

First-Cut GAM Fits for Patuxent Chlorophyll-*a*

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GAM Models tested

In each case, for “flow”, used: (1) vertically averaged salinity at that location, and (2) fall-line flow from previous x days.

- Model 1: Basic additive model

$$\log(\text{chl}a) \sim s(\text{date}) + s(\text{doy}) + s(\text{flow})$$

- Model 2: Allow for smooth interactions of the variables

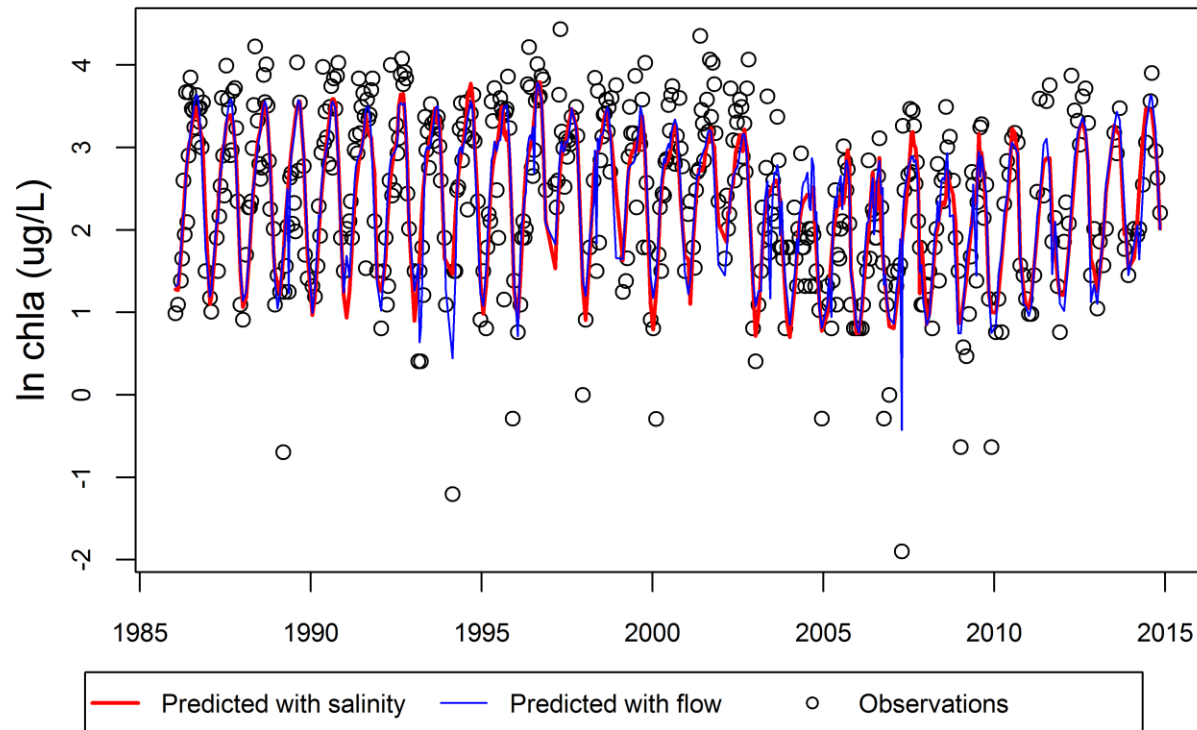
$$\log(\text{chl}a) \sim \text{te}(\text{date}, \text{doy}, \text{flow})$$

- Model 3: Account for residual autocorrelation, using a mixed model

$$\log(\text{chl}a) \sim \text{te}(\text{date}, \text{doy}, \text{flow}) + \text{AR1}$$

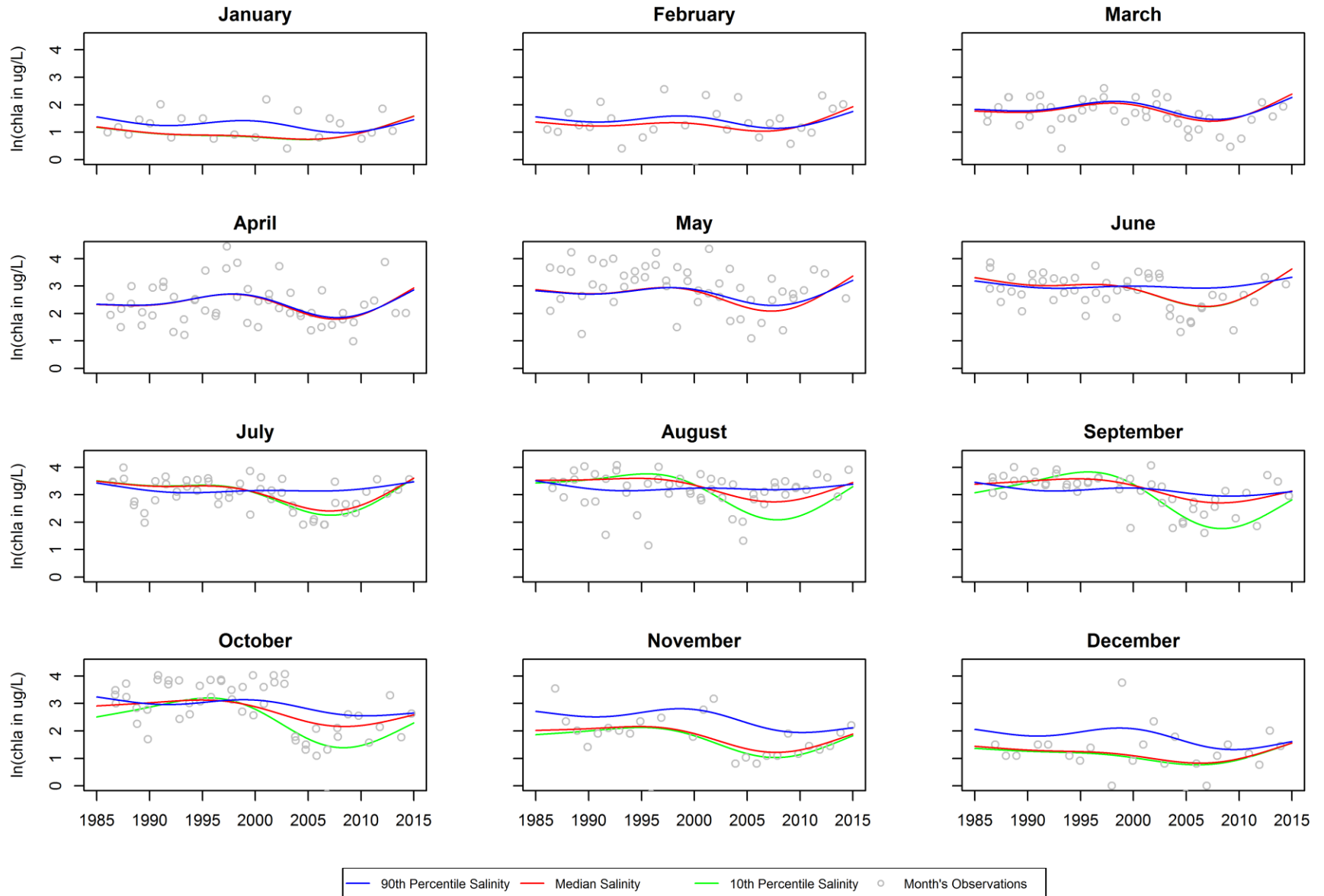
- $s()$ is one of a number of possible GAM spline fits
- $\text{te}()$ is the tensor product smooth that allows for a combination of interacting splines

GAMM Surface chlorophyll-a at TF1.6

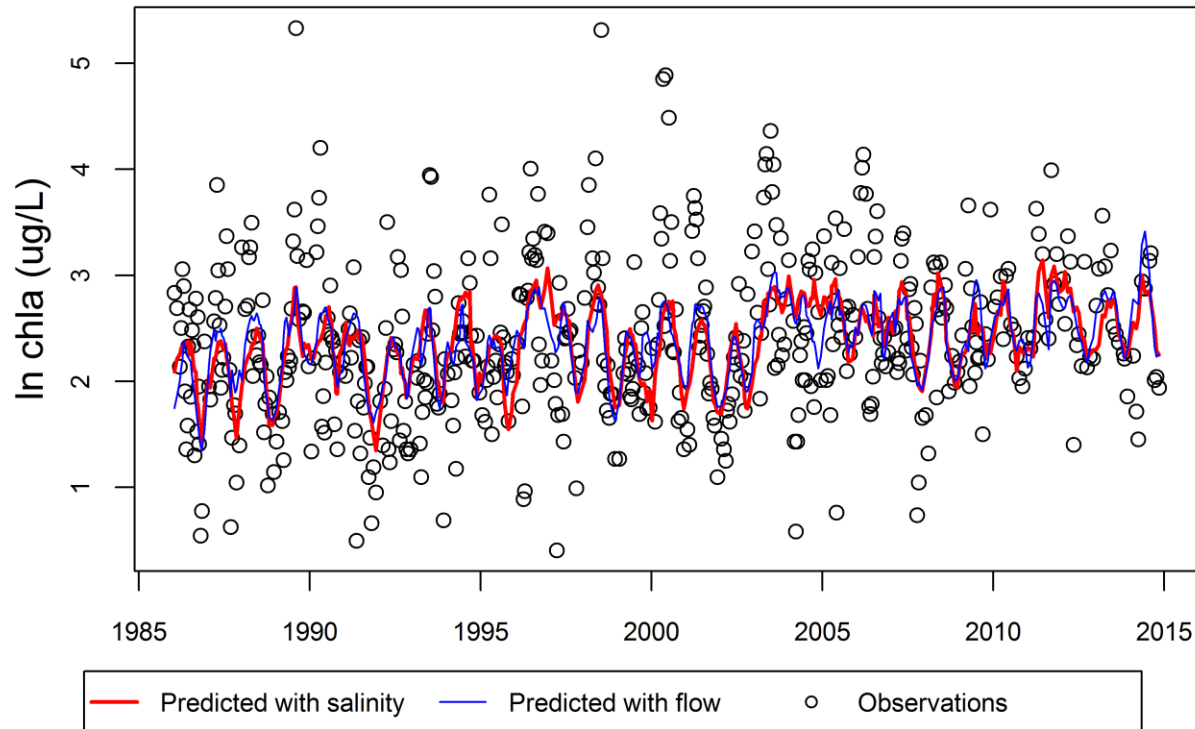


Fit statistic	GAMM model for TF1.6	
	With Salinity	With Flow (5 day lag)
RMSE (of logs!)	0.63	0.59
AIC	1079	1036

TF1.6 GAMM salinity-normalized predictions with each month's data

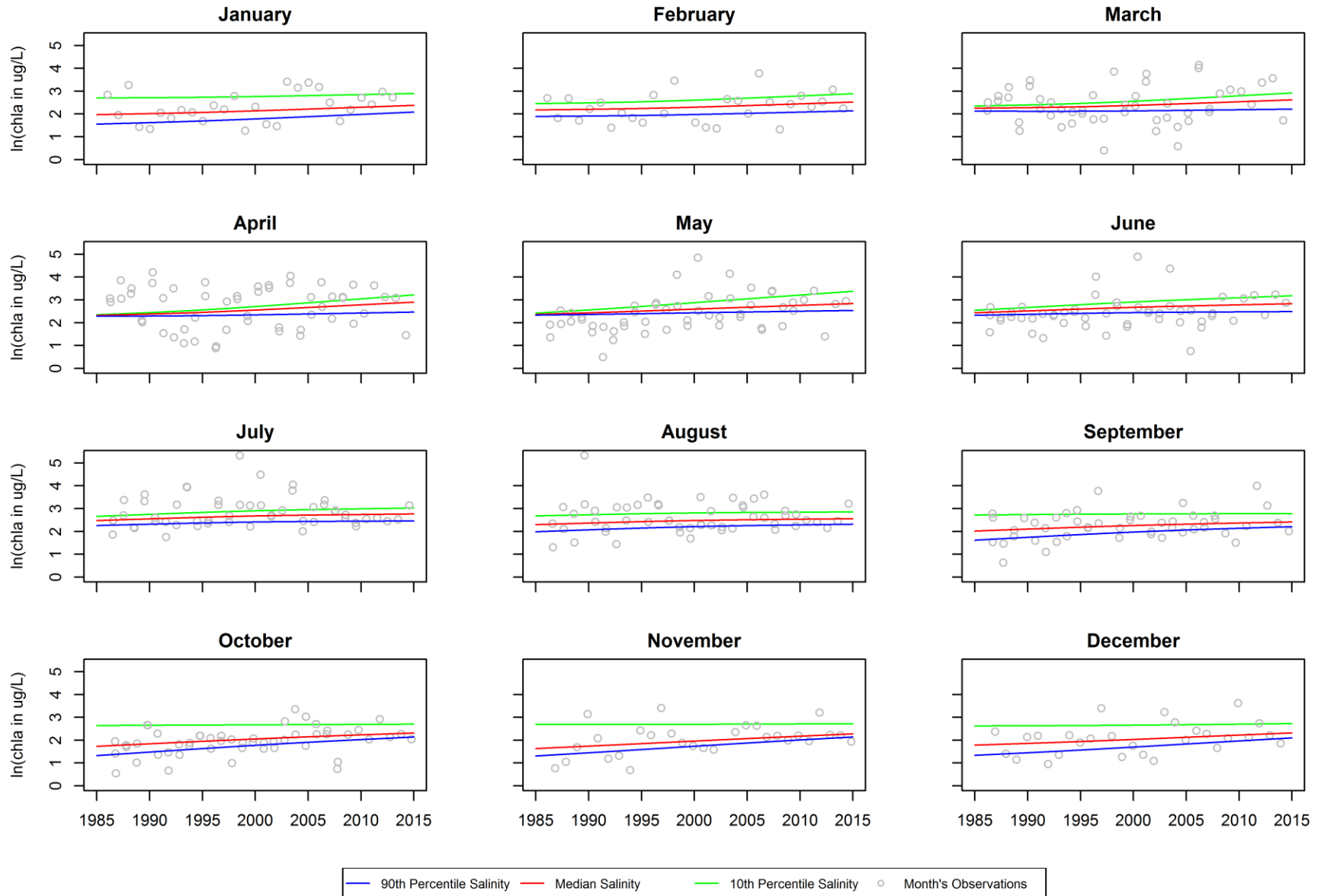


GAMM Surface chlorophyll-a at LE1.3



Fit statistic	GAMM model for LE1.3	
	With Salinity	With Flow (90 day lag)
RMSE (of logs!)	0.66	0.65
AIC	1006	1016

LE1.3 GAMM salinity-normalized predictions with each month's data



To-do for GAMs

- This was a rough first cut, so still tweaking model fit
- Log back-transformation approach
- Develop some additional comparable graphics