IRS2012-586
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012

Ocean Optics: The Next Frontier

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With the recent decline in funding for ocean optics, it is time to rethink the areas of research that were once the "holy grail" of this very fruitful field. The research emphasis, once dominated by the study of pelagic regions of the oceans, has now shifted to the more turbid surf and littoral zones. New and innovative instrumentation for the determination of inherent optical properties whose measurement is commensurate with high turbidity will be discussed. We will revisit the use of inelastic processes such as Raman and Brillouin scattering as tools to measure important quantities such as sound speed, ocean temperature, and salinity as a function of depth. The rising importance of polarimetry in ocean optics will be elucidated. And, as introduction to a new ocean monitoring concept, we will show how femtosecond lasers can be used to generate filaments in the water. This is a nonlinear process leading to an underwater line source of supercontinuum light that can be used for hyperspectral sensing. It also produces directed sound waves that may be used both for bathymetry remote sensing and for sound speed determinations. The use of Filament Induced Breakdown Spectroscopy (FIBS) will be shown to be a potentially viable tool for remotely determining many important physical and chemical properties of riverine and estuarine environs.