



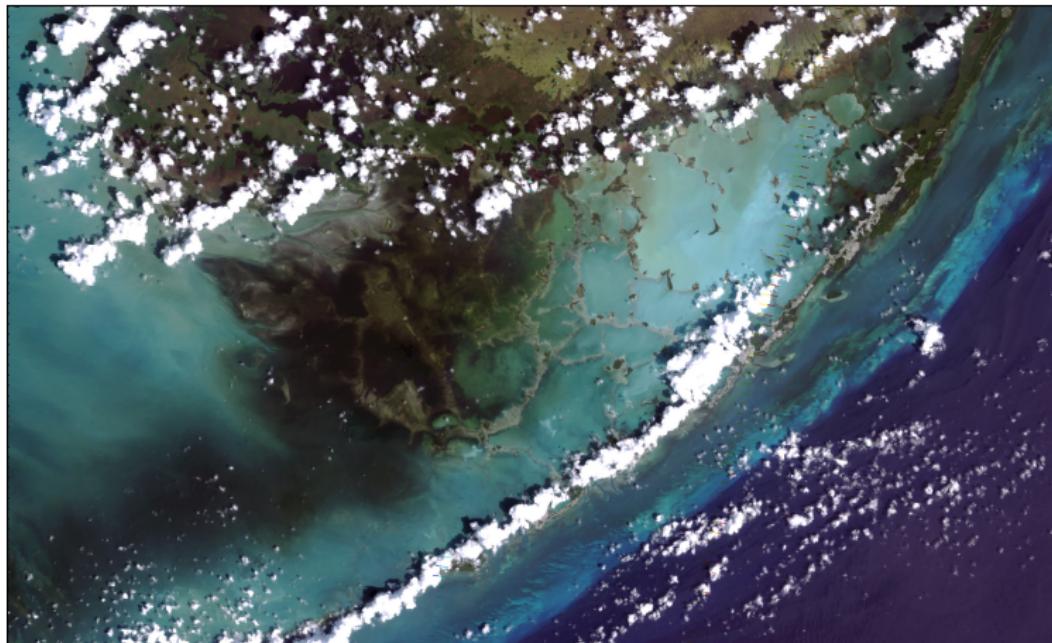
FINE-SCALE SPATIAL PATTERNING OF PHYTOPLANKTON ABUNDANCE IN A COASTAL ESTUARY

August 2016

Joseph Stachelek, Christopher Madden, Stephen P. Kelly, Michelle Blaha

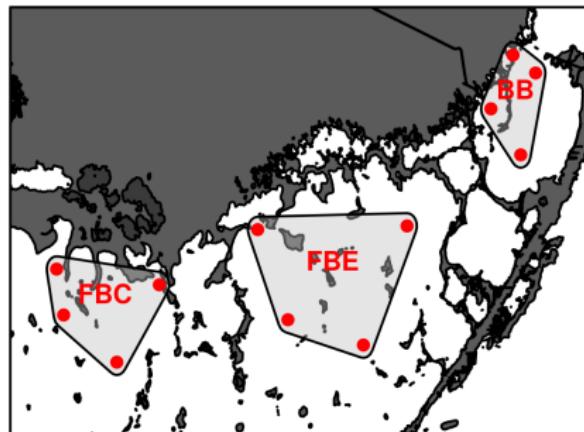
Michigan State University South Florida Water Management District

HOW CAN WE DESCRIBE PHYTOPLANKTON DISTRIBUTIONS?

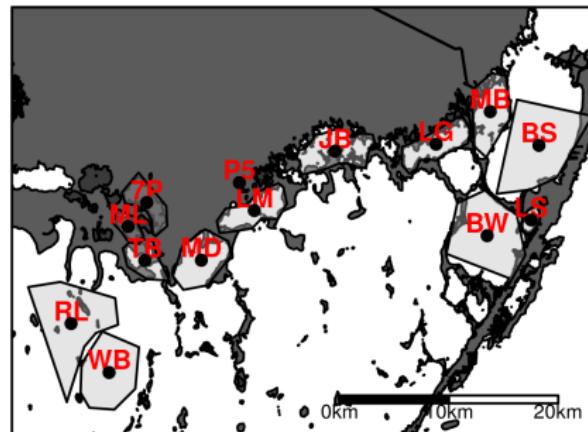


THE DISCRETE APPROACH

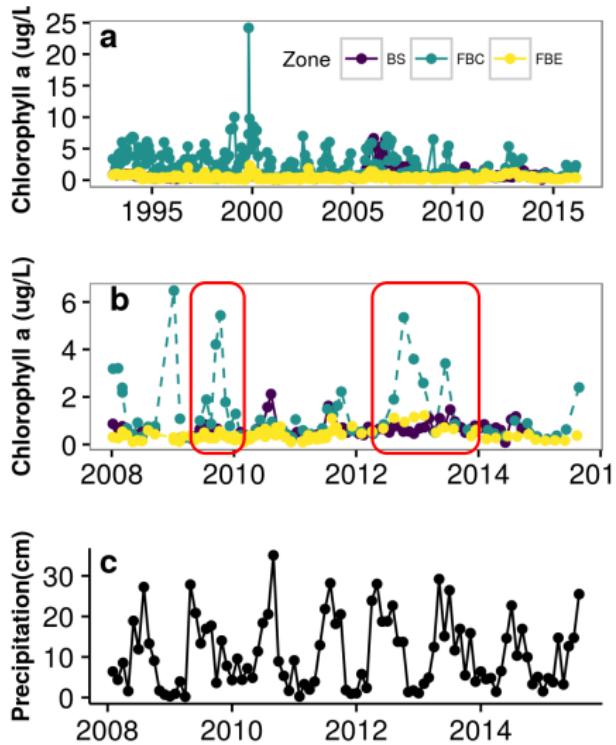
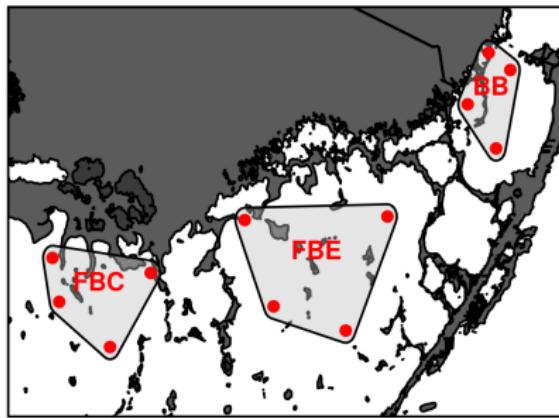
Bay-Wide Network
(1993 - 2015)



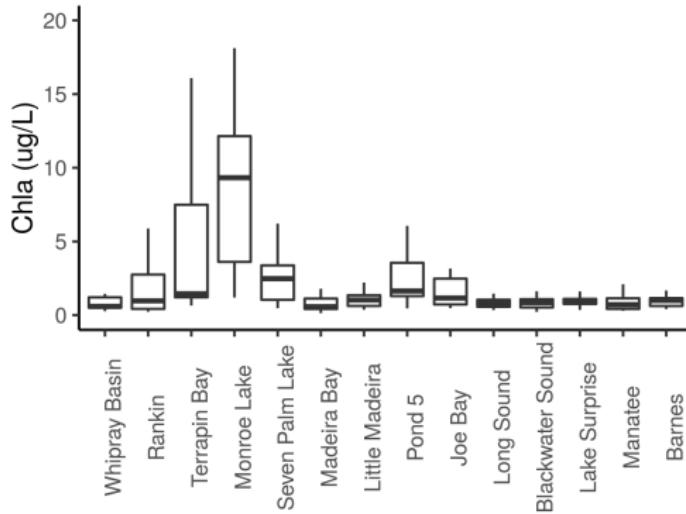
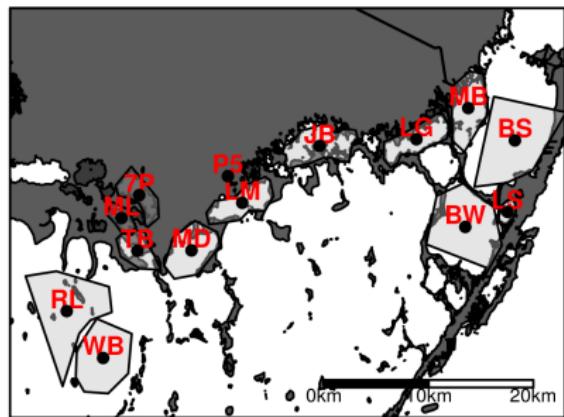
Coastal Network
(2008 - 2015)



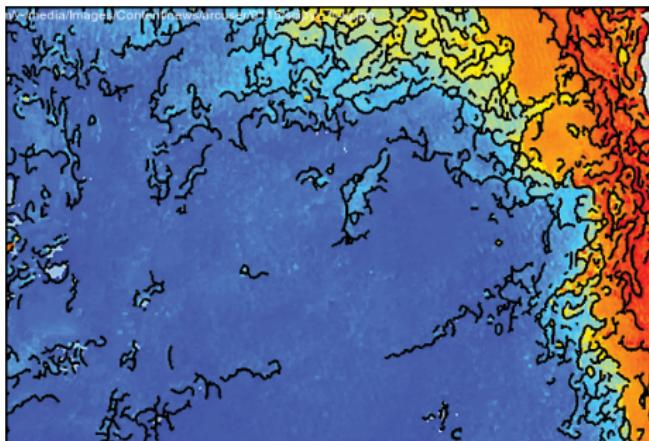
TEMPORAL VARIABILITY



SPATIAL VARIABILITY



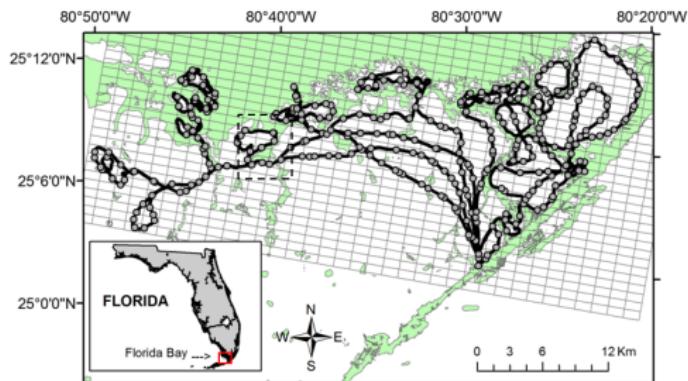
WHAT DO WE MISS WITH THE DISCRETE APPROACH?



- ▶ Spatial Gradients
- ▶ Point Source Extent

AN ALTERNATIVE - THE UNDERWAY APPROACH

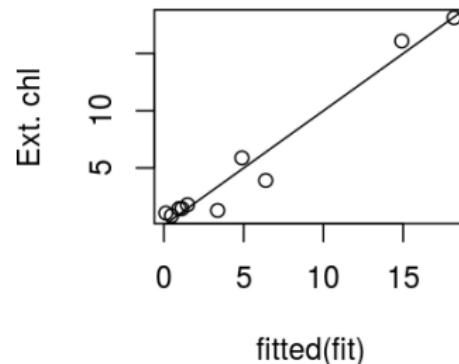
- ▶ Quarterly surveys
- ▶ Measurements every 50m
- ▶ Emphasis on freshwater discharge



CHLOROPHYLL MODELLING^{1,2}

1 to 1 line

Instrument Package	Parameter
Optical 1	CDOM
...	Chlorophyll
Optical 2	CDOM
...	Chlorophyll
...	Phycocyanin
...	Phycoerytherin

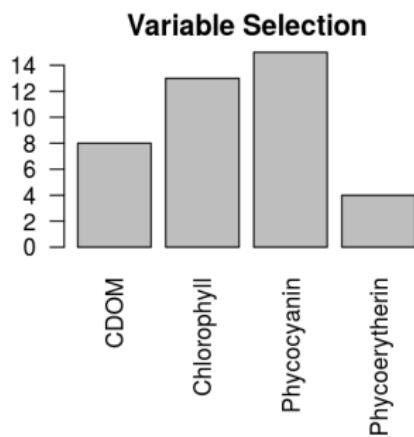
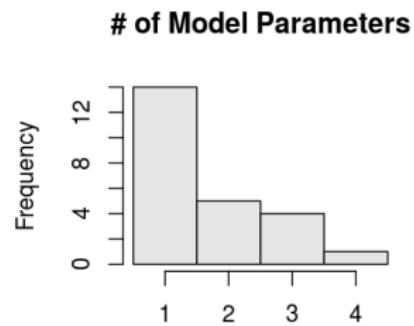
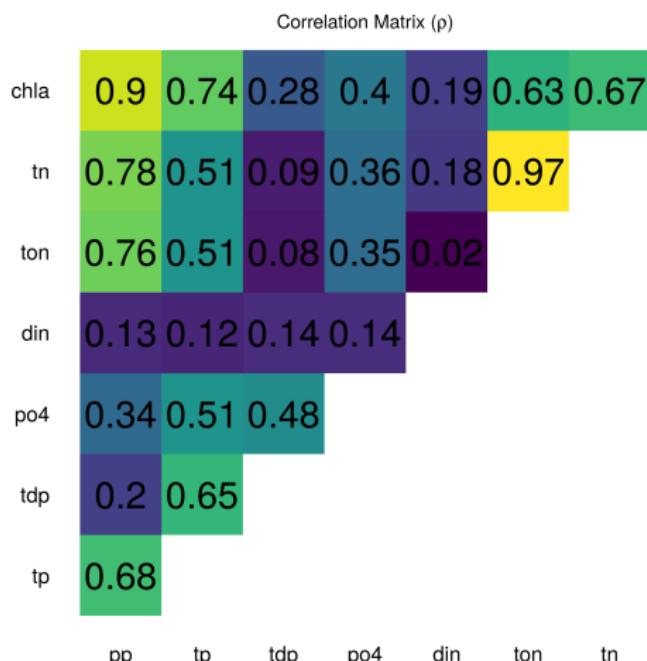


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DataflowR:::chlcoef(201509, corcut = 0.75)
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- > Initial correlation matrix
- > MLR with all variables...
- > Checking for redundancy in variable pairs
- > Generate AIC for candidate models
- > Checking VIF...

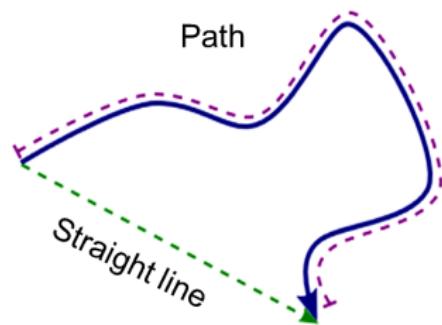
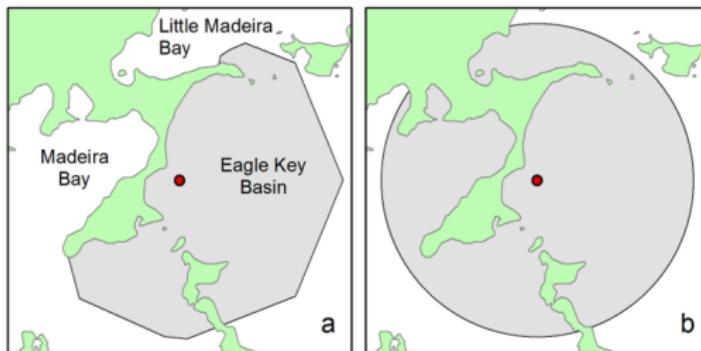
¹Seppälä et al. 2007 ²Venables and Ripley 2002

WHAT DID WE LEARN FROM CHL MODELLING?



INVERSE PATH DISTANCE WEIGHTING (IPDW)

As the crow flies or as the fish swims?²³



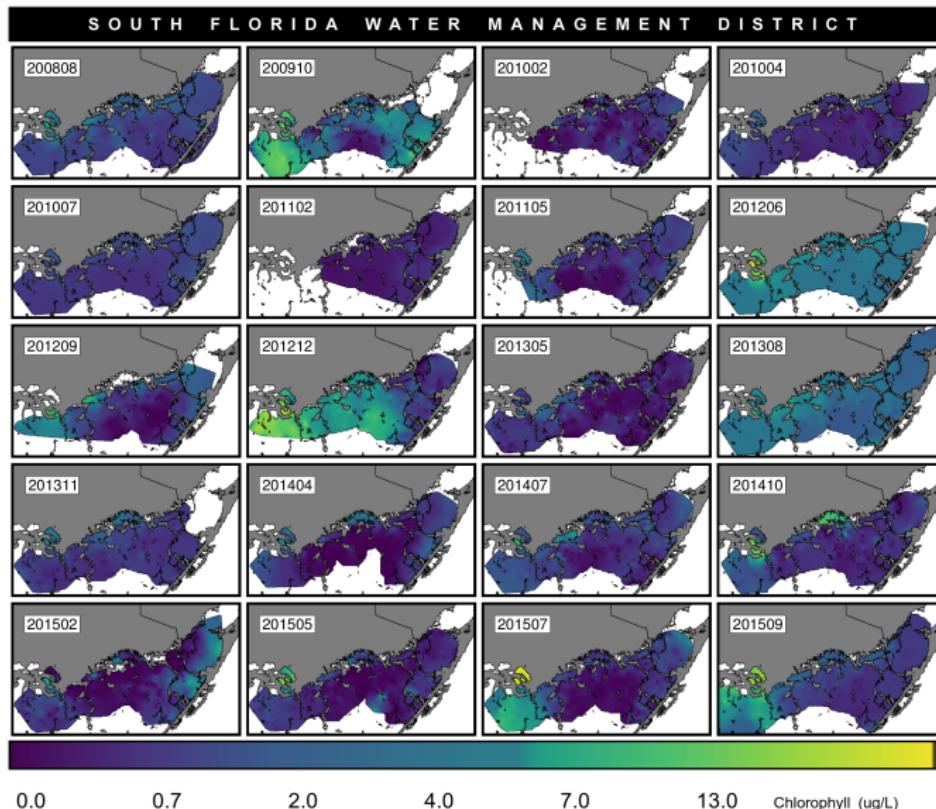
Project-specific optimization for:

- ▶ Spatial Grain
- ▶ Max Neighborhood Distance

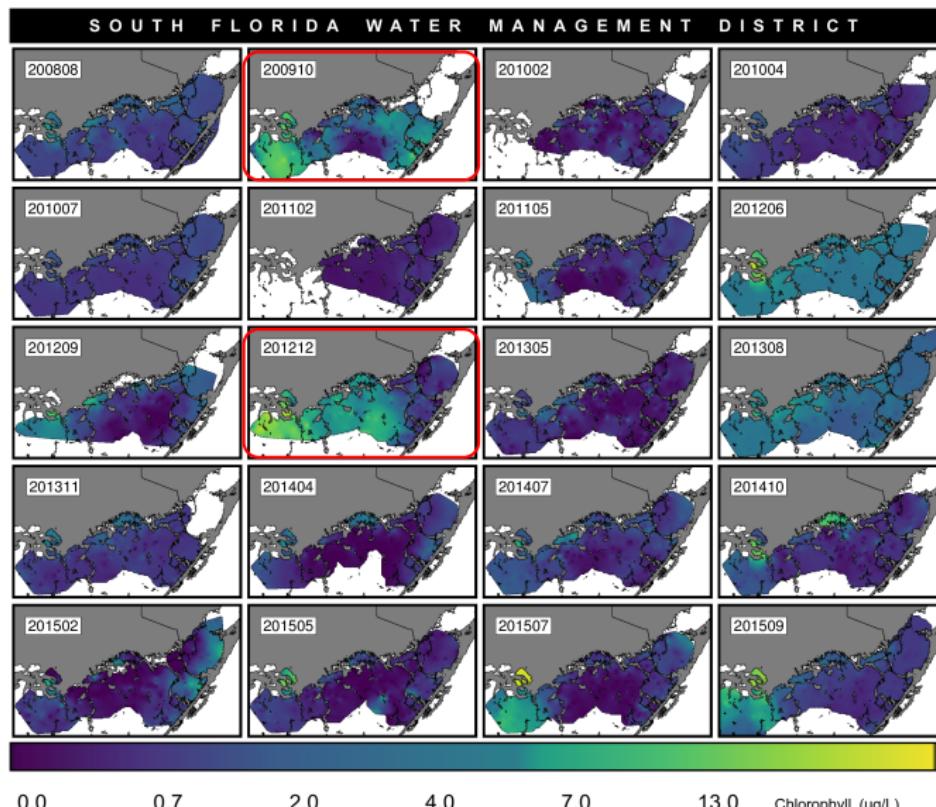
²Little et al. 1997

³Suominen et al. 2010

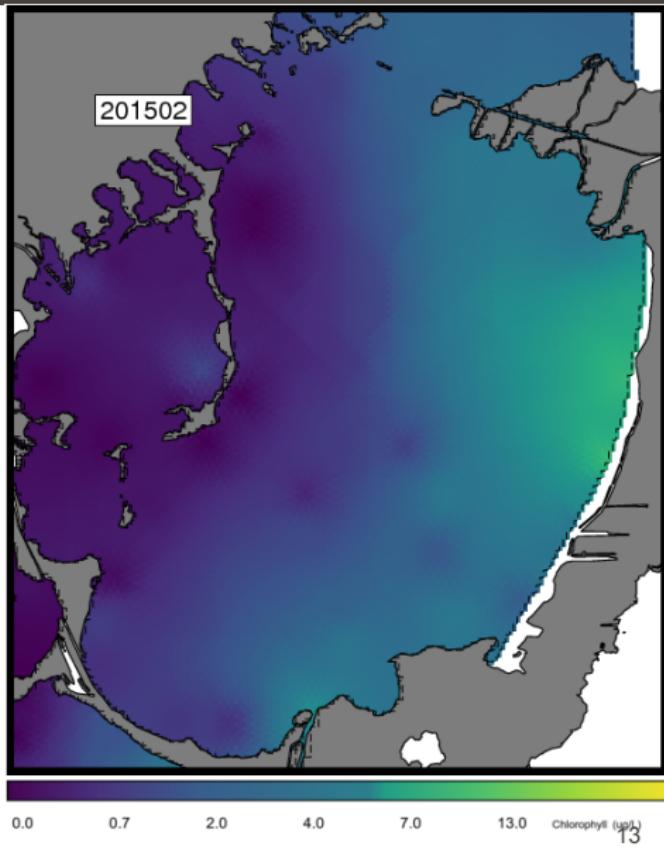
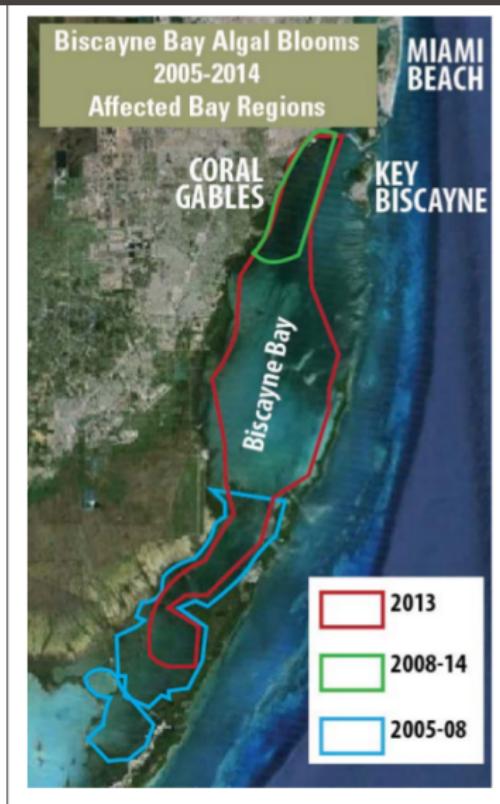
SPATIO-TEMPORAL VARIABILITY



SPATIO-TEMPORAL VARIABILITY



SPATIAL VARIABILITY



RESOURCES

<http://cran.r-project.org/package=ipdw>

- ❑ Stachelek J.,C. J. Madden,S. P. Kelly,M. Blaha (submitted).
Fine-scale relationships between phytoplankton abundance
and environmental drivers in Florida Bay, USA.
»Estuaries and Coasts«
- ❑ Stachelek J.,C. J. Madden. 2015. Application of Inverse
Path Distance Weighting for high-density spatial mapping
of coastal water quality patterns
»Int. J. Geographical Information Science«
- ▶ **stachel2@msu.edu**