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Study of the environmental impact of insecticides by metabolic foot-printing approach - An introduction to the concept

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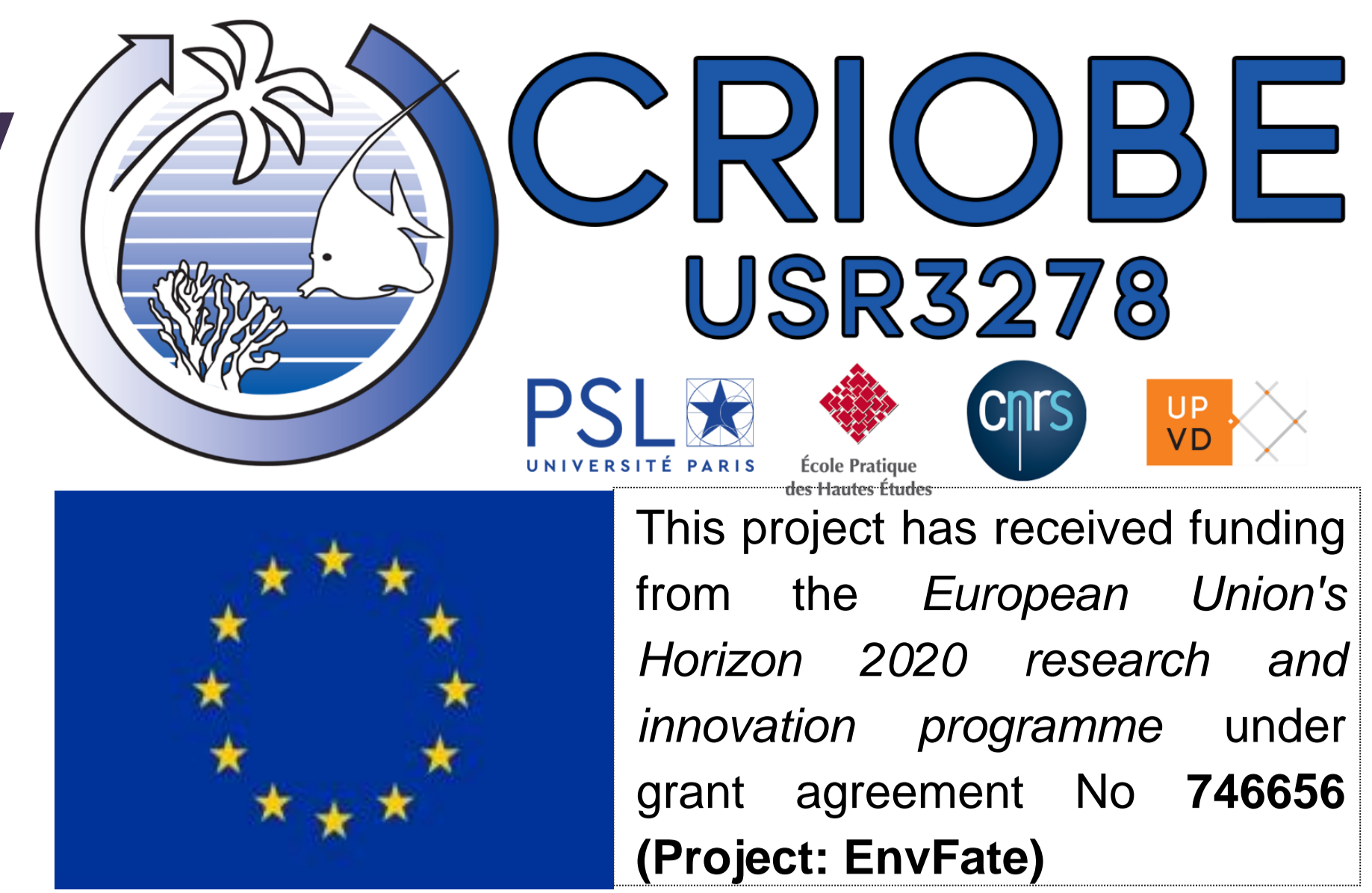
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Study of the environmental impact of insecticides by metabolic foot-printing approach - An introduction to the concept.

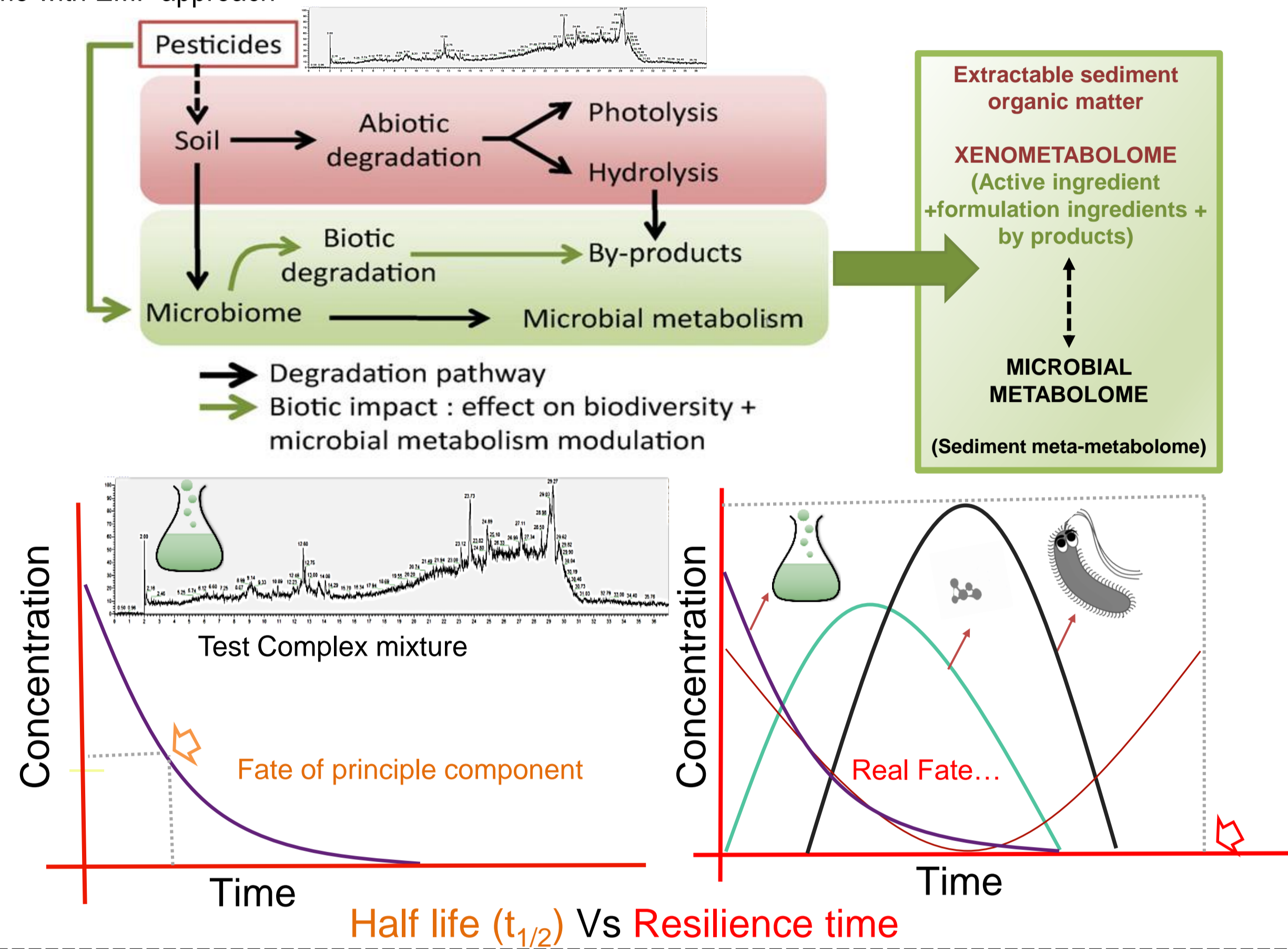


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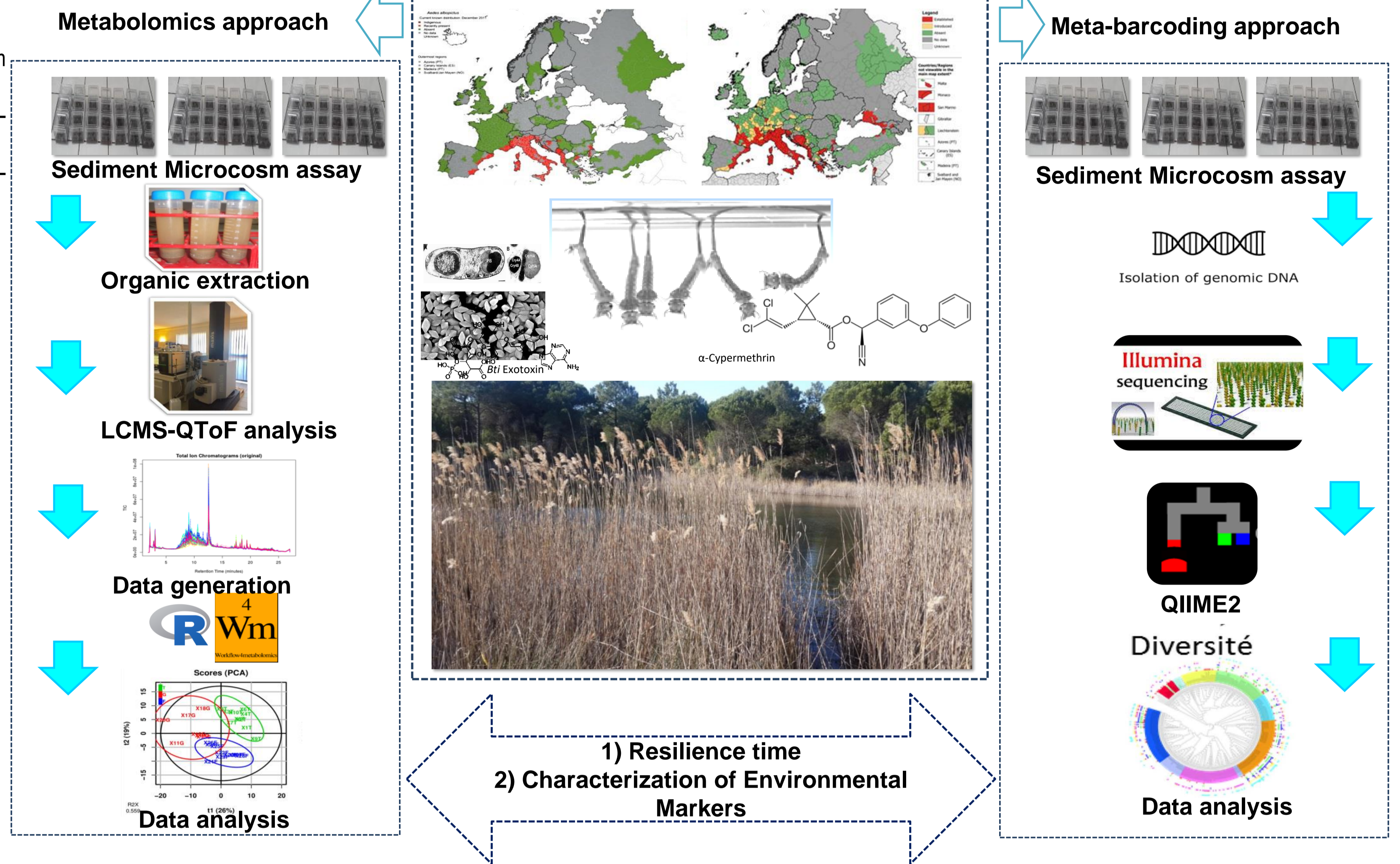
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Context :

- Assessment of environmental pollution complex mixtures (new generation biological compounds, e.g. insecticides) is a major challenge.
- Evaluation of insecticides Half-life ($t_{1/2}$) is the time it takes for a certain amount of a pesticide to be reduced by half
- However, half-life determination does not apply if active substance is a complex mixture of compounds derived from biological sources (e.g. plant extract, microbes etc)
- Half-life values give restricted information as it does not describe all phenomena occurring such as the formation of by-products and the effect on biodiversity
- We propose an alternative approach: the resilience time, this value could be determined with kinetic study of meta-metabolome with EMF approach

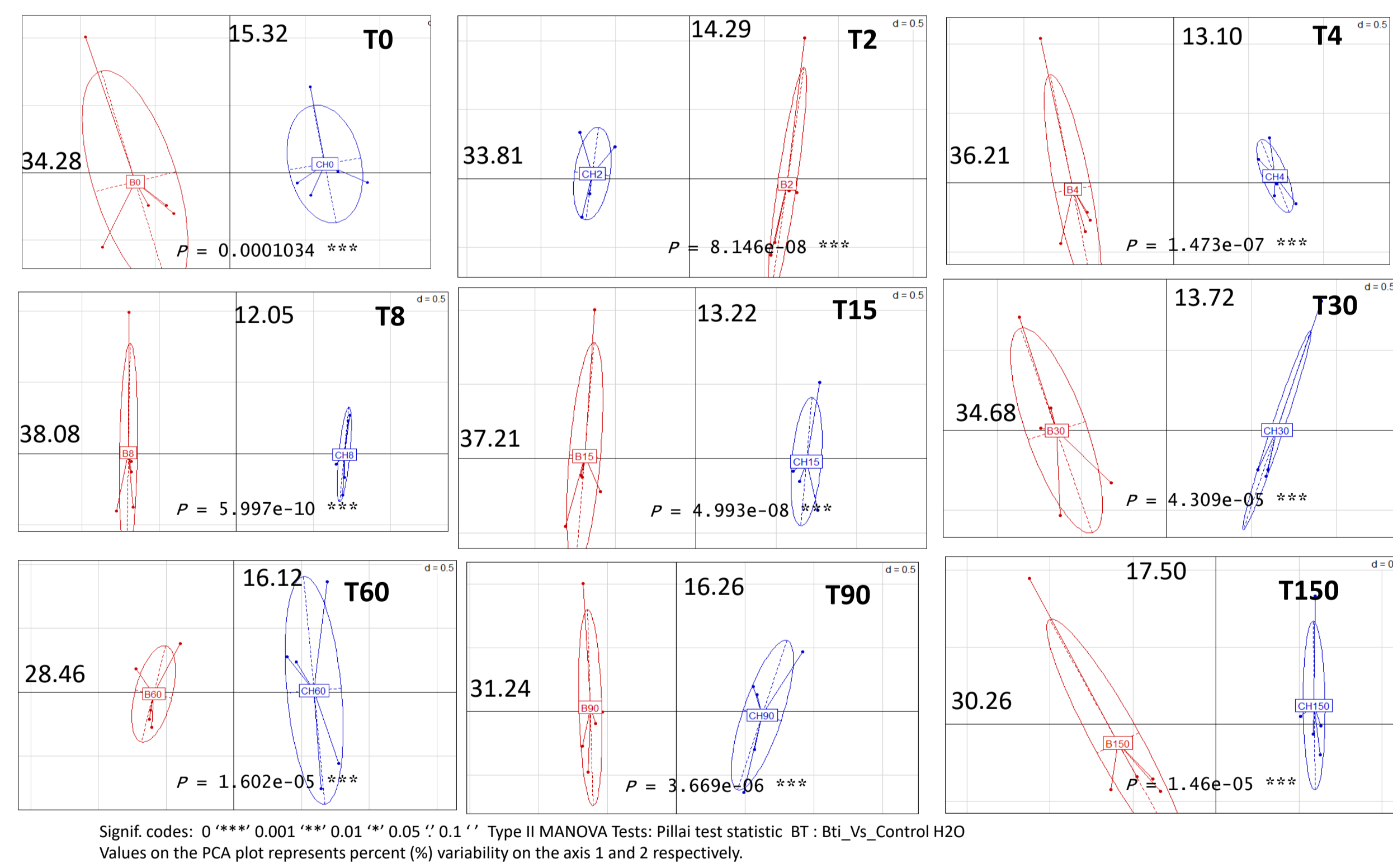


Environmental Metabolic Foot-printing (EMF) approach

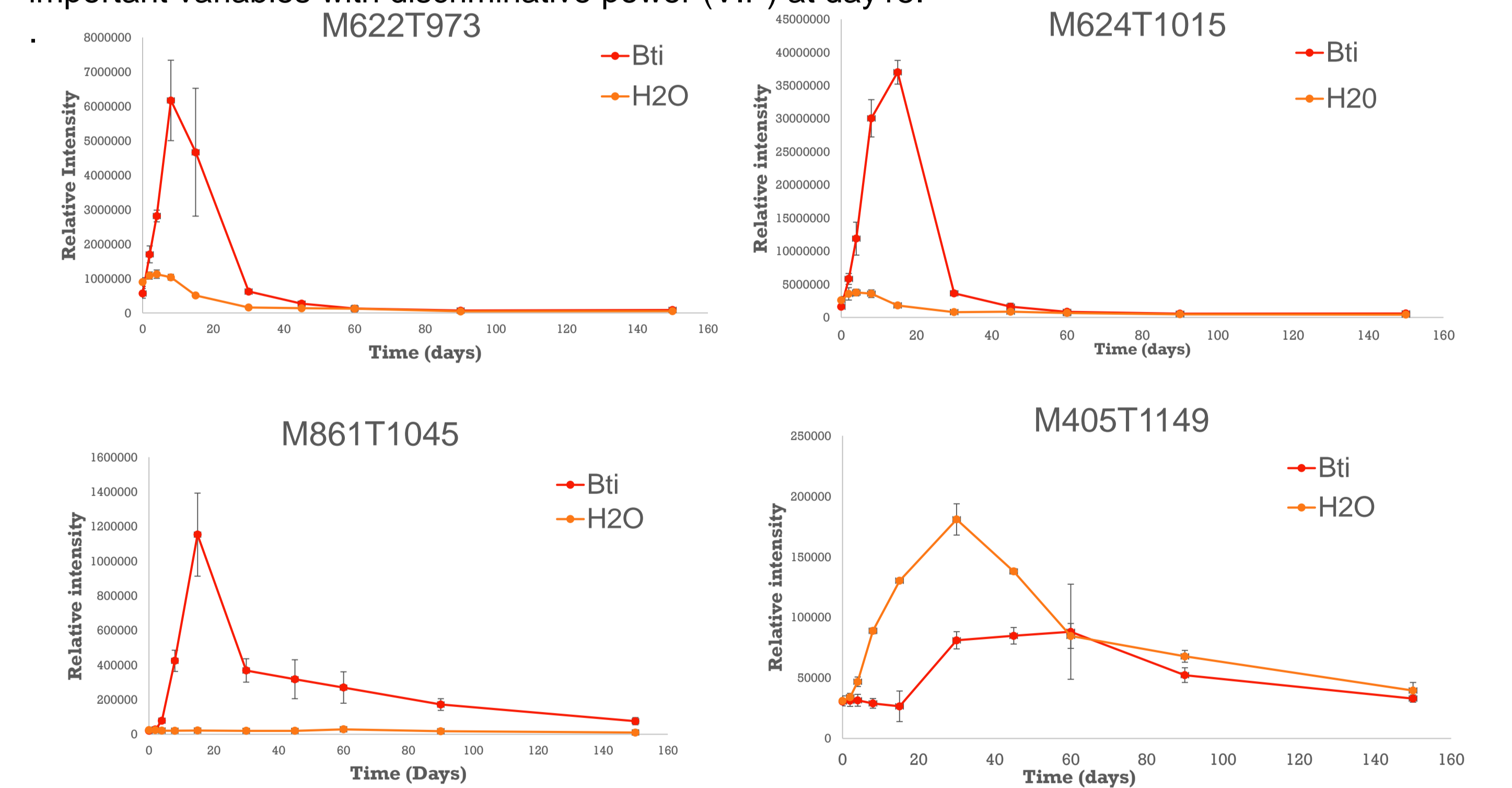


PCA and MANOVA of each time in Positive ion mode Control vs Bti

After 150 days of incubation PCA analysis still showed difference between EMF of treated sediment by Bti and EMF of Control sediment. (Bti at 10 times of field dose)

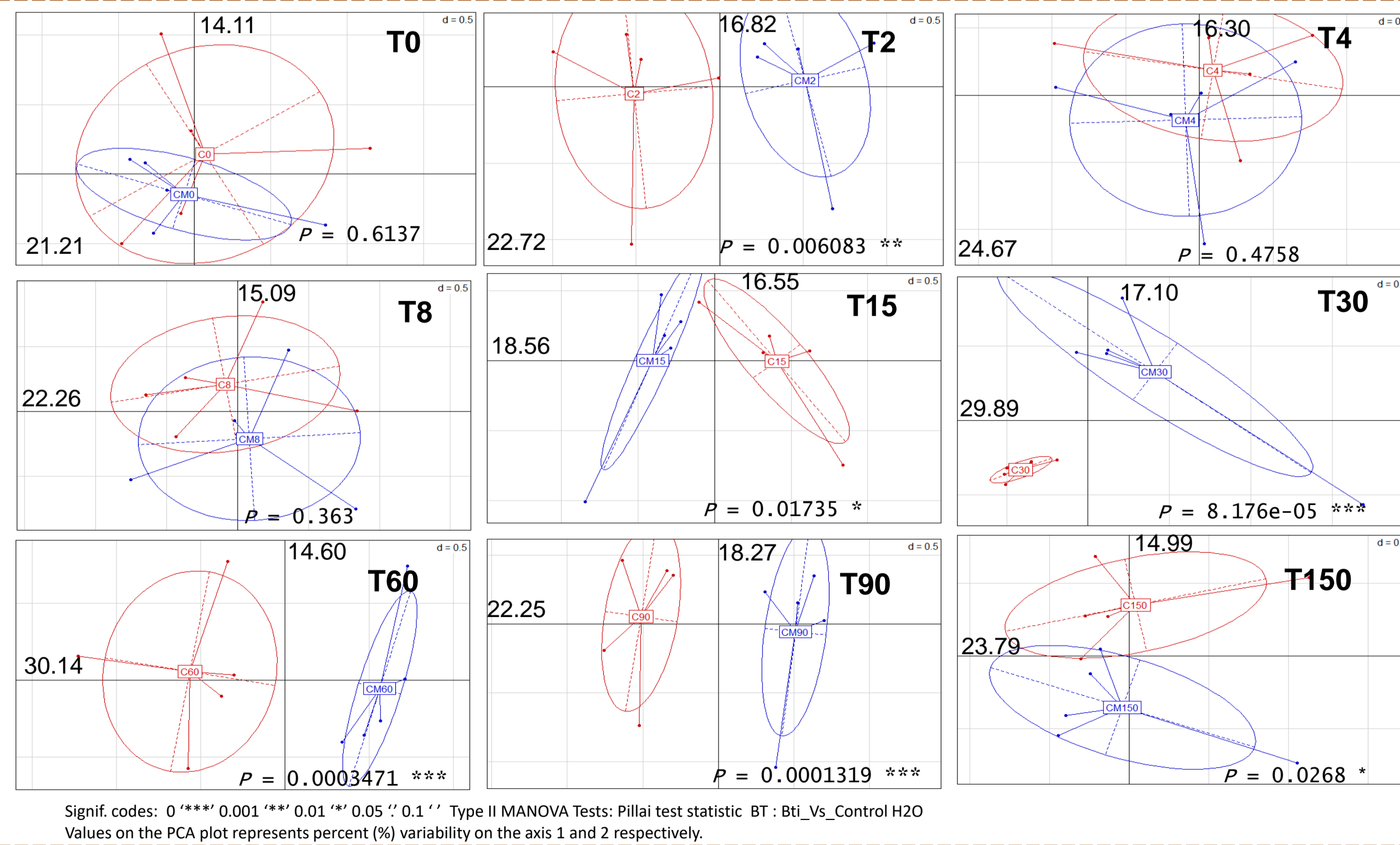


Partial-least squares discrimination analysis (PLS-DA) was performed as supervised method to identify important variables with discriminative power (VIP) at day15.

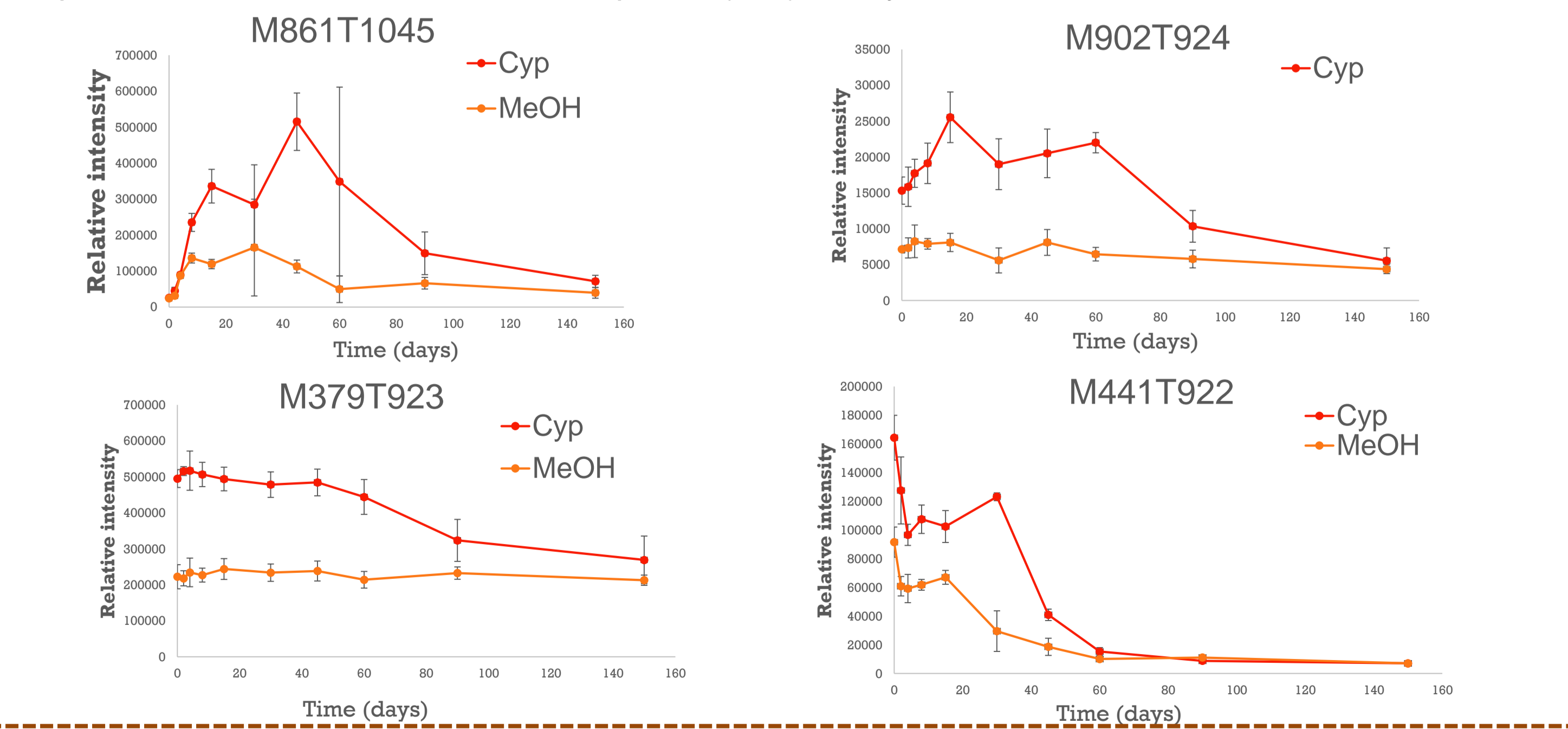


PCA and MANOVA of each time in Positive ion mode Control vs alpha-cypermethrin

After 150 days of incubation PCA analysis still showed difference profile between EMF of treated sediment by Cypermethrin and EMF of Control sediment. (α -Cypermethrin at 10 times of field dose)



Partial-least squares discrimination analysis (PLS-DA) was performed as supervised method to identify important variables with discriminative power (VIP) at day15.



Conclusion and perspectives

- Complex natural substances may be tested with this novel analytical protocol.
- It could potentially replace half life ($t_{1/2}$) concept with resilience time.
- Metabolomics approach may help to identify potential markers for environmental diagnosis of environmental contamination by pollutants.
- Characterization of selected markers from variables important in projection (VIP) of PLS DA are ongoing in our laboratory.
- Setting up of an experiment that mimics seminatural conditions (microclimatic chamber) with extended time and improving experimental and analytical parameters.

Bibliography

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 Salvia MV, Jrad AB, Raviglione D, Zhou Y, Bertrand C. Environmental Science and Pollution Research. 2017 Jun 28:1-7

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