Geophysical Research Abstracts,
Vol. 11, EGU2009-11058-1, 2009
EGU General Assembly 2009

Calibration of suspended sediment sensors in relation to particle size of transported material at the Vallcebre research catchments (Eastern Pyrenees).

M, Soler, G. Catari, G. Nord, and F. Gallart

Institute for Environmental Aseessment and Water Research (IDAEA), CSIC, Barcelona, Spain (fgallart@ija.csic.es, +34-934110012)

Suspended sediment transport is the main mechanism of stream sediment export. Sediment concentration is usually measured through sampling, but the use of sensors allows continuous estimation during floods, which usually transport most of the material. The relationship between gravimetric sediment concentration and the response of these sensors, as widely recognized, is sensitive to the characteristics of sediment particles such as size, density and colour. In the Vallcebre research catchments, two different types of sensors are used. The first sensor is an infrared turbidity sensor which functions on Optical-backscatter Sensing (OBS), it sends out a beam of infrared light emitted by a diode and the reflected light is measured by a phototransistor, a portion of the beam is scattered if particles are in suspension; a high light scattered indicates therefore high sediment concentration. The second sensor is an ultrasound sensor which operates by transmitting pressure pulses or short bursts of approximately 10 μs of high frequency sound (3.5 MHz) emitted from one transducer to another, where a fraction of each pulse is attenuated or backscattered by suspended sediment; a high attenuation of the signal is therefore indication of high sediment concentration. An automatic water sampler is also used to take grab samples of water into a series of bottles, at time intervals depending on flow conditions.
Initially, the sensors were calibrated according to the commonly transported materials which are silt and clay, but during large floods (which represented only 2% of floods and transported the 51% of total suspended sediment during the last 12 years) the dominant suspended material was sand. Sensor calibrations performed with different particle sizes, (< 63um and 63 < d < 250 um) showed that in the presence of sand the infrared sensor underestimates the sediment transport whereas the ultrasonic sensor tends to overestimate it.
Although the diverging response of both sensors during some events provided an indication of changing sediment grain size and may help to estimate the appropriate sensor calibrations, water and sediment samples are needed to obtain sensor calibrations during the main floods, otherwise the error might be considerable.