Integration of ecotoxicological indicators into multi-scale and multi-pressure models to improve understanding of pressure-impact relationships at basin scale

Rivers and their watersheds are complex systems in dynamic equilibrium. If most processes like transport of organic matter and sediments, litters transformation, etc ..., are qualitatively well known, it is much more difficult to have a complete quantitative representation because of the interlocking of process scales, the interactions between the terrestrial compartment and the aquatic environments and especially the different stressors that combine them.

In this context, the Quantitative Hydroecology laboratory (LHQ) of research unit MALY of Irstea Lyon-Villeurbanne, focuses on studying the major determinisms of the functioning of rivers and their response to alterations, apprehended in a structured framework through biology, described at the community scale. To co-supervise this work, the laboratory partners with the ecotoxicology laboratory of the same research unit, which is developing research on the transfer and impact of chemical contamination in organisms and aquatic populations of streams.

The objective of this PhD project is to introduce the ecotoxicological tools developed by the Ecotoxicology team in ecological approaches in the aim to better understand pressure-impact relationships at watershed scale. More specifically, the work carried out will be organized around three questions. The first question will focus on an ecotoxicological questioning with the aim of proposing a model allowing to establish a clear link between the anthropic pressures and the level of contamination and/or toxicity. The second will be to construct and introduce a latent chemical toxicity variable into the pressure-impact model recently developed by the LHQ team and to evaluate its importance as a source of degradation at biological community level. Finally, the last question of this work will be to evaluate the interest attributed to certain biological and ecological traits of benthic macroinvertebrates to explain the relationship between levels of contamination and biological responses. This part will be developed in collaboration with the LIEC (University of Lorraine).

The candidate must hold a Master in one of the following fields:

- Ecotoxicology
- Ecology of aquatic environments
- Biostatistics
- Modeling complex systems

He or she will have strong skills in biostatistics and / or statistical modeling applied to biology.

References :

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