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Linking water quality to lake size: a database analysis

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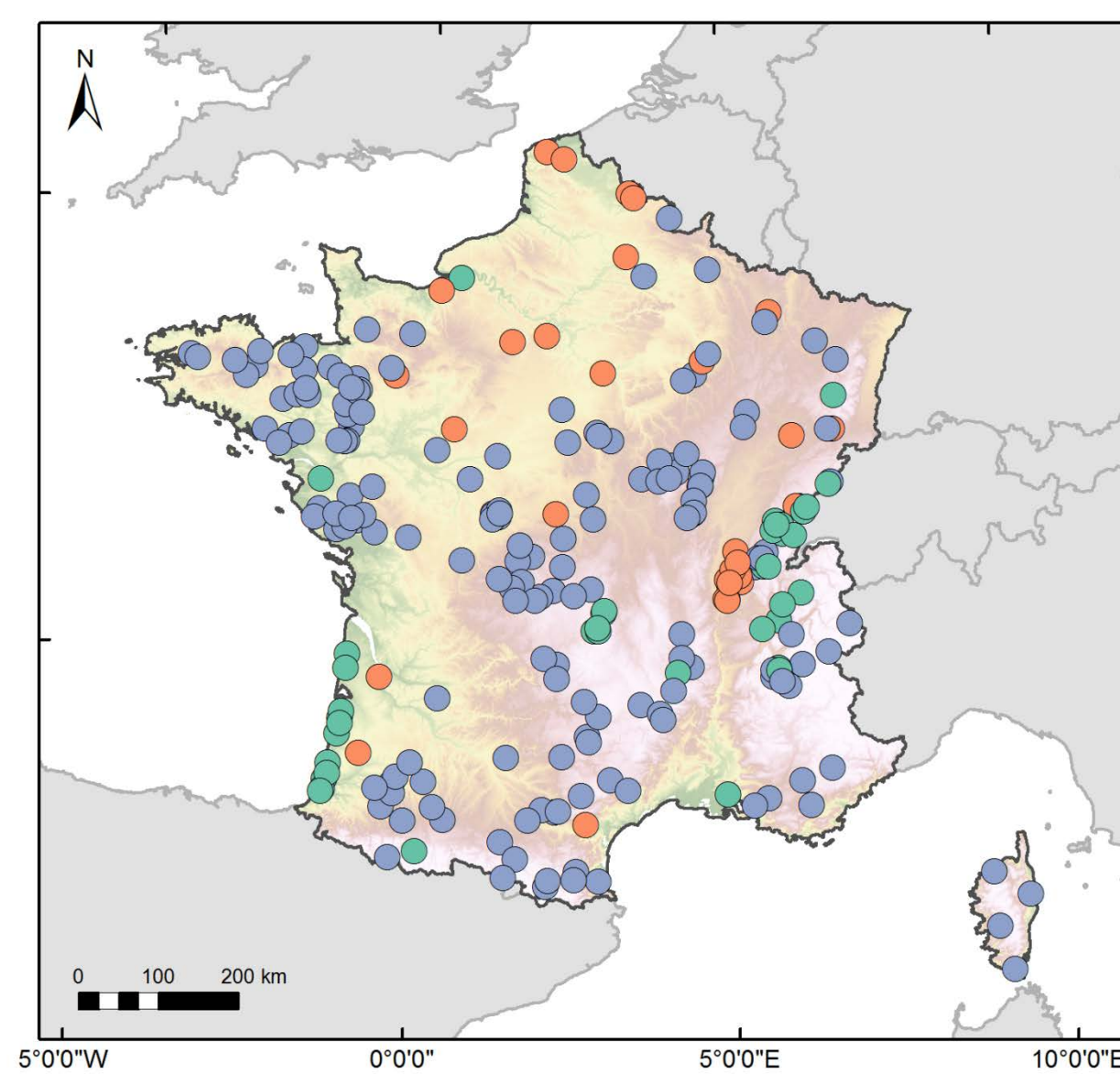
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LINKING WATER QUALITY TO LAKE SIZE: A DATABASE ANALYSIS

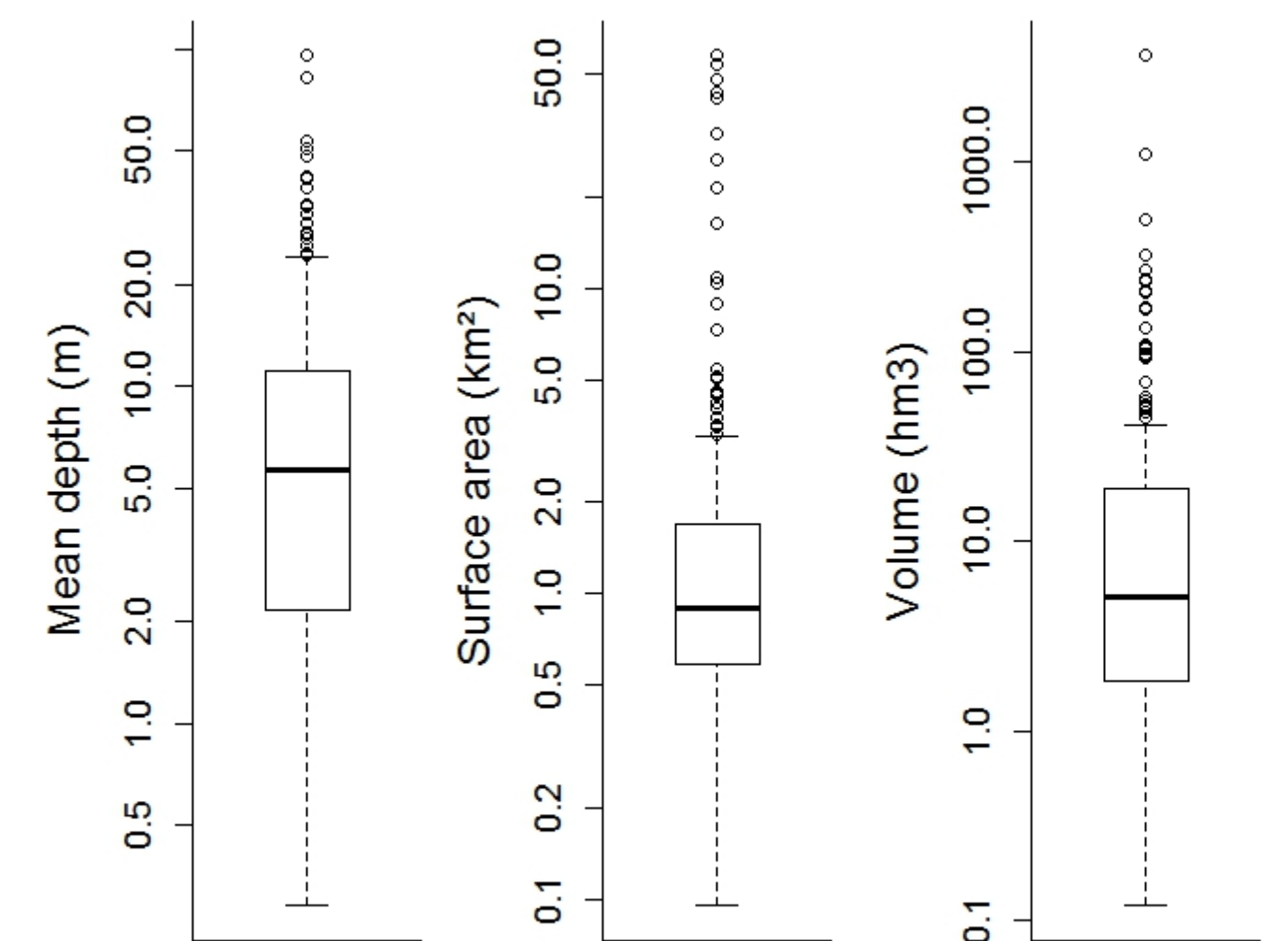
Vincent Roubeix, Jordi Prats and Pierre-Alain Danis
Pôle R&DAFB-Irstea Hydroécologie des Plans d'eau, Irstea Aix en Provence

Lake database

- 244 lakes in France, of various types (>0.1 km²)
- 4 water samples/year, in the euphotic zone, at one point (of maximal depth)
- 38 water physico-chemical variables
- biovolumes of 275 phytoplankton taxa in 8 phyla



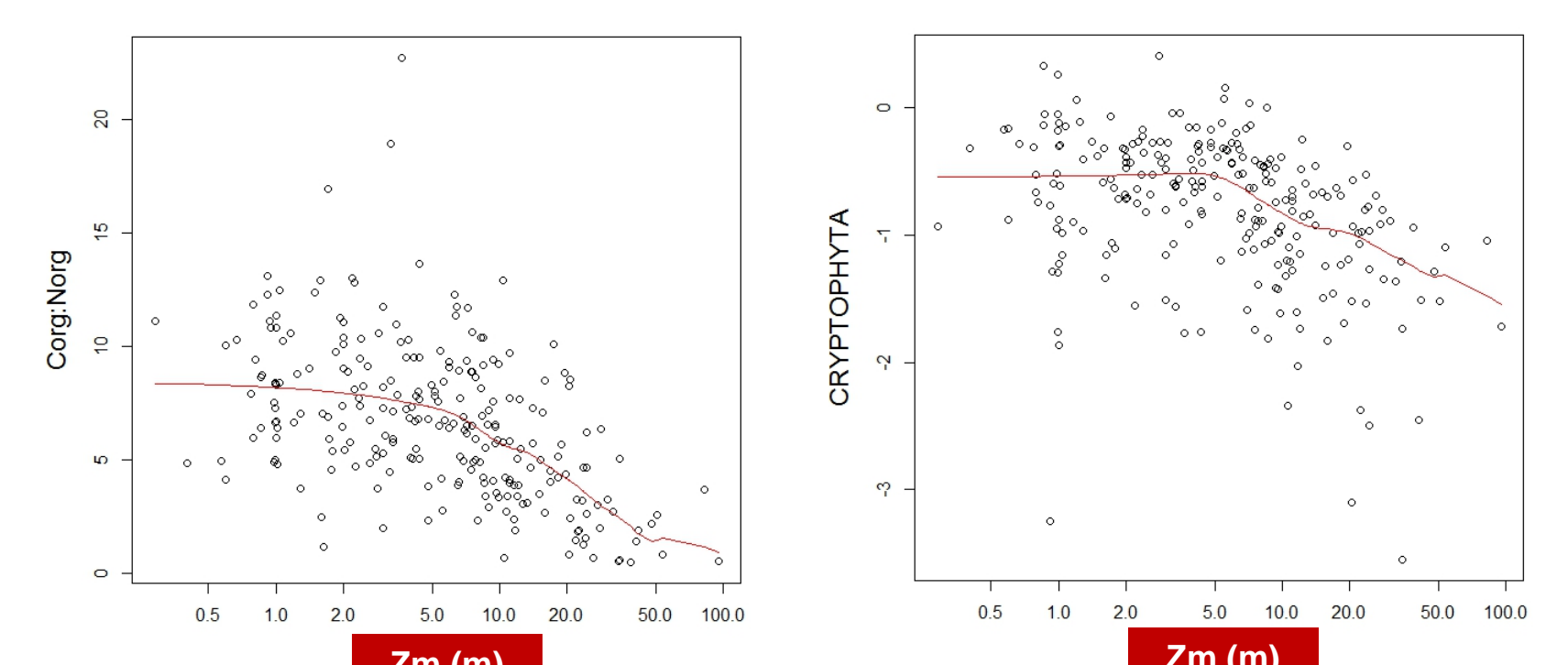
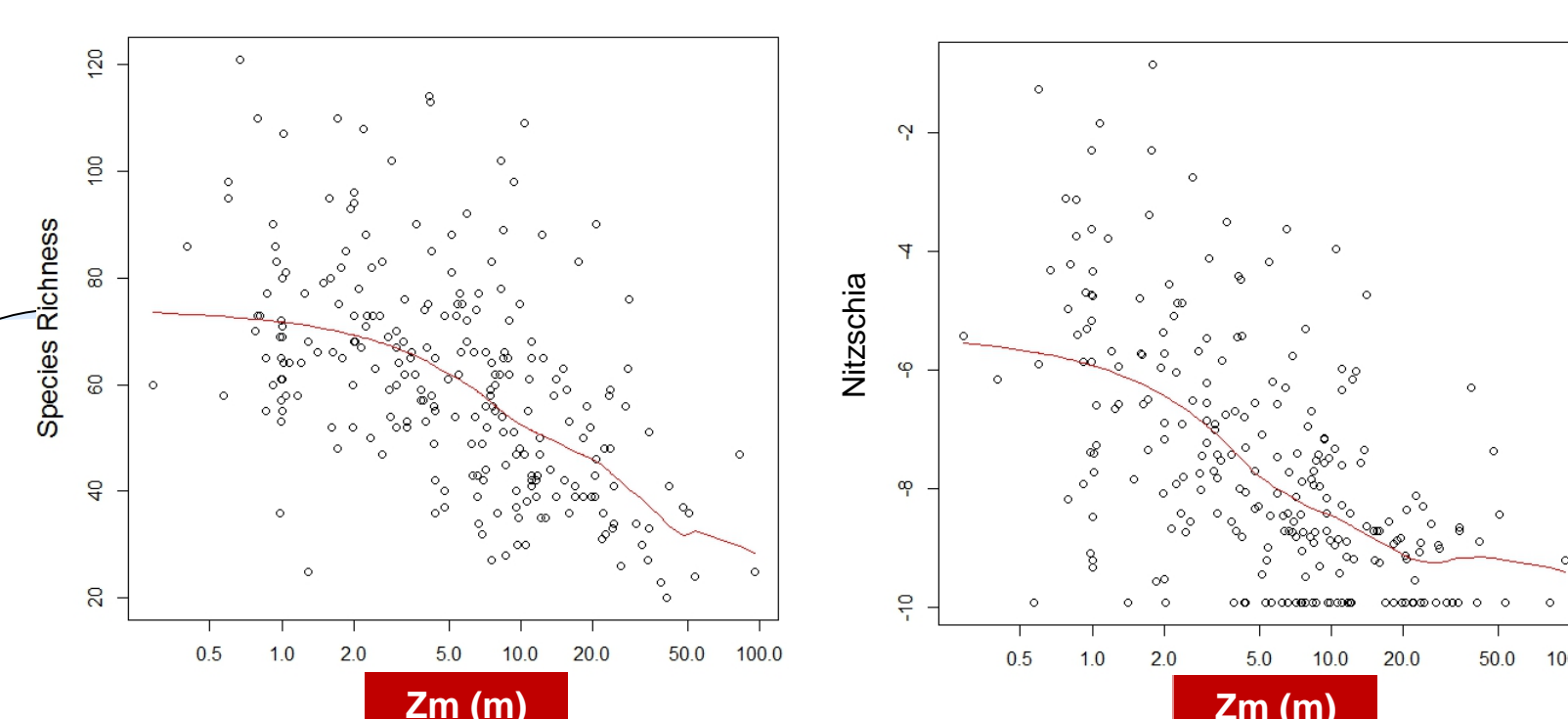
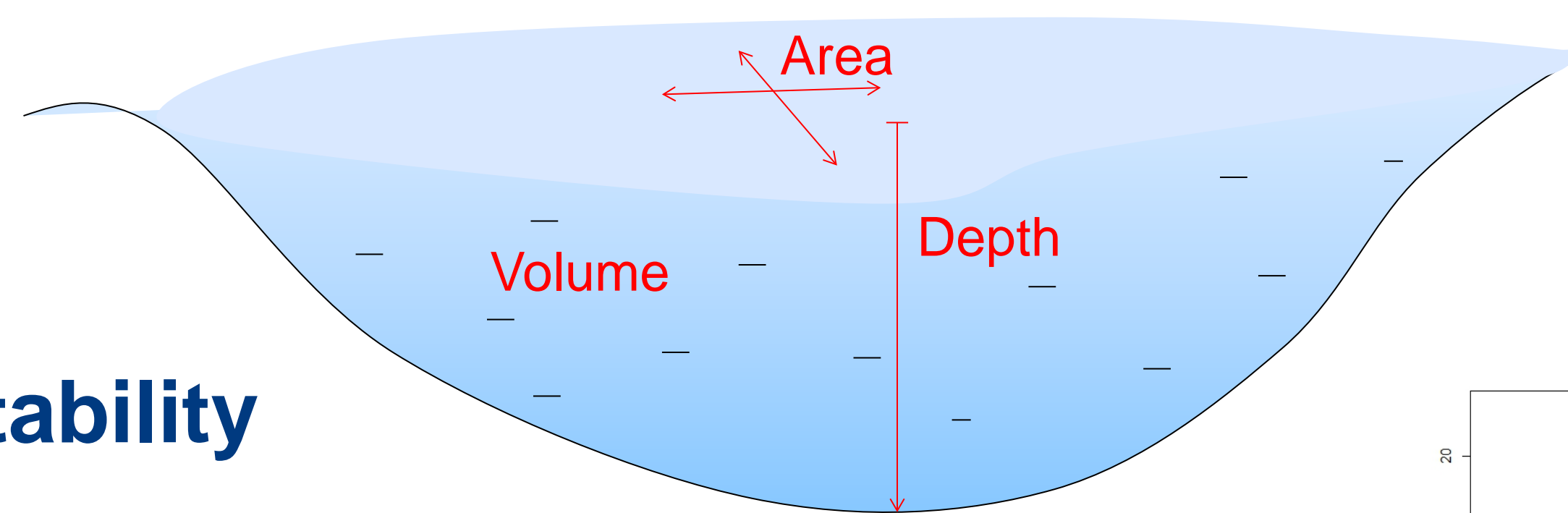
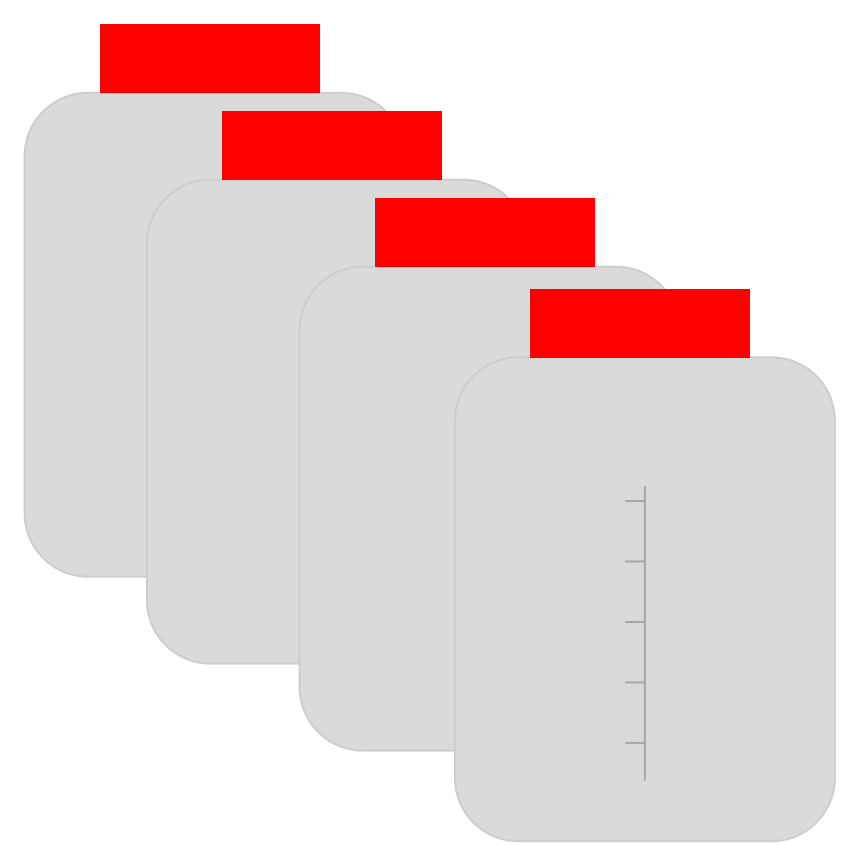
Map of the lakes considered (● natural lakes, ● reservoirs, ● artificial lakes)



Distribution of lake dimensions in the database

Objective

Water quality ← ? → Lake size

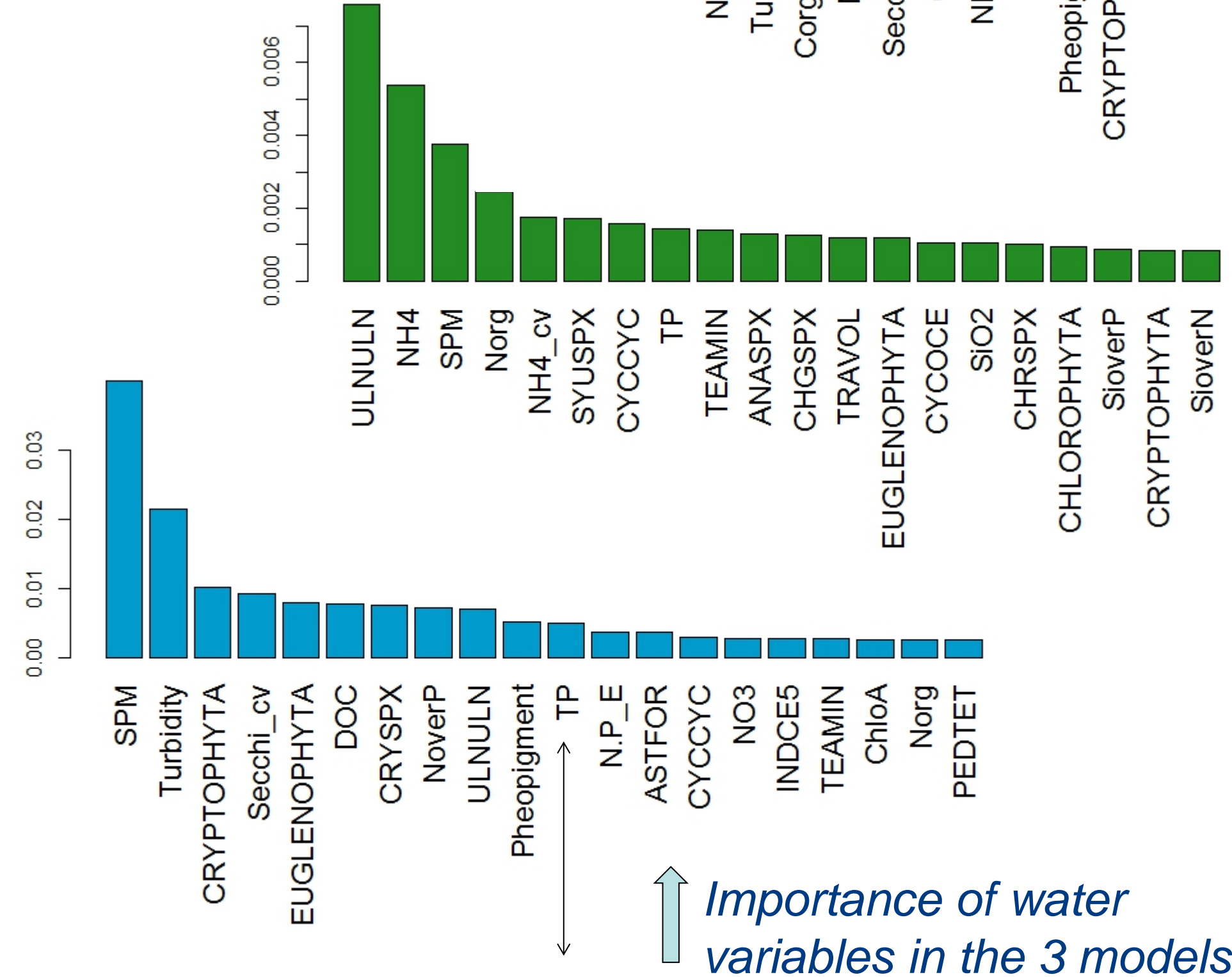
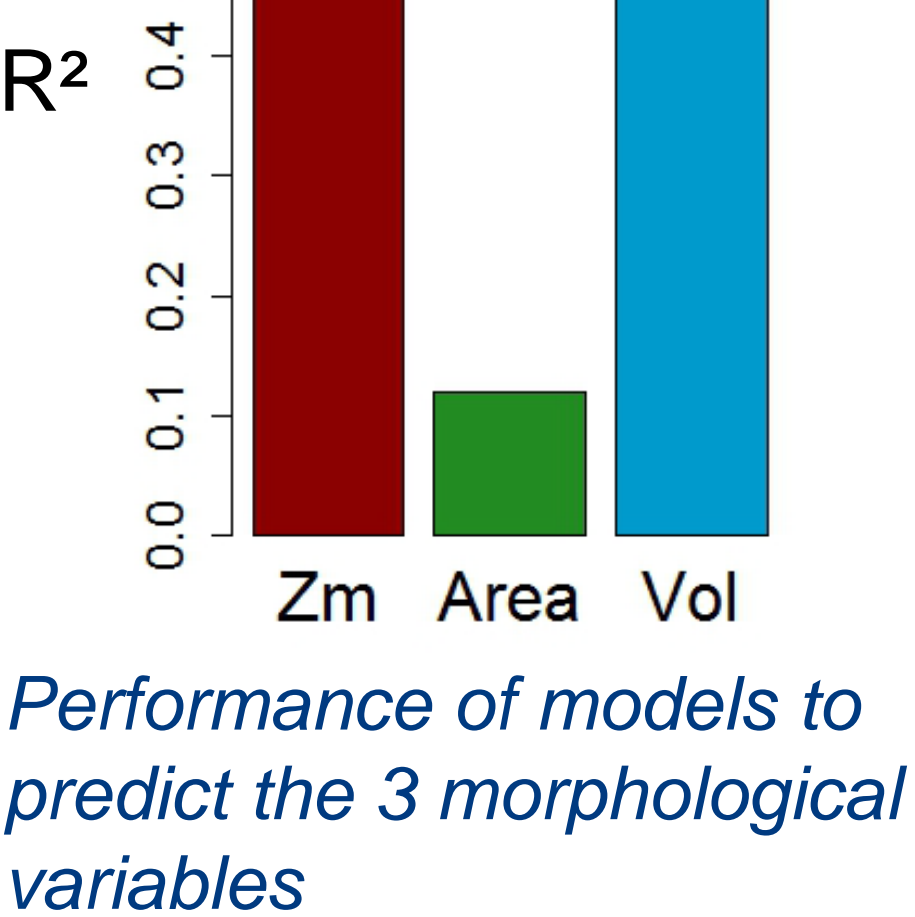
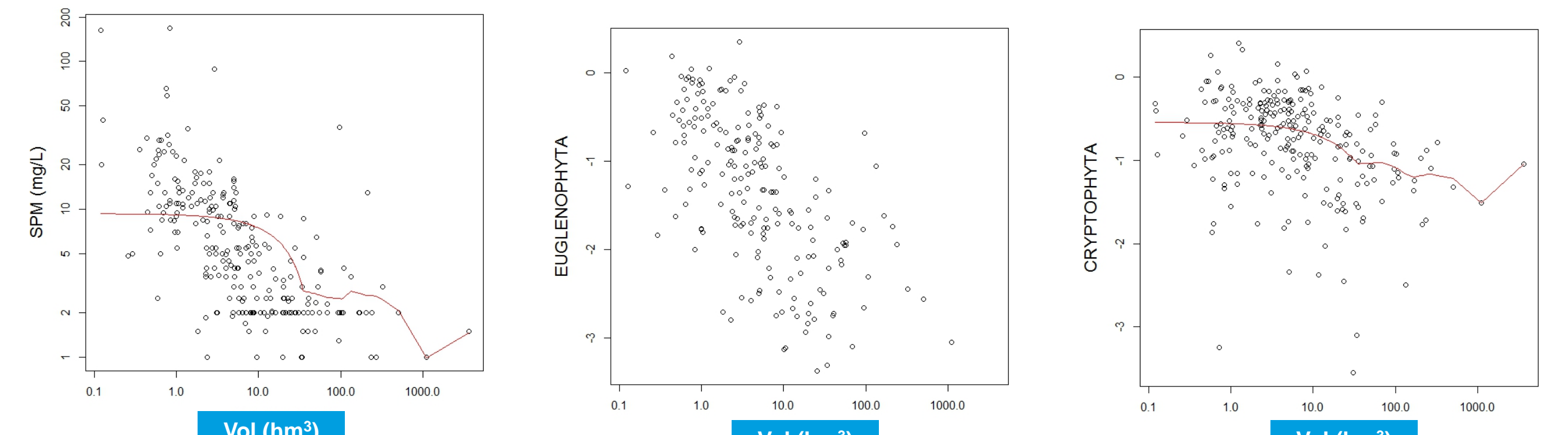
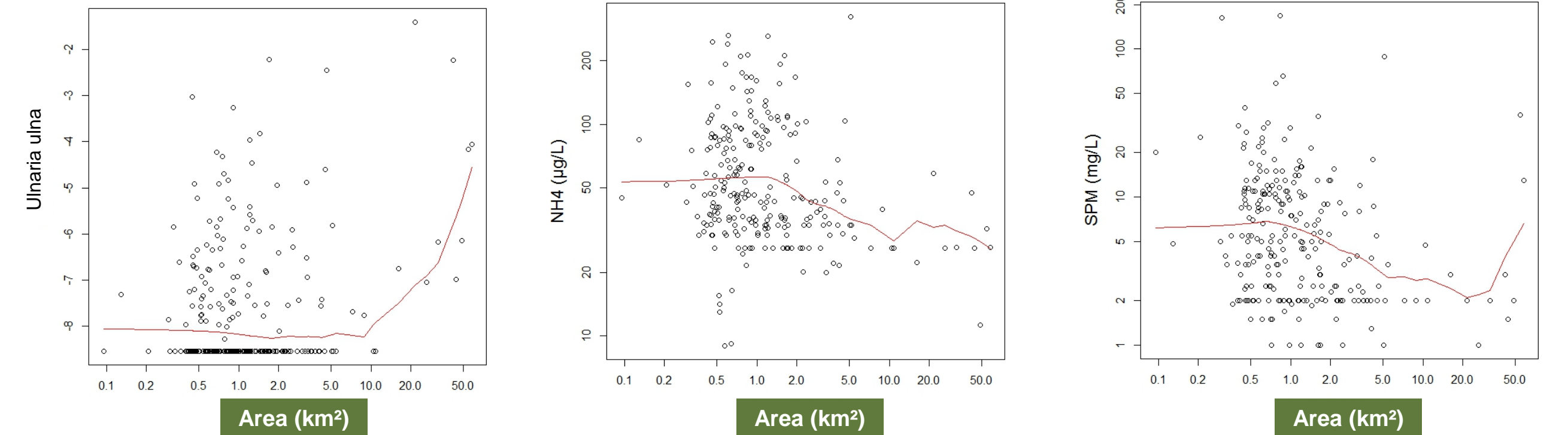
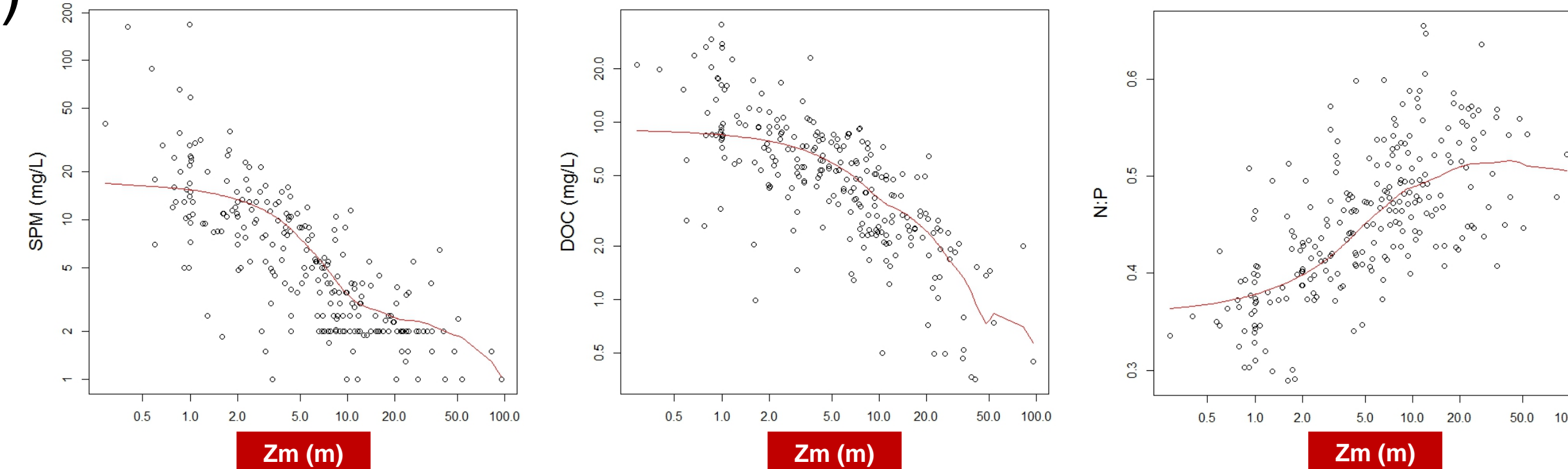
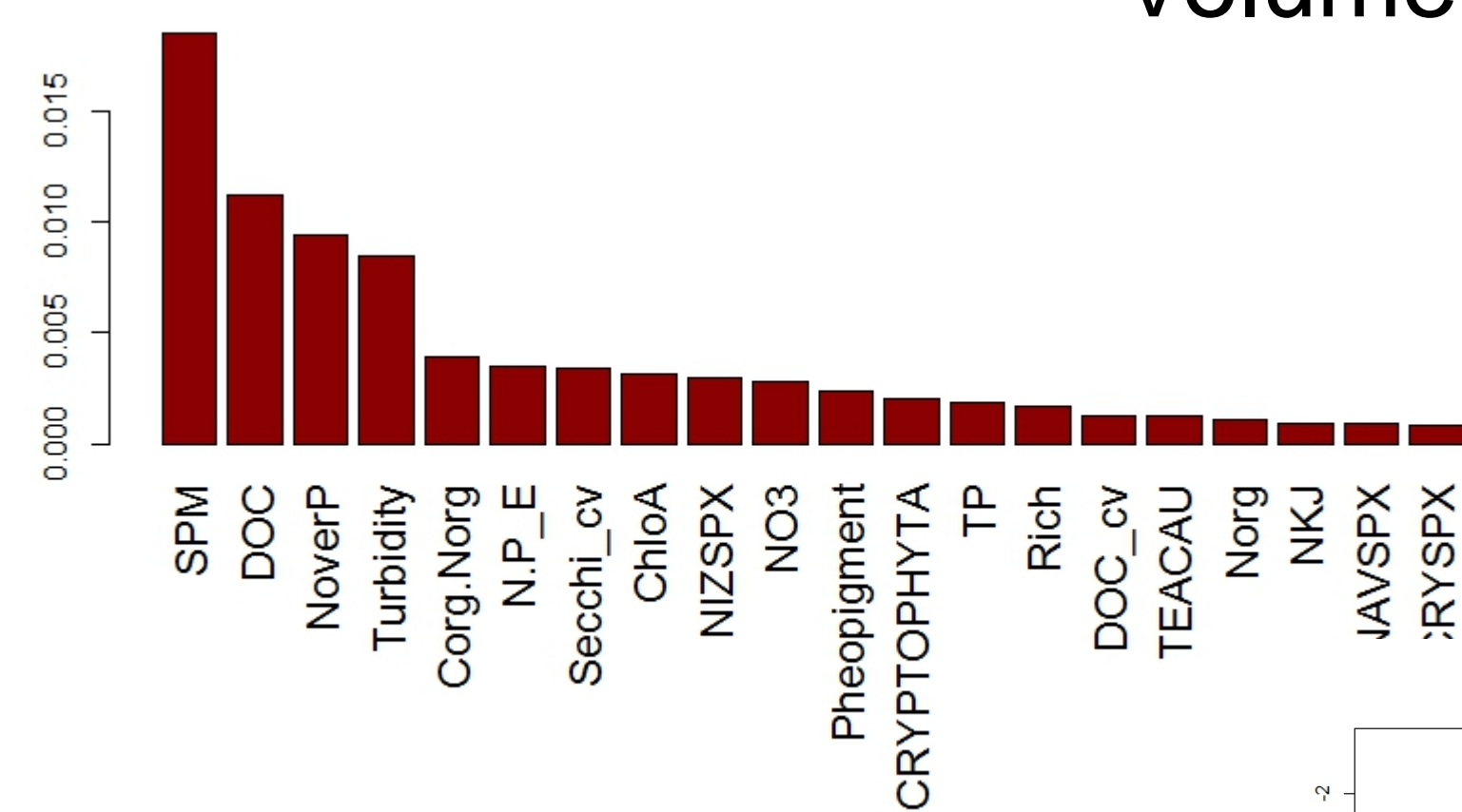


Predictability
using random forest
models ?

Water samples
physico-chemical variables
(annual means+CV)
+ phytoplankton biovolumes
(annual means)

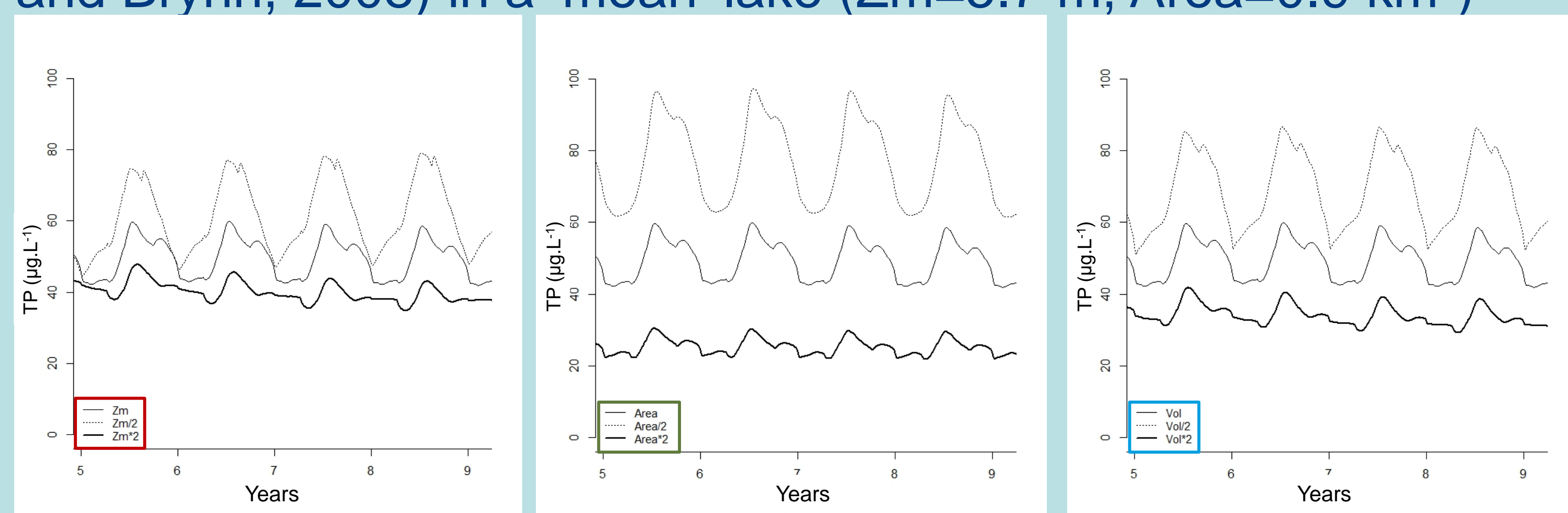
Lake dimensions
Surface area (Area)
Mean depth (Zm)
Volume (Vol)

Results



Model analysis for phosphorus

Total phosphorus concentration simulated with LakeMab (Hakanson and Bryhn, 2008) in a 'mean' lake (Zm=5.7 m, Area=0.9 km²)



Conclusion

- Lake mean depth is the most predictable dimension
- This study highlights interesting relations to depth
- Area is poorly related to water quality and phytoplankton
- Phosphorus appears more sensitive to Area in the model than in the data