrometer due to their well known performance.

OTT PARSIVEL®: Laser-based optical Disdrometer for simultaneous measurement of PARticle SIze and VELocity of all liquid and solid precipitation

www.ott.com

Version 1 of this disdrometer was not specially designed for remote operation, so we had to work hard on the solar power unit.
For datalogging and transmission we went for our own design and prototype. We had to transmit a matrix of wind velocity and size of droplets of more than 1064 cells every minute and coming from 16 disdrometers. Risky but it worked close to perfection. We decided to go for an ad-hoc development in order to have everything under control.

"Using our own design and ad-hoc development let us have everything under control to overcome the challenges of this project "

Results

This project deployed more than 16 instruments able to detect the size and velocity of droplets with a 1 minute temporal resolution and almost in real time in a central server. The main reason of success with this project was the design of an intense maintenance program. Disdrometers windows get dirty, animals love to scratch their back on them and spiders love those nice arms in the middle of the field. Besides this minor problems, this project went really smoothly.

Some international publications and a Ph Thesis came out of this campaign:

Tapiador, F. J., R. Checa, and M. de Castro (2010), "An experiment to measure the spatial variability of rain drop size distribution using sixteen laser disdrometers", Geophys. Res. Lett., 37, L16803, doi:10.1029/2010GL044120.

Thanks to our excellent trajectory with projects like this and good procedures , professional competences and environmental commitment, interMET has accreditation on **ISO 14001:2004** for the activity: **"Design, installation and management of meteorological and environmental networks"**.

For more information on interMET services and projects visit:
www.intermet.es