Supplementary Material

Satellite Estimates of Phytoplankton Absorption Spectra

The ocean colour algorithm of Craig et al. (2012) was used to estimate phytoplankton absorption spectra ($a_{ph}(\lambda)$) from remote sensing reflectance ($R_{rs}(\lambda)$, sr^{-1}) using date-matched pairs of level 2 LAC 1 km MODIS Aqua satellite data and *in situ* measurements of $a_{ph}(\lambda)$. An area bounding the Scotian Shelf was selected (43 °N ≤ latitude ≤ 46 °N, -68 °W ≤ longitude ≤ -59 °W), and a 3x3 pixel box surrounding the water sample co-ordinates defined the tolerance for satellite matchups with water samples. $R_{rs}(\lambda)$ spectra from the 3x3 pixel box were filtered to remove spectra lying out with a 4-standard deviation envelope, then averaged to give a mean spectrum for the box.

The model for $a_{ph}(\lambda)$ was derived by performing an EOF analysis of area-normalised $R_{rs}(\lambda)$ spectra and using the resulting EOF scores as independent variables in a multilinear regression against $\log_{10}[a_{ph}(\lambda)]$. The resulting model accurately predicted a_{ph} at all wavelengths, with no discernable bias (Fig. S1, Table S1). The model was then used to estimate $a_{ph}(\lambda)$ in the period 2003-2011 from MODIS Aqua level 3 mapped 4 km monthly composites of $R_{rs}(\lambda)$ in a box surrounding station HL2 (43.5 °N ≤ latitude ≤ 45 °N, -65 °W ≤ longitude ≤ -63 °W).

Supplementary Figures

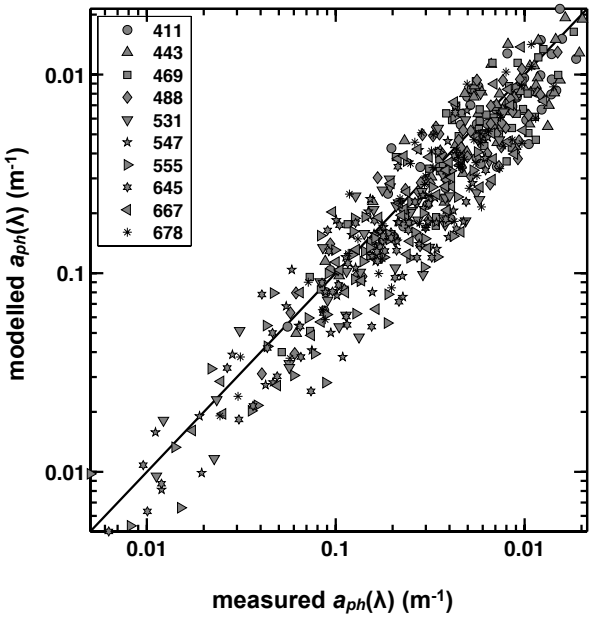

Fig. S1

Supplementary Figure Captions:

Fig. S1: Measured and modelled phytoplankton absorption. Legend refers to wavelengths (nm). Modelled values were derived from MODIS Aqua level 2 LAC 1 km $R_{rs}(\lambda)$ using the empirical orthogonal function (EOF) ocean colour model of Craig *et al*. (2012).

Table S1. Statistics for the ocean colour model.

wavelength (nm)	R^2 (N = 54)	*RMSE*	F_{med}
412	0.819	0.145	1
443	0.819	0.148	1
469	0.807	0.153	1
488	0.793	0.161	1
531	0.818	0.181	1
547	0.813	0.181	1
555	0.806	0.198	1
645	0.834	0.184	1
667	0.828	0.174	1
678	0.829	0.169	1

All statistics are in $\log_{10}$ space. RMSE – root mean square error. $F_{med} = 10^{bias}$. For example, if $F_{med} = 1$, there is no model bias; if $F_{med} = 2$, the model overestimates by a factor of 2; if $F_{med} = 0.5$, the model underestimates by a factor of 2.