DEVELOPMENT AND APPLICATION OF AN OBSERVATION-BASED LIGHT ATTENUATION EQUATION FOR NORTHERN GULF OF MEXICO

Phillip A. DePetro[1], Wilson Melendez[2], Amy M. Anstead[1], Timothy J. Feist[3], James J. Pauer[4]

1. ICF International, 9311 Groh Road, Grosse Ile, MI, 48138
2. Computer Sciences Corporation, 9311 Groh Road, Grosse Ile, MI 48138
3. Trinity Engineering Associates, 9311 Groh Road, Grosse Ile, MI 48138
4. US EPA/ORD/MED, 9311 Groh Road, Grosse Ile, MI 48138

Solar radiation is one of the main factors controlling the rate of primary production on the Louisiana Shelf in the northern Gulf of Mexico. This work seeks to improve on previously published empirical equations through the use of statistical data transformation and the incorporation of a greater vertical resolution. A paired dataset, including light measurements and a number of water quality variables, was analyzed to develop a light attenuation equation. The resulting equation calculates the attenuation coefficient, kd, as a function of salinity, chlorophyll a, and particulate detrital carbon. This equation reasonably reproduces the vertical light profile across a variety of spatially and temporally varying conditions, from the Mississippi Plume to the offshore “blue water” (R-squared = 0.65, n=424, $p<0.005$). Equation-generated profiles of light are presented with the associated field data to highlight model performance, with implications on predicted primary production and associated sensitivities discussed. Given the strong response of eutrophication models to light input, the equation was developed to decrease uncertainty in hypoxia and process forecasts for the northern Gulf of Mexico as part of a larger modeling effort.