Geophysical Research Abstracts
Vol. 19, EGU2017-6223, 2017
EGU General Assembly 2017

Programmable Off-The-Shelf cell-enabled GPS loggers optimized for retrieving after being used as a float in large river experiments.

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Throwing something in a river and seeing how fast it floats downstream is the first thing that every hydrologists does when encountering a new river. Using a collection of floats allows estimation of gauge surface water velocity and dispersion characteristics.

To use floats over long (hundreds of kilometers) stretches of river requires either a crew that keeps an eye on the floats (labor intensive) or having high-tech floats that upload their location on regular intervals, such that they can be retrieved at the end of the experiment.

GPS floats with communication units have been custom build by scientists before. Connecting GPS units to GSM modems used to require deep knowledge on micro-electronics and network protocols. In this work we present a version that is build using only off-the-shelf electronics that require no deep knowledge of either micro electronics nor network protocols. The new cellular enabled Particle Electron development board made it possible to connect a Sparkfun OpenLog (SD-card based logger) to a GPS tracker with no soldering and little programming. Because scientist can program the device themselves, settings like sample time can be adapted to the needs of specific experiments and additional sensors can be easily added. When writing GPS location every minute to SD and reporting every fifteen minutes online, our logger can run for three days on a single 2200 mAh LiPo battery (provided with the Particle Electron). Cost of components for our logger is less than $150.

The durability of our GPS loggers will be tested during a field campaign at the end of January 2017 where 15 floats will float down the Irrawaddy river over a length of more than 200 km, during two days.