

Effects of Climate and Human Drivers on Surface Water Change

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Introduction

- Inland water distribution is changing over time and space as climate and land use/land cover are changing [1], [2]
- Climate models project increased precipitation and intensity of hurricanes [3]
- Southeastern US: most land cover/use change and highest rate of population growth in the country [4]

Do human or climate factors more heavily impact changes in surface water detectable using satellite imagery?

Data

- Surface water – Dynamic Surface Water Extent (DSWE) [5]
- Precipitation – Gridded Surface Meteorological (GRIDMET) [6]
- Max. Temp. – GRIDMET [6]
- Min. Temp. – GRISMET [6]
- Agriculture land cover – USDA Cropland Dataset (CDL) [7]
- Developed land cover – CDL [7]
- Natural land cover – CDL [7]
- Population – LandScan [8]

Methods

Linear Mixed Effects Models

Fixed Effects:

Climate variables: standardized seasonal anomalies

Land Cover variables: percent land cover type

Population variables: population density

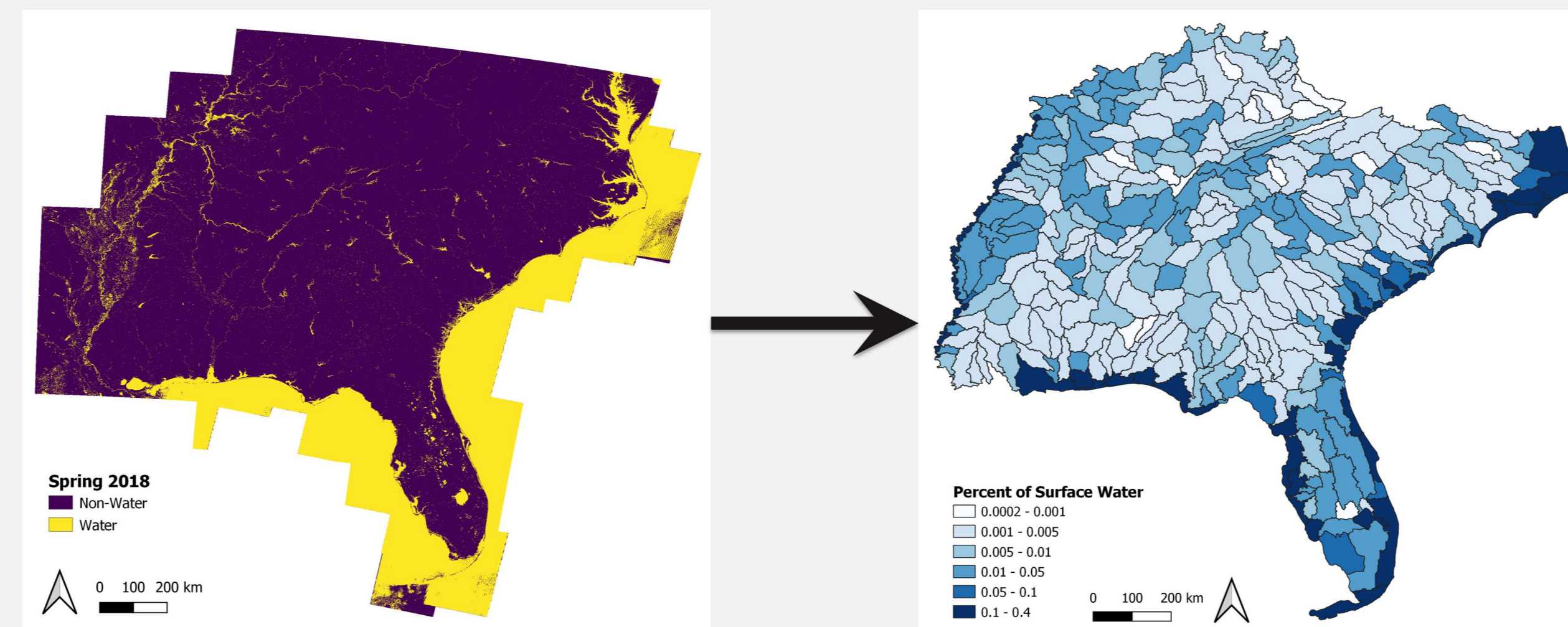
*each variable calculated per 8-digit Hydrologic Unit per season in 2018

Random Effects:

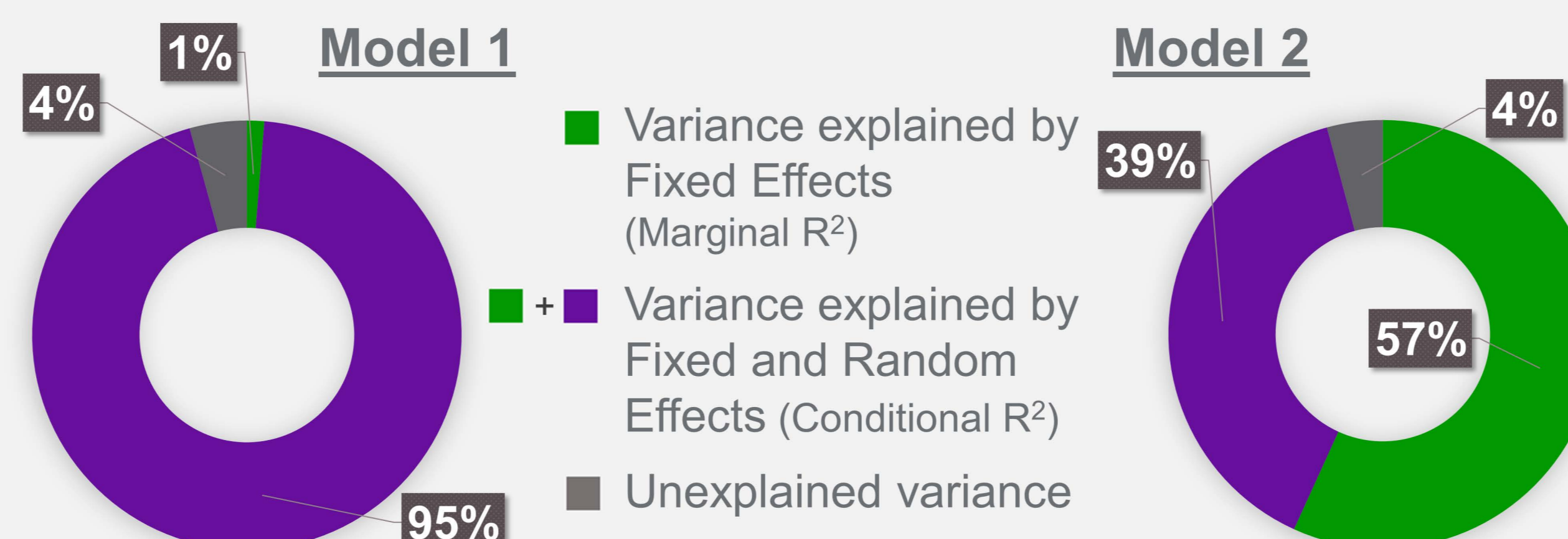
8-digit Hydrologic Unit

Model 1 – Climate Variables

Model 2 – Climate and Human Variables



Results



Conclusions

- Climate drivers alone do not explain a lot of the variance in surface water
- Adding human drivers increased the amount of variance explained by the fixed effects
- Warmer temperatures and higher precipitation lead to increases in surface water
- Natural land cover can limit runoff and reduce surface water

Human drivers more heavily impact the estimation of surface water

Future Work

- Expand temporal scale: only for 2018, but will be scaled up to 30 years
- Assess temporal trends: seasons and years will be nested grouping factors (random effects)
- Incorporate soil moisture data

References

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