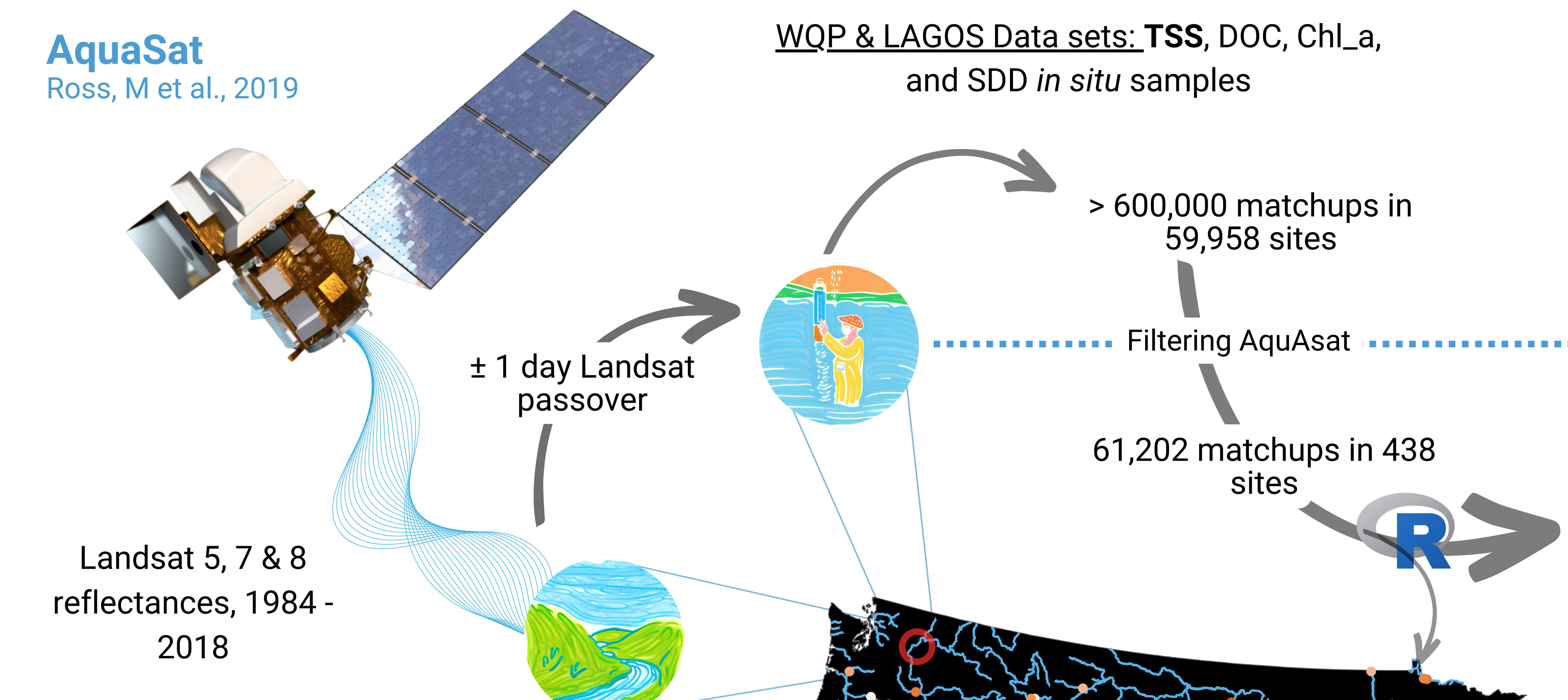
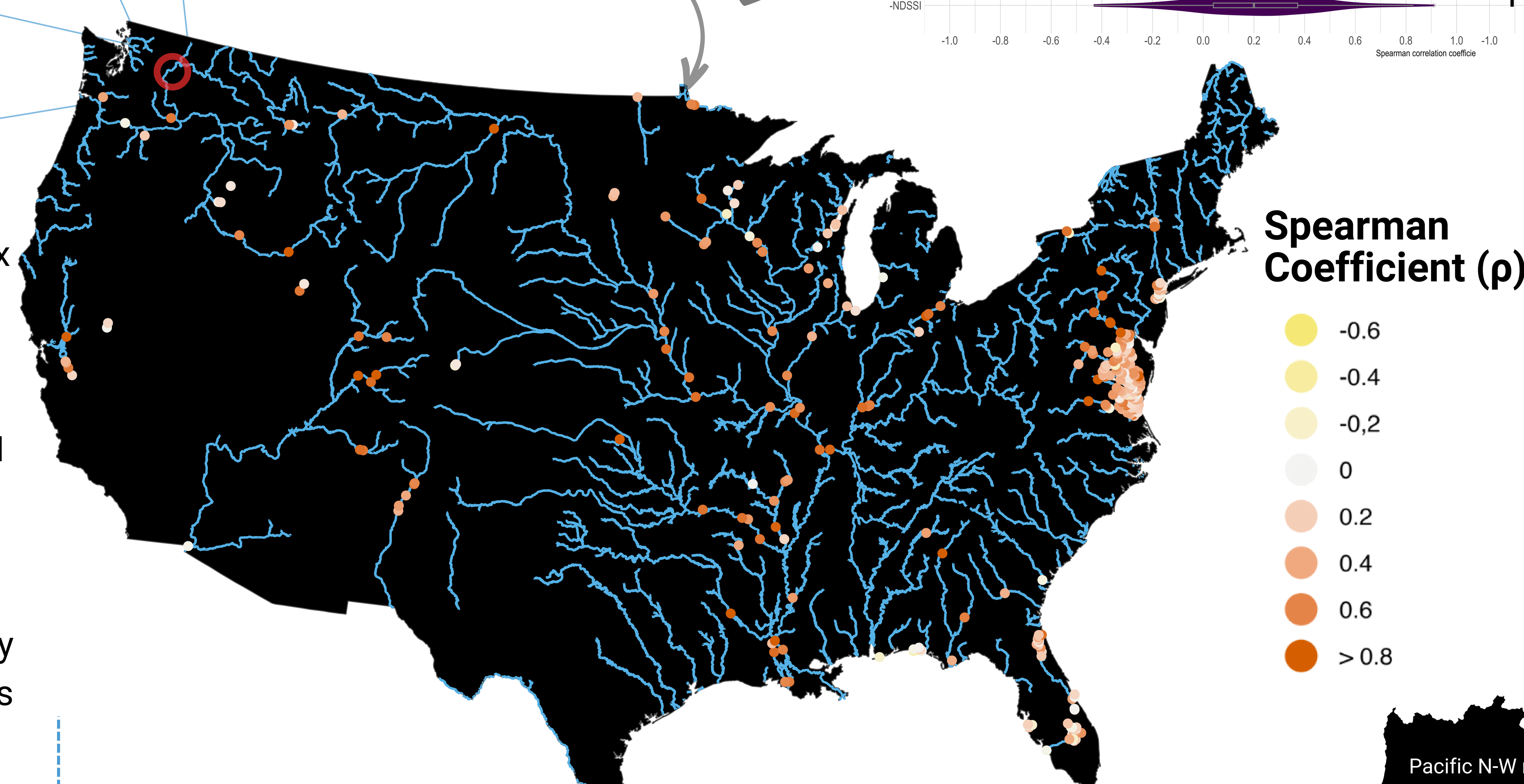
Do previously published simple algorithms for extracting water quality from satellite imagery work in a broad range of cases?

J. Daniel Vélez C.* & Tamlin Pavelsky
Department of Earth, Marine and Environmental Sciences. University of North Carolina at Chapel Hill
*davelez@unc.edu - @_josele_

MATERIAL AND METHODS





INTRODUCTION

Like NDVI Normalized Difference Vegetation Index (NDVI) in remote sensing of land, researchers have been looking for universal Total Suspended Sediments (TSS) water quality indices (or bands normalization and ratios) in inland water like NDTI (Normalize Difference Turbidity Index), NSMI (Normalized Suspended Material Index), NDSSI (Normalized Difference Suspended Sediment Index), (R-B)/(R+G), (R-G-B)/(R+G+B), among many others, that would allow known if a water body has a high, moderate, or low concentration of TSS:

But, is this feasible?

Can we use simple model correlations to evaluate the variability of TSS in a water body?

Can we extrapolate indexes between water bodies?

REFERENCES

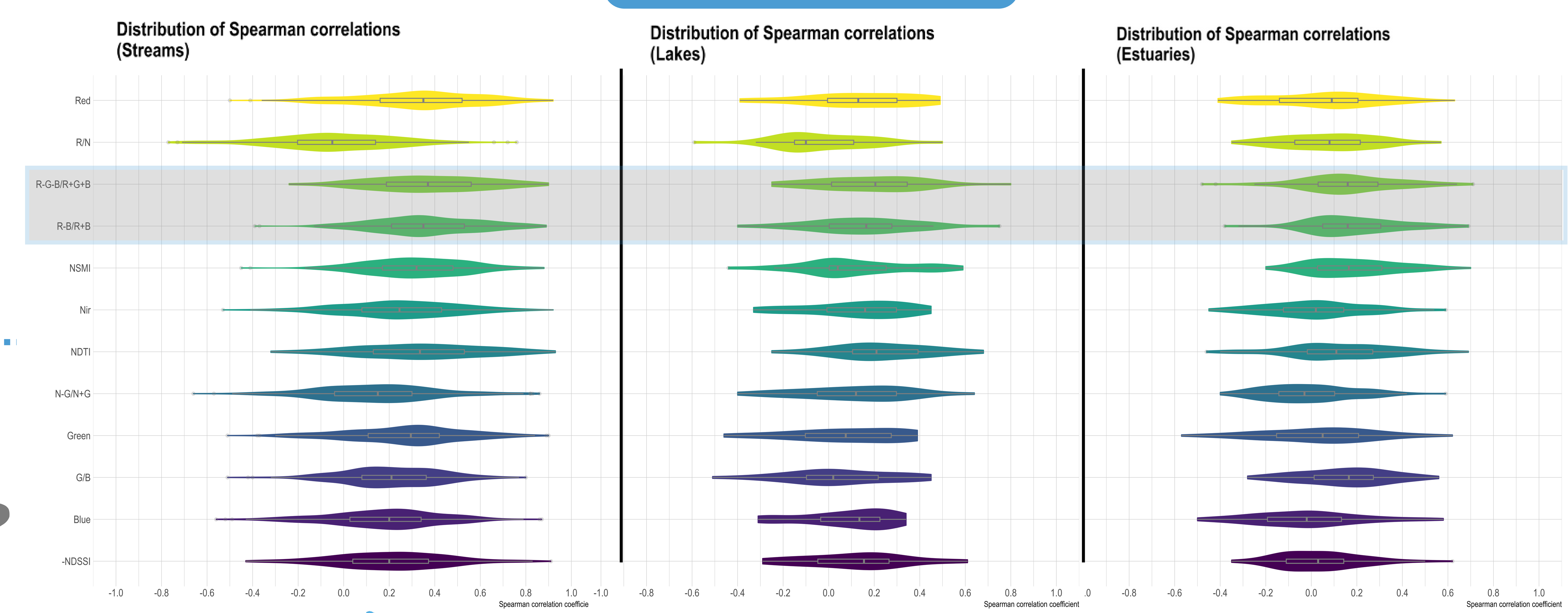
1. Hossain, A.; Jia, Y.; Chao, X. Development of Remote Sensing Based Index for Estimating/Mapping Suspended Sediment Concentration in River and Lake Environments. In Proceedings of the 8th International Symposium on ECOHYDRAULICS (ISE 2010), COEX, Seoul, Korea, 12–16 September 2010; Volume 435, pp. 578–585.

2. Montalvo 2010 Spectral Analysis of Suspended Material in Coastal Waters: A Comparison between Band Math Equations (Mayaguez: Departement of Geology University of Puerto Rico)

3. J-P. Lacaux, Y. M. Tourre, C. Vignolle, J-A. Ndione, and M. Lafaye, 2007. "Classification of Ponds from High-Spatial Resolution Remote Sensing: Application to Rift Valley Fever Epidemics in Senegal," Remote Sensing of Environment 106 66–74.

4. Ross et al., 2019, M.R.V. Ross, S.N. Topp, A.P. Appling, X. Yang, C. Kuhn, D. Butman, M. Simard, T.M. PavelskyAquaSat: a data set to enable remote sensing of water quality for inland waters. Water Res. Res., 55 (11) (2019), pp. 10012-10025

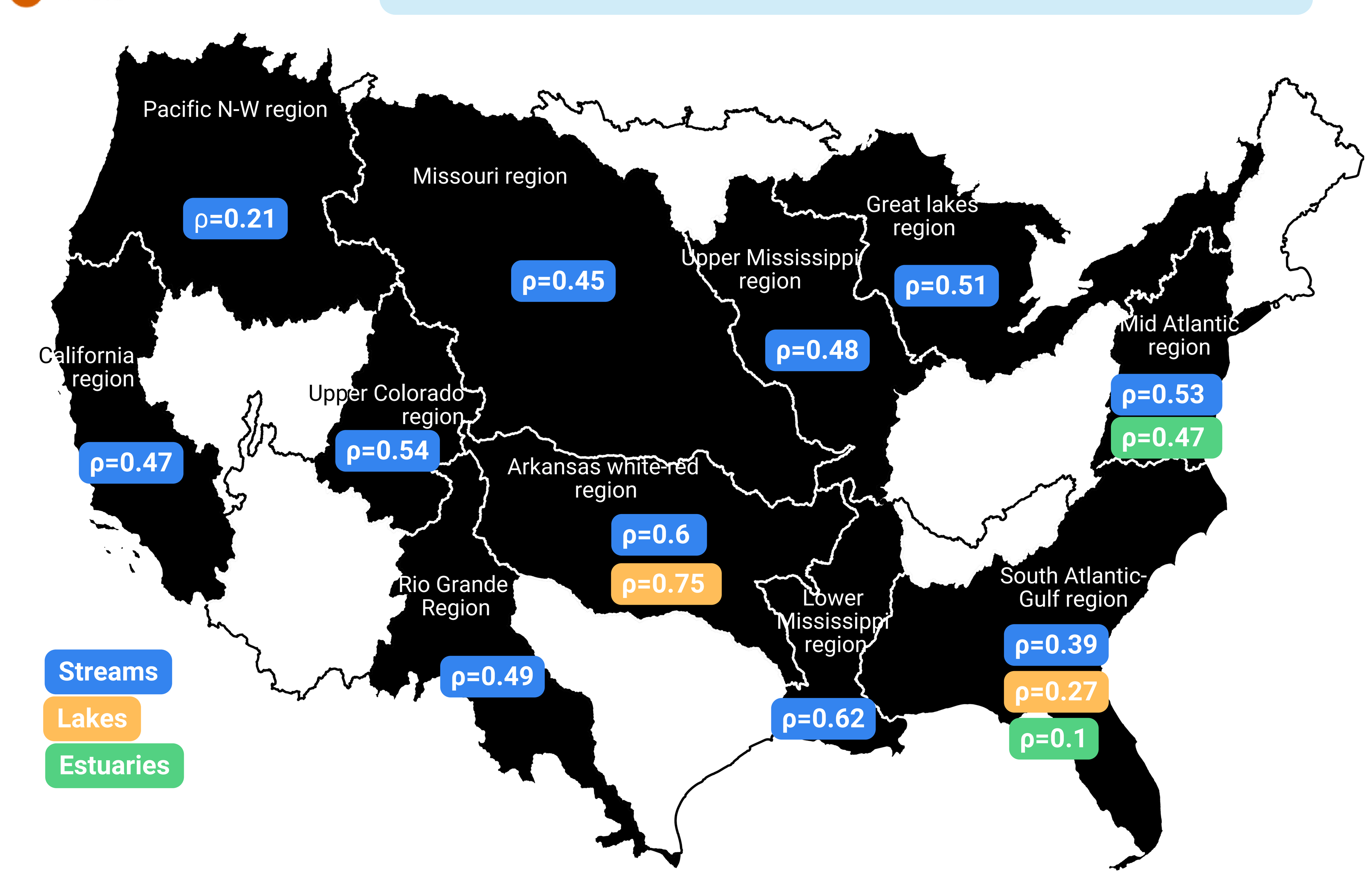
PRELIMINARY RESULTS



Spearman coefficient for each site with more than 20 matchups repetition.

Two approaches were used

Retrieving Spearman coefficients by areas, as is usually done by researchers
Here, the U.S. was splitting into Hydrologic units.



PRELIMINARY CONCLUSIONS AND NEXT STEPS

1. Results suggest relatively weak relationships between in situ TSS and simple indices in most locations, which suggests that caution should be taken when applying indices across large areas

2. The spearman coefficient for each site shows no clear generalized results nor a pattern along the U.S.

3. Some specific regions showed interesting results by splitting the U.S. into hydrologic units. However, overall these remain heterogeneous.

4. Several analyses remain to be done: the effect of a dominant water quality parameter other than TSS and could mask it, intrinsic characteristics of water bodies (e.g., color), and additional data set constraints (e.g., deep, the time difference between Landsat passover and in situ sample by water body).