Linking water quality to lake size: a database analysis

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LINKING WATER QUALITY TO LAKE SIZE: A DATABASE ANALYSIS

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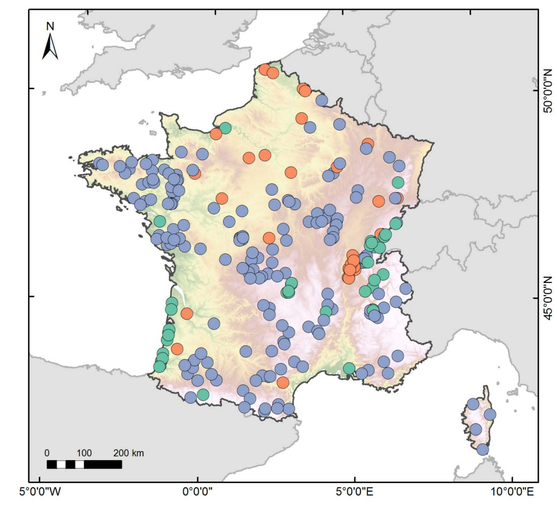
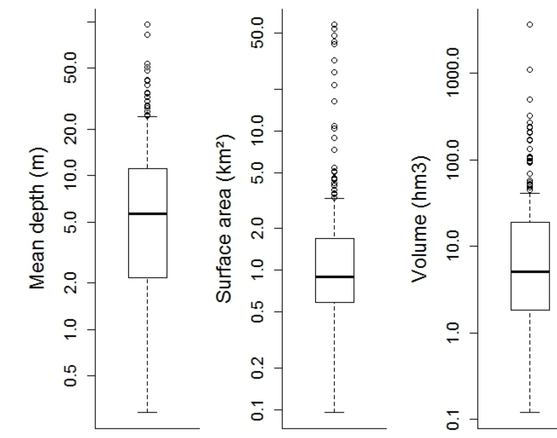
Lake database

- 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



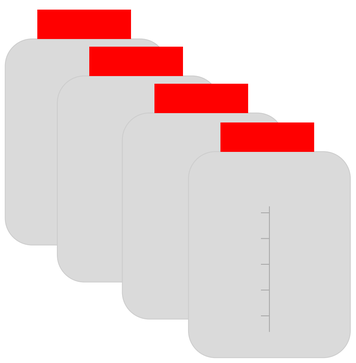
Map of the lakes considered (● natural lakes, ● reservoirs, ● artificial lakes)

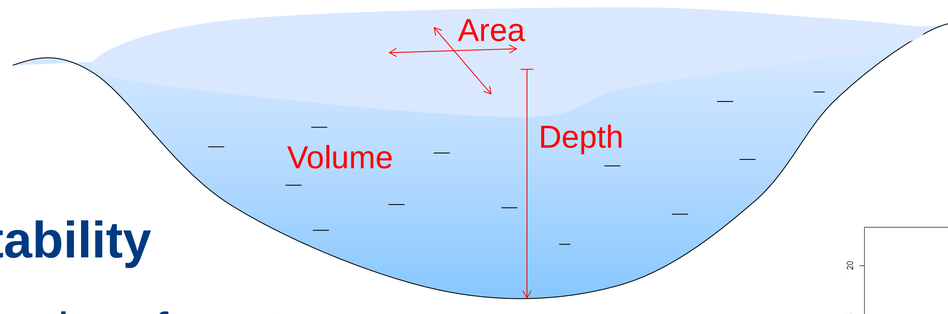


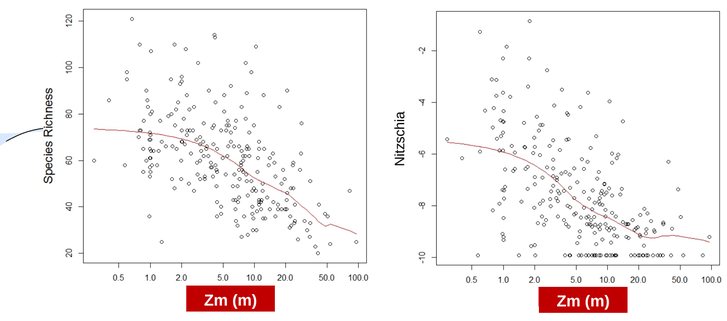
Distribution of lake dimensions in the database

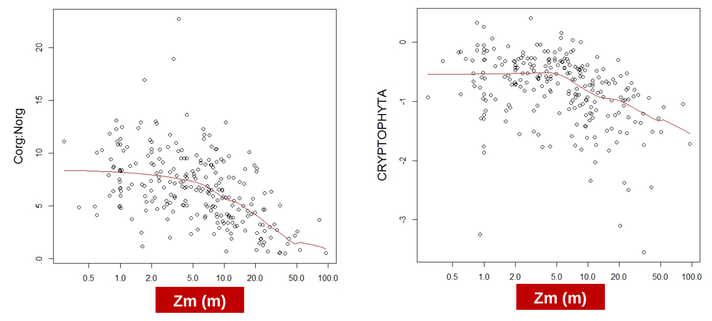
Objective

Water quality ? Lake size









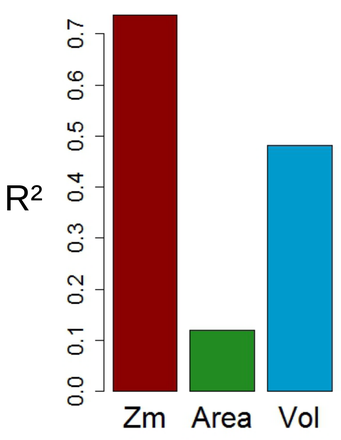
Water samples
physico-chemical variables
(annual means+CV)
+ phytoplankton biovolumes
(annual means)

Predictability

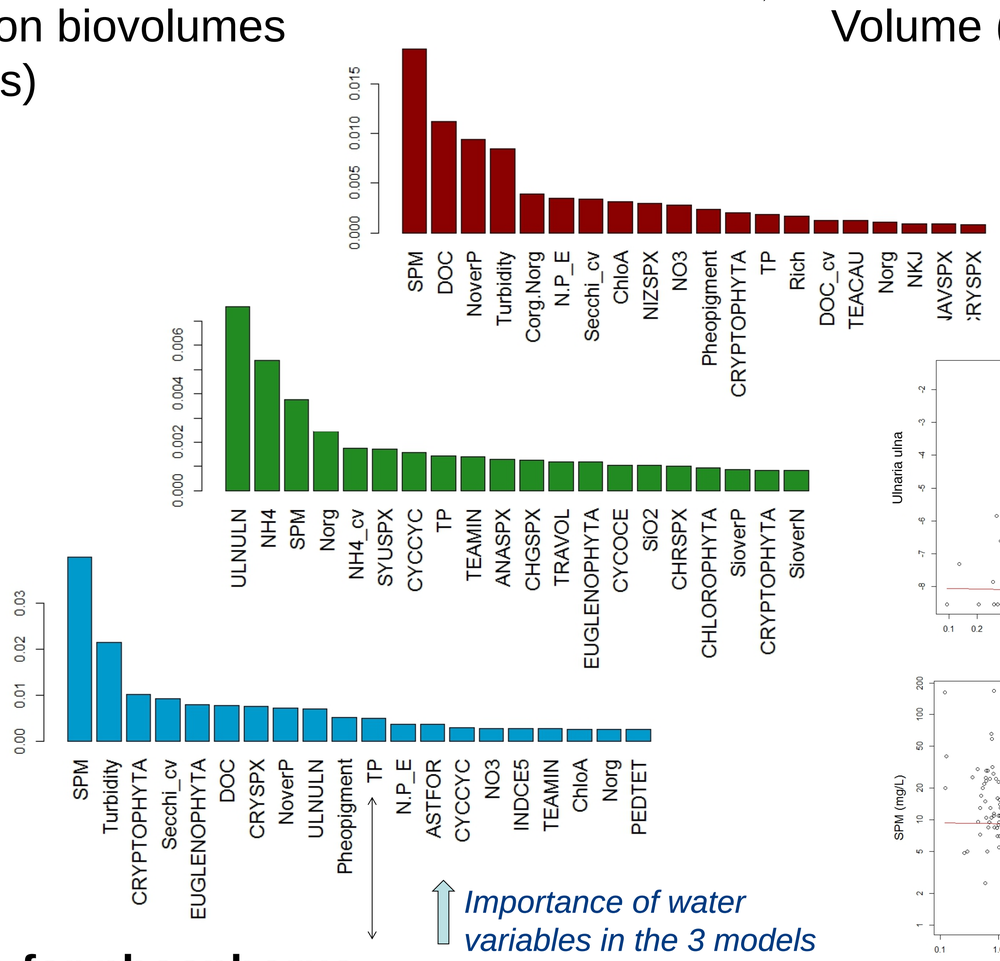
using random forest models ?

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

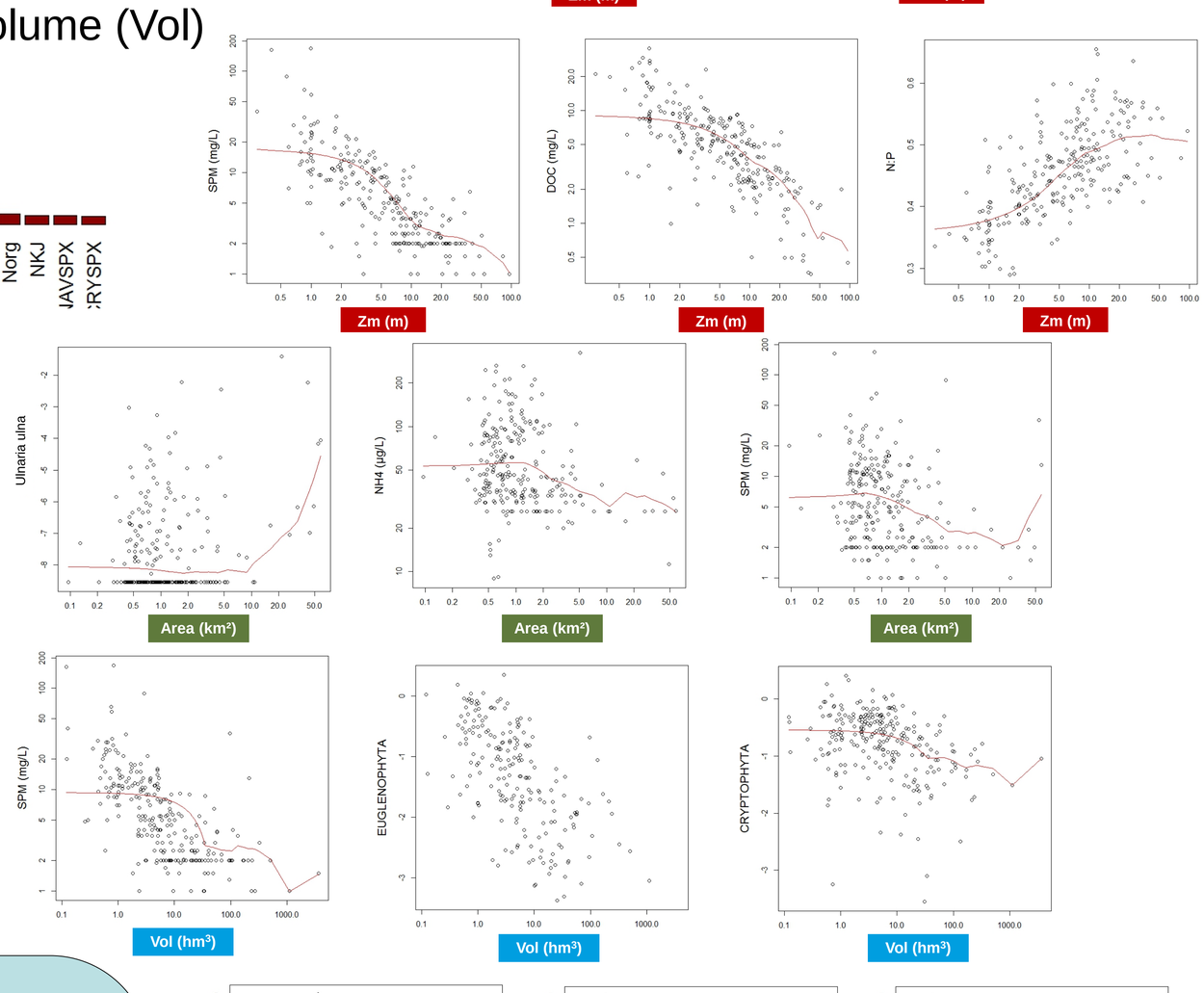
Results



Performance of models to predict the 3 morphological variables

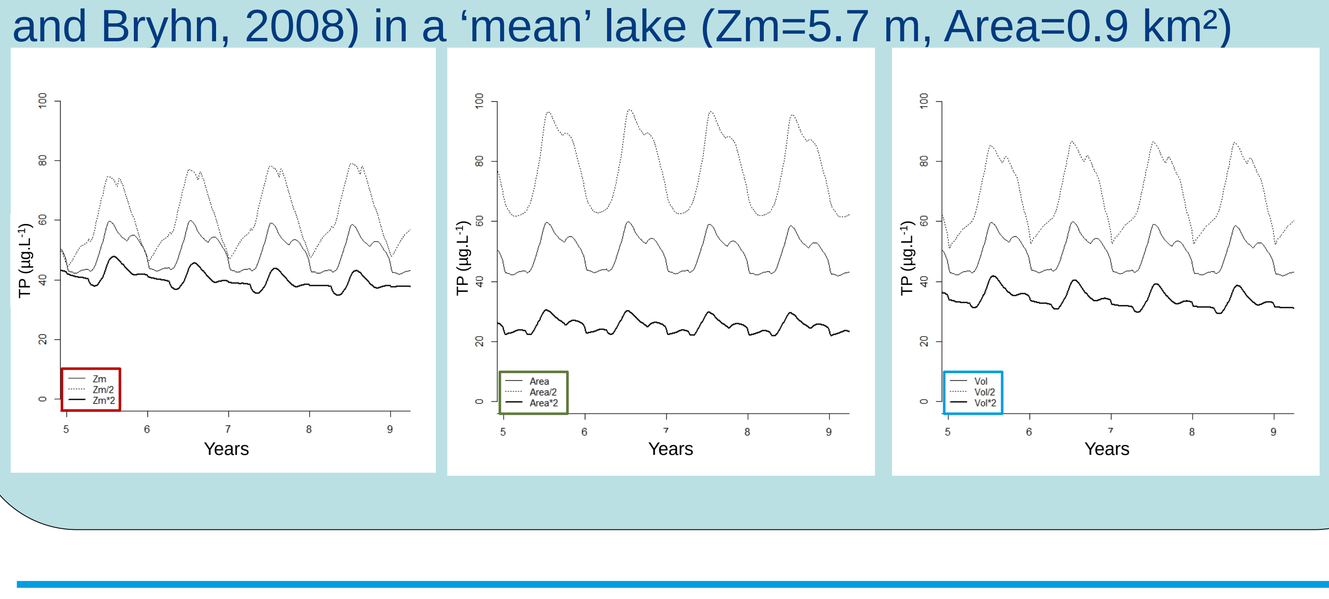


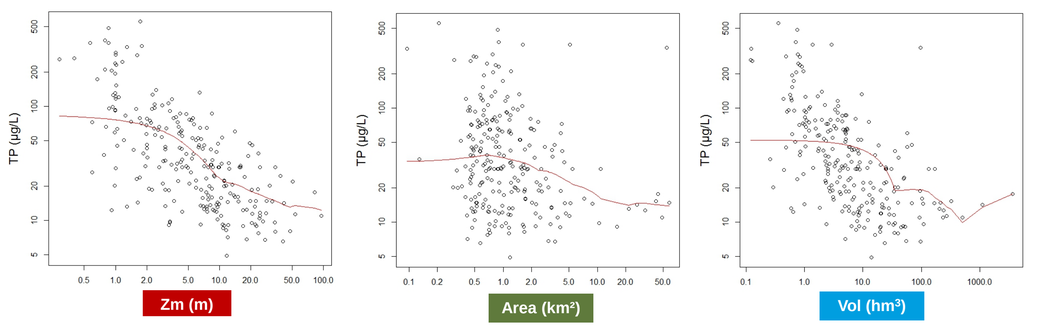
Importance of water variables in the 3 models



Model analysis for phosphorus

Total phoshorus 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

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