USGS NSF GRIP, GSP Opportunity

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USGS Center:	New England Water Science Center
Project Title:	Clean data from dirty waters: solving particle interference in optical sensors
Summary:	Work in the beautiful Green Mountains of Vermont, as part of the USGS WEBB team investigating dissolved organic carbon (DOC) dynamics in five forested catchments across the U.S. Help the scientific community better utilize in-stream fluorescence by solving the problem of particle interference. Design field and laboratory sensor testing, with opportunities to publish results.
Project Hypothesis or Objectives:	Sensors that measure in situ fluorescing dissolved organic matter (FDOM) are increasingly used in freshwater streams to investigate dissolved organic carbon (DOC) dynamics. This high-resolution temporal information reveals new insights on nutrient cycling, DOC flow paths, and watershed-scale hydrology. In some streams, suspended solids compromise FDOM measurements by quenching the signal. This interference can be corrected in large part by using concurrent turbidity measurements, but recent evidence suggests that a simple universal equation is not always applicable due to spatial and temporal shifts in suspended sediment character. The primary objective of this internship will be to design and carry out experiments to quantify the effects of variations in suspended sediment concentration, size, and color on FDOM measurements, and to develop a more comprehensive sediment interference correction algorithm. The GRIP intern will also participate in the interpretation of the resulting data streams to help us understand catchment nutrient cycling processes.
Duration:	Up to 12 months
Internship Location:	Montpelier, VT
Field(s) of Study:	Chemistry, Engineering, Geoscience, Life Science

Applicable NSF Division:	EAR Earth Sciences, CBET Chemical, Bioengineering, Environmental, and Transport Systems, CHE Chemistry
Intern Type Preference:	Either Type of Intern
Keywords:	optical sensors dissolved organic carbon FDOM turbidity biogeochemistry
Expected Outcome:	FDOM sensors are now widely used, but there is limited awareness of the need for turbidity corrections. Even among the aware, there is limited guidance on how best to implement these corrections. By formulating a strategy to make robust corrections, the intern will provide a valuable service not only to the USGS WEBB group but to the broader community of sensor users. The intern will contribute to or potentially lead papers on the correction approach, as well as interpretive papers on DOC processes.
Special skills/training Required:	Basic experience with spreadsheets, statistical packages, and data bases. Hydrologic and biogeochemical background and interest. Lab and field experience desirable.
Duties/Responsibilities:	In consultation with the mentors, the intern will design and carry out field and laboratory experiments to quantify the effects of suspended sediment quantity and quality variations on optical fluorescence. Field experiments may involve concurrent deployments of co-located filtered and unfiltered FDOM sensors as well as in situ particle analyzers during hydrologic events, while collecting suspended sediment at different points on the storm hydrograph. Laboratory experiments will test variations in sediment effects under controlled conditions. The intern will develop a FDOM data correction algorithm that may include parameters for sediment characteristics, and will contribute to and potentially lead methods papers on algorithm performance as well as interpretive studies.