Modeling the Contribution of Long-Range Transport to Nitrogen Deposition in U.S. Hydrological Regions

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INTRODUCTION

Excess nitrogen ⟶ growth of algae, deforestation, human health problems, and biodiversity reduction

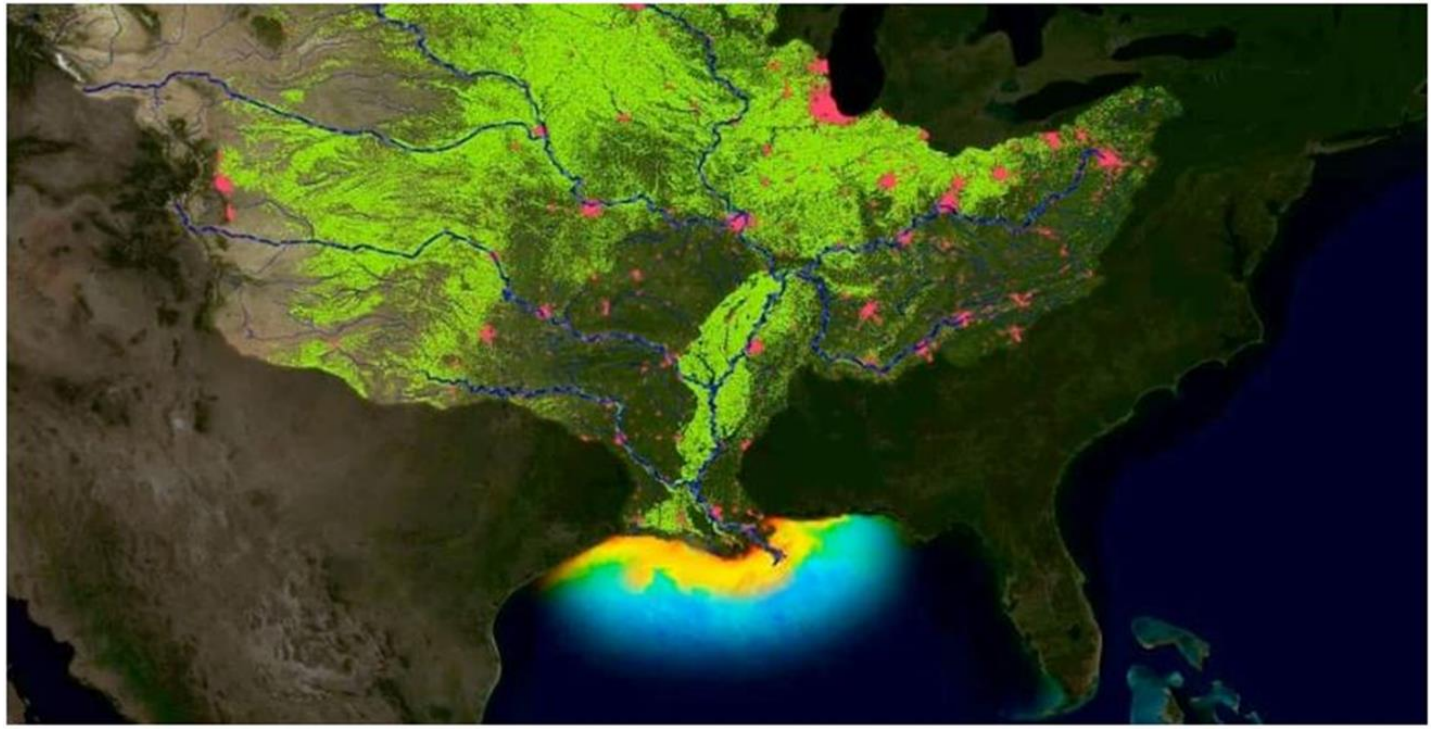

Figure 1: Largest hypoxic or dead zone in United States [1]

Figure 2: Fish death due to harmful algal blooms [2]

[1]. *Hypoxia Research Programs*. National Oceanic and Atmospheric Adminstration, https://coastalscience.noaa.gov/research/stressor-impacts-mitigation/habhrca/hypoxia-program/. October 9 2019

[2]. Graham, Dr. Jennifer L., *Harmful Algal Blooms*. United States Geological Survey. https://www.usgs.gov/media/images/harmful-algal-blooms-7. October 9 2019

OBJECTIVE

To model and quantify spatially and temporally-resolved contributions to atmospheric nitrogen containing species deposition from major source regions in the United States based on 2-digit Hydrologic Unit Code(HUC) regions

METHODOLOGY

Model: Comprehensive Air Quality Model with Extensions (CAMx) version 6.0

Resolution: 12km*12km horizontal grid

Inputs: United States Environmental Protection Agency's (USEPA) 2011 modeling platform

Time Period: 2011

Probing Tool: CAMx with PSAT (Particulate Source Apportionment Technology)

Mechanism: Carbon Bond 6 (CB6) with aerosol chemistry

Deposition Scheme: WESELY89 -- Wesely (1989) and Slinn and Slinn (1980)

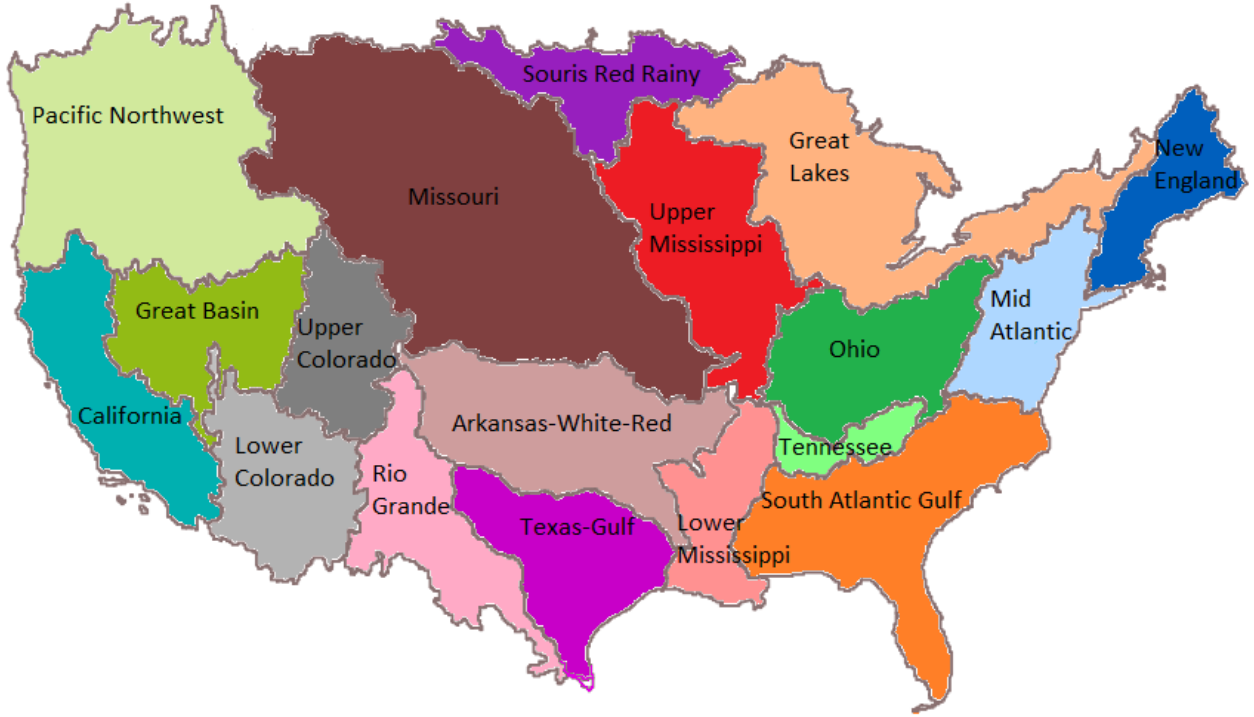

Figure 3: Water resource regions of the United States based on 2-digits hydrologic unit code (HUC)

RESULTS

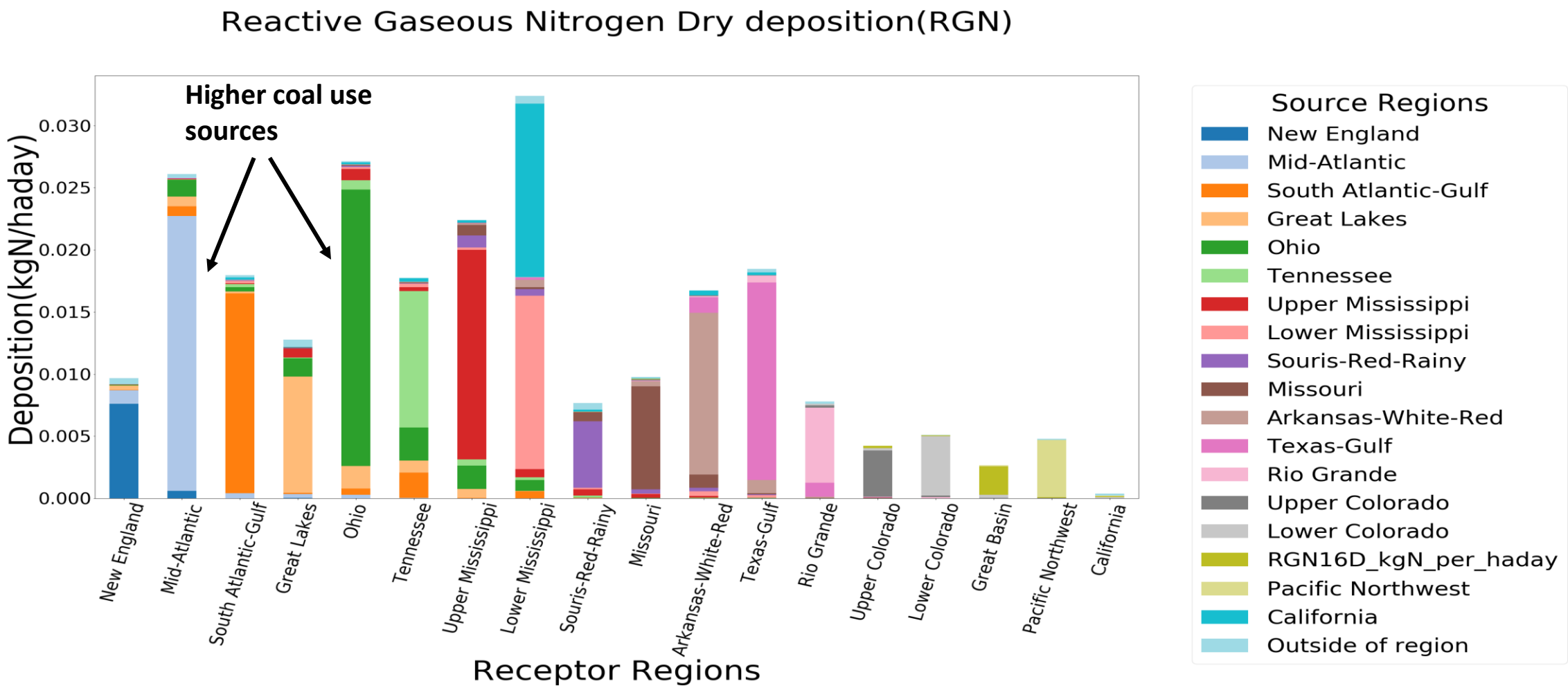

Figure 4: Dry deposition of reactive gaseous nitrogen (RGN) species (NO, NO_2, NO_3, HONO, and N_2O_5)

RESULTS

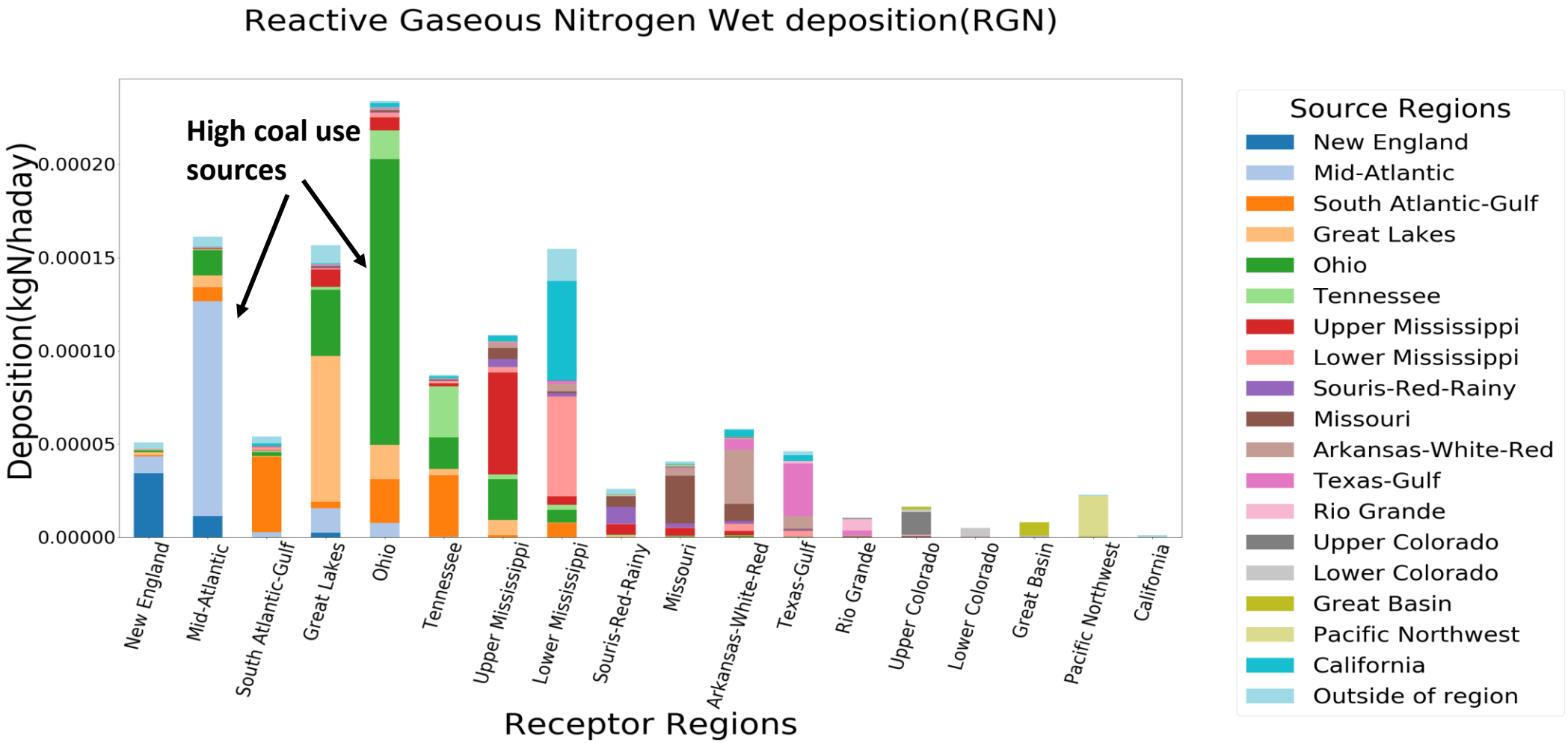

Figure 5: Wet deposition of reactive gaseous nitrogen (RGN) species (NO, NO_2, NO_3, HONO, and N_2O_5)

RESULTS

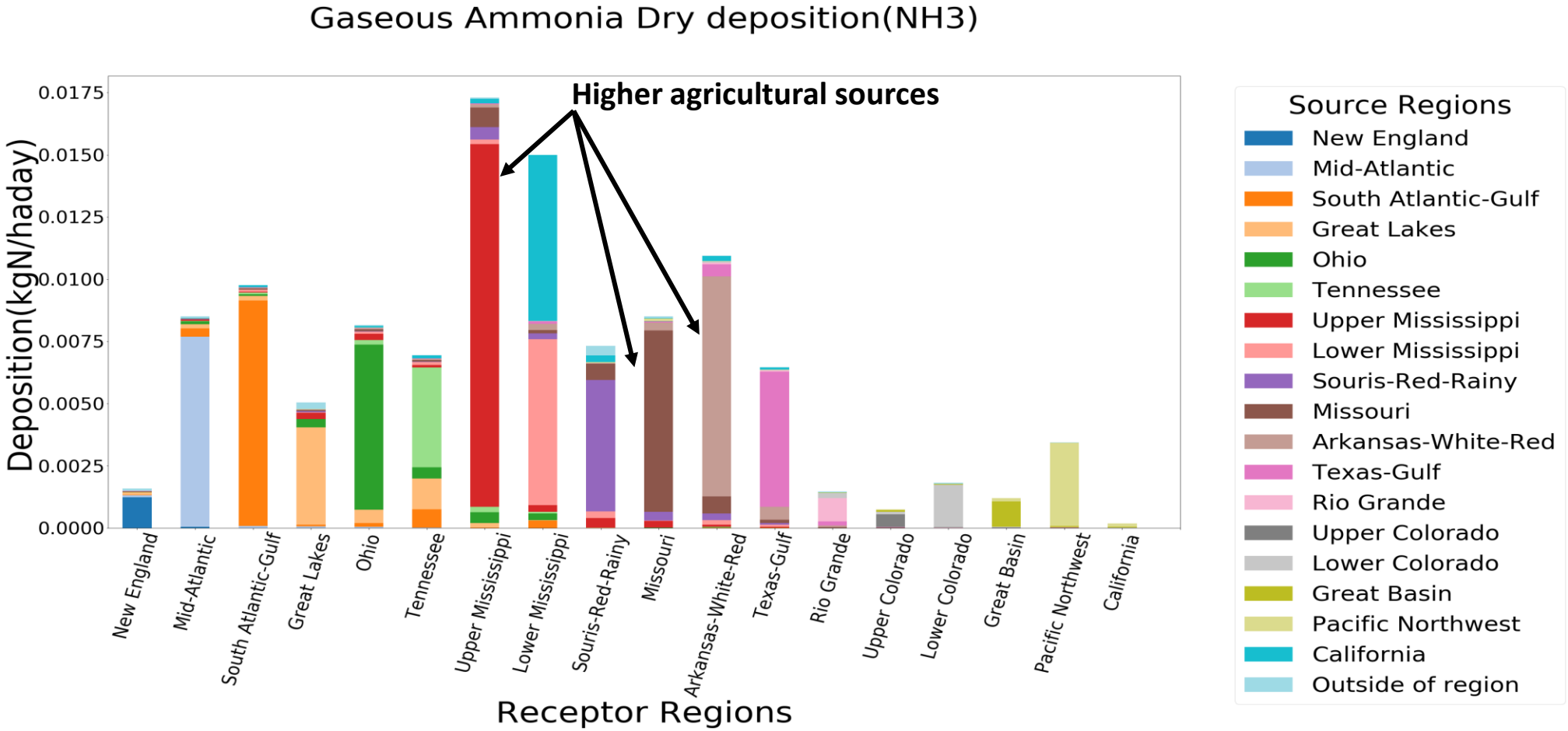

Figure 6: Dry deposition of Gaseous Ammonia (NH3) species

RESULTS

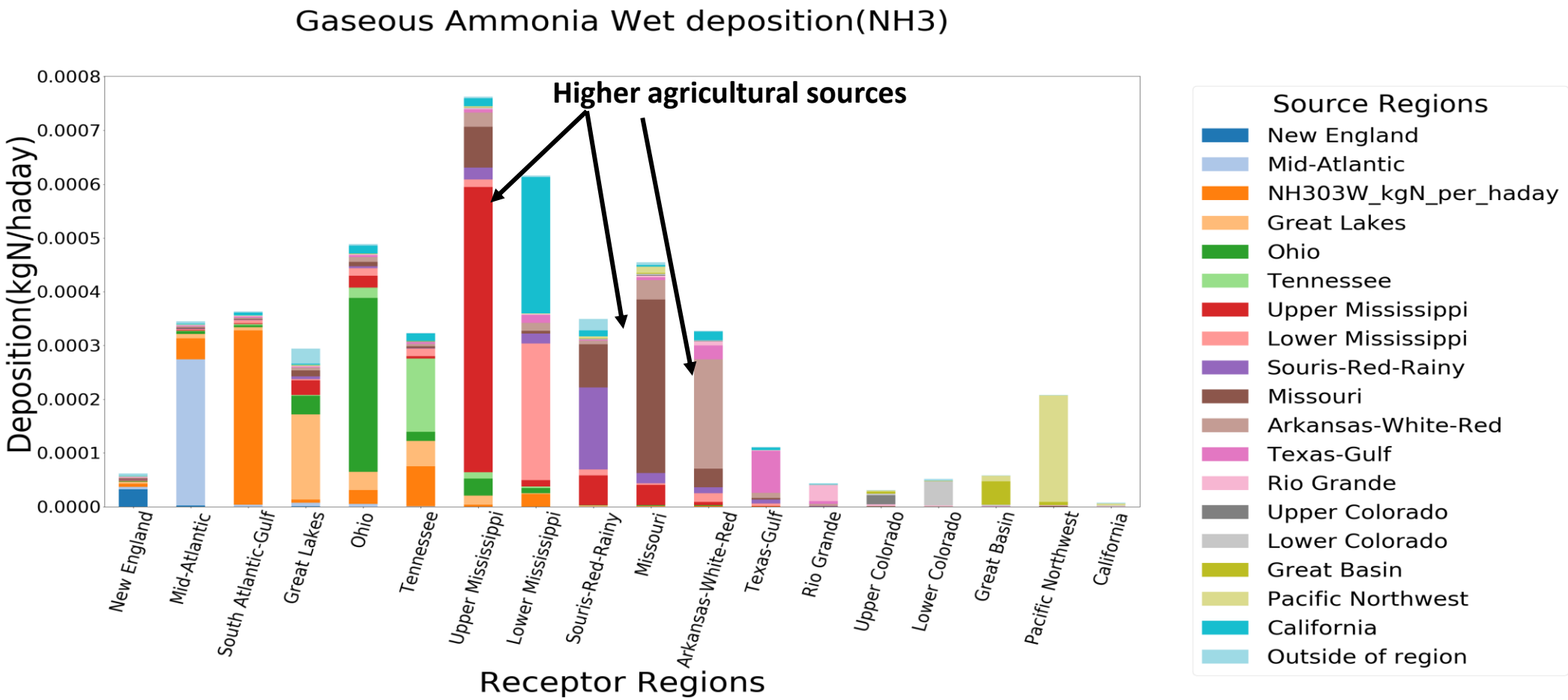

Figure 7: Wet deposition of Gaseous Ammonia (NH3) species

CONCLUSIONS

- The **Ohio** and **Mid-Atlantic** regions experience considerable dry and wet **reactive gaseous nitrogen deposition** where these regions are the main sources for deposition within their own region. Long range transport of reactive gaseous nitrogen from Ohio has led to deposition in regions such as the Tennessee, Great Lakes, Mid-Atlantic .
- The **Upper Mississippi** region experiences the most dry and wet **gaseous ammonia deposition** where the Upper Mississippi region is dominant source region for deposition within its own region. Long range transport of gaseous ammonia from the Upper Mississippi and Missouri regions has led to deposition to other regions .

ACKNOWLEDGEMENTS

We would like to thank the National Science Foundation Award #1705813 for supporting this project. Also, we would like to thank the high-performance computing facilities at the University of Connecticut for the computational resources and required technical assistance to perform this work