Multi-Parameter Probes

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The single most important limitation to the advancement of biogeochemical field research in the hydrological sciences - as identified by the user community - is the current inability to obtain more extensive spatial and finer temporal sampling and analysis of key nutrient and geochemical species (e.g., dissolved oxygen, ammonium, nitrate, phosphate, dissolved organic carbon). The technologies to obtain this data exist now. New, more robust sensor technologies are making it far easier to obtain reliable data at meaningful (i.e., often low) ambient concentrations. However, for the most part these technologies have been developed in other fields (e.g., oceanography) and have not been utilized widely in field watershed research.

Thus, we currently have a very poor understanding of the spatial and temporal scaling characteristics of drainage networks. Considerable evidence confirms that in-stream processing is a critical component of overall watershed solute processing, transformation, and retention. Thus, better quantification of the spatial and temporal characteristic of biogeochemical processes in drainage networks would significantly advance our understanding of watershed functions.

The proposed HMF sensors are a set of multi-parameter sondes which include, at a minimum, measurements of dissolved oxygen, electrical conductivity, and nitrate. Instrument specifications for the YSI Inc. sonde are available at http://www.ysi.com/v2/media/V2-Spec-Sheet.pdf. The sondes are deployable in fresh, sea, or polluted water. They include data loggers, and power supplies.

Example of a multi-parameter data-logging sonde. http://www.ysi.com

The multi-parameter sensor node would provide the hardware required to instrument from 3-5 sites with a suite of instruments to measure dissolved oxygen, electrical conductivity, and nitrate with robust, membrane-less sensors. We would provide the integrated logging interface and a technician who would maintain and calibrate the instruments and ensure that they were used so as to maximize the value of the data collected. In any given year, it might be practical to consider servicing 3-5 of these groups, depending on their particular experimental needs.

It is expected that more research groups who would have in interest in this equipment than could be accommodated in one year. For example the NSF-funded Lotic Inter-site Nitrogen Experiment (LINX) group consists of 10 different university groups and over 50 individual scientists and students collaboratively studying nitrogen and carbon dynamics in river networks. It is likely that there are an equivalent number of other groups that would have similar interests in utilizing this hardware. One potential indicator of this demand is the number of proposed CUAHSI Hydrologic Observatories themselves. Some form of biogeochemical research in included in most if not all of these observatory work plans. Many of these groups will likely be interested in this advanced instrumentation.