

# Opening Conference for the EcoDep project

<http://doukhan.u-cergy.fr/EcoDep.html>

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<http://doukhan.u-cergy.fr/onlineconference.html>

## 1 Organisation

Due to the pandemic, the conference will be organised online. It will be totally free but **registration** is mandatory.

Please register as soon as possible at <https://www.u-cergy.fr/fr/laboratoires/agm/actualites-du-laboratoire/conference-ecodep.html> in order to book your seat securely:

**For technical reasons, the number of registrations will be limited to 100.**

### 1.1 Scientific Program

Five sessions of around 3 hours will aim at organising adequate orientations of the project ECODEP.

The conference will be concluded by a round table: the next steps of the project will be planned and separate workshops will be organised with subgroups of the team to set more precisely in order to improve and complete the various tasks in the project.

This round table session will be organised with your help. For this don't hesitate to email [doukhan@cyu.fr](mailto:doukhan@cyu.fr) to improve the round table, with:

- Questions,
- Suggestions,
- New relevant subjects.

Talks will

- develop probabilist models of population dynamics
- develop statistical tools for applications.
- implement such tools for applications in ecology.

The Provisional schedule is designed in order that researchers from all over the world may attend and give talks:

- Morning (Eastern Sessions) 9:00-12:00, Paris Time  
[16:00-19:00 Tokyo Time], [19:00-22:00 Nouméa Time].
- Afternoon (Western Sessions) 15:00-18:00, Paris Time  
[10:00-13:00 Santiago], [9:00-12:00 New-York Time].

Sessions indicated are three hours long but the online characteristic of the whole conference will make it possible to have a more flexible timing.

## 1.2 Social Program

Beginning such a program led me to realise two things,

- first I should apologise because it is so restrictive but it is necessarily biased;
- the second point it to think about the importance of keeping all those incredibly beautiful places which justify thousands times the existence of projects in analogous lines.

The text is full of links: [click on locations to safely travel during this complicate period.](#)

The social program <sup>(1)</sup> will be free:

- Brazil: Iguazu falls, Rio-Corcovado, Amazonia Forests,
- Chile: Patagonia, Paranal, Atacama desert, Valparaiso, Caleta Portales,
- China: The great wall, Peking-Forbidden city, Hong-Kong,
- France: Lyon <sup>(2)</sup>, Nantes-Machines de l'Ile, Paris-Plage, Paris-Tara Expedition, Vannes, Luminy,
- Germany: Aachen, Berlin, Heidelberg, Munich-Hofbraeuhaus, Oberwolfach,
- Mexico: Mexico-Frida Khalo Museum, Mexico-Coyoacan,
- New Caledonia: Nouméa,
- Poland: Torun, Varsaw-Jewish Museum,
- Spain: Barcelona-La Pedrera, Figueras-Dali Museum, Granada,
- USA : Colorado, New York City,
- Venezuela: Delta del Orinoco, Salto Angel.

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<sup>1</sup>Don't hesitate to help for improving this important feature of the conference.

<sup>2</sup>Sorry for reducing the attraction of this beautiful city to food but a social program should include a conference dinner and Lyon is the capital of Gastronomy...

Let us hope that we can meet physically in this city for a physical event!

Maybe I should add a link for the Welcome Cocktail?

## 2 Schedule

Paris Time is indicated and the duration of talks does include questions.

- Eastern session, September 9
  - 9:00-9:15 **Paul Doukhan**. Opening.
  - 9:15-10:15 **Sylvie Méléard**. Adaptation to a gradual environment - Research of lineages.
  - 10:15-11:00 **Eric Renault**. Lag-augmented local projections and causality properties at different horizons.
  - 11:00-11:30 **Lionel Truquet**. Times series: exogeneity and random environment.
  - 11:30-12:00 **Michael Neumann**. Multivariate isotonic regression for time series.
- Western session, September 9, Moderator **Yahia Sahli**
  - 15:00-15:45 **Thierry Huillet**. Scaling features of two special Markov chains involving total disasters.
  - 15:45-16:45 **Pablo Marquet**. Reconstructing complex ecological networks.
  - 16:45-17:30 **Sergio Navarrette**, The wonderful complexity of coastal marine ecological networks.
  - 17:30-18:00 **Yves Lebras**. Bat mortality in wind farms: assessment and mitigation.
- Eastern session, September 10, Moderator **Lionel Truquet**
  - 9:00-9:45 **Morgan Mangeas**. New mathematical approaches for modelling dengue fever dynamics at global and local scales.
  - 9:45-10:30 **Pierre Alquier**. Parametric estimation via MMD optimization: robustness to outliers and dependence.
  - 10:30-11:00 **Gilles Durrieu**. A nonparametric statistical procedure for the detection of marine pollution and global warming effects.
  - 11:00-11:30 **William Kengne**. Model selection for common time series models.
- Western session, September 10, Moderator **Rolando Rebolledo**
  - 15:00-15:45 **Joel E Cohen**. Tornadoes, infectious disease, human death rates, fish, and prime numbers: variance functions and Taylor's law of fluctuation scaling.
  - 15:45-16:30 **Victor de la Pena**. On the Empirical Taylor's Law and the Bias of the Coefficient of Variations.
  - 16:30-17:15 **Yahia Sahli**. Dynamic Taylor's laws.
  - 17:15-18:00 **Joseph Rynkiewicz**. Mixtures of Nonlinear Poisson Autoregressions.
- Eastern session, September 11, Moderator **Hélène Morlon**
  - 9:00-10:00 **Hélène Morlon**. Stochastic models in (macro)evolution.
  - 10:00-10:45 **Alejandra Cabana**. Estimation of under reporting in count time series data. Application to CoVID-19 cases.
  - 10:45-11:30 **Viet Chi Tran**. User-driven exploration of social networks with application in epidemiology.
- Western session, September 11, 15:00-18:00, **Round table**

*The round table will be organized in two times, first an open exchange, and then a discussion within the group will aim at making explicit the future activities of the project.*

### 3 Abstracts

- **Pierre Alquier**, RIKEN-AIP, Tokyo.

*Parametric estimation via MMD optimization: robustness to outliers and dependence.*

In this talk, I will study the properties of parametric estimators based on the Maximum Mean Discrepancy (MMD) defined by Briol et al. (2019). In a first time, I will show that these estimators are universal in the i.i.d setting: even in case of misspecification, they converge to the best approximation of the distribution of the data in the model, without ANY assumption on this model. This leads to very strong robustness properties. In a second time, I will show that these results remain valid when the data is not independent, but satisfy instead a weak-dependence condition. This condition is based on a new dependence coefficient, which is itself defined thanks to the MMD. I will show through examples that this new notion of dependence is actually quite general. This talk is based on published works, and works in progress, with Badr-Eddine Chérif Abdellatif (ENSAE Paris), Mathieu Gerber (University of Bristol), Jean-David Fermanian (ENSAE Paris) and Alexis Derumigny (University of Twente):

<http://arxiv.org/abs/1912.05737>

<http://proceedings.mlr.press/v118/cherief-abdellatif20a.html>

<http://arxiv.org/abs/2006.00840>

- **Alejandra Cabana**, UAB, Barcelona.

*Estimation of under reporting in count time series data. Application to CoVID-19 cases.*

We introduce a new model used to study and analyse the severe acute respiratory syndrome coronavirus 2 (SARS-CoV2) epidemic reported data from. It is a Hidden Markov Model whose hidden layer is a regeneration process with Poisson immigration, Po-INAR(1), together with a mechanism that allows the estimation of the under-reporting in non-stationary count time series. A novelty of the model is that the expectation of the innovations in the unobserved process is a time-dependent function defined in such a way that information about the spread of an epidemic, as modelled through a SIR dynamical system, is incorporated into the model. In addition, the parameter controlling the intensity of the under-reporting is also made to vary with time to adjust to possible seasonality or trend in the observed data. Maximum likelihood methods are used to estimate the parameters of the model. The original motivation for this work was the study of daily reported cases of SARS-CoV2 in different areas of Spain. The protocol for testing as of February 2020 only included clinically suspicious patients who recently arrived from China. The protocol experienced changes in the succeeding weeks, and by May 2020, the norm became the polymerase chain reaction (PCR) or molecular tests performed to individuals with a broader collection of symptoms and contacts of confirmed patients. This scenario suggests that there is a hidden process that governs the evolution of the daily number of infected individuals, and an observed process that reflects only part of it. Moreover, the proportion of unobserved cases varies in time, due at least to the changes in testing protocols. On the other hand, it is reasonable to assume that the underlying process is non-stationary since the evolution of the epidemic of SARS-CoV2 has been observed to evolve initially drawing a mild logarithmic curve followed by an outbreak with exponential growth, which later slows down and also declines exponentially, with varying growth-decay rates which depend much on the application and effectiveness of public health prevention measures.

- **Joel E Cohen**, Laboratory of Populations, Rockefeller University & Columbia University, New-York; Department of Statistics, University of Chicago:

*Tornadoes, infectious disease, human death rates, fish, and prime numbers:  
variance functions and Taylor's law of fluctuation scaling.*

From 1954 to 2014, the annual mean number of tornadoes (of intensity F1+) per tornado outbreak in the continental United States grew, on average, by nearly 0.7%/year, while the annual variance of the number of (F1+) tornadoes per outbreak grew, on average, by nearly 2.9%/year. That is, the variance grew in proportion to slightly more than the fourth power of the mean, with consequences for insurance and risk to life and property. This power-law relation of the variance to the mean is an example of a very widespread pattern called Taylor's law of fluctuation scaling, which originated in ecology. In another example, the set of primes that do not exceed a positive integer  $n$  has a variance that is asymptotically equal to one-third times the square of the mean of those primes as  $n$  becomes large. Taylor's power law is one of many variance functions. The variance function of a family of nonnegative random variables (rvs) gives the variance of each rv as a function of its mean, assuming each rv has finite mean and finite variance. Variance functions were invented to assist statistical analyses of agricultural experiments. They have since (under various names) found applications in basic and applied ecology (fisheries, forestry, wildlife), physics, meteorology, number theory, computer science, finance, generalized linear models, epidemiology, and demography, among other fields. This talk will survey some uses and models of variance functions and recent generalizations of Taylor's law to families of nonnegative rvs with infinite means and infinite variances.

- **Victor de la Pena** , Department of Statistics, Columbia University:

*On the Empirical Taylor's Law and the Bias of the Coefficient of Variation.*

In this talk I will introduce some properties of Taylor's law and its connection to the coefficient of variation. In particular, I will show how Karamata's formula can be used in the calculation of the empirical coefficient of variation. Some examples will be included.

- **Paul Doukhan**, AGM-CYU, Cergy:

*Opening Ecodep Project.*

I am extremely happy to open this nice conference together with the project itself. This project is based on cross-participations of the Ecodep Team. The initial idea was to think of the main question of ecology with tools issued from Statistics and models of Dynamic of populations. As a statistician involved in stochastic dependence structures I realised that it is possible to go within important applications of ecology with such mathematical tools.

Purely time series based talks are mixed with papers addressing ecological subjects. Some of them are based on heavy mathematical arguments, others are more descriptive and some others already mixed both concepts.

In order to go further in the projects participants are kindly asked to think in a very open way of combining concepts used in several talks to derive applications of interest to the current project.

- **Gilles Durrieu**, LMBA, University Bretagne Sud, France.  
This is a joint work with Bernard Bercu (University of Bordeaux) and Sami Capderou (University of Geneva).

*A nonparametric statistical procedure for  
the detection of marine pollution and global warming effects.*

This talk is devoted to the estimation of the derivative of the regression function in fixed and random design nonparametric regression. We establish the almost sure convergence as well as the asymptotic normality of our estimates. We provide concentration inequalities which are useful for small sample sizes. We also illustrate our nonparametric estimation procedure on simulated data and real life data associated with sea shores water quality and global warming.

- **Thierry Huillet**, LPTM-CYU, Cergy, Joint work with Branda Goncalves:

*Scaling features of two remarkable Markov chains involving total disasters.*

Catastrophe Markov chain population models have received a lot of attention in the recent past. We herewith consider two special cases of such models involving total disasters, both in discrete and in continuous-time. Depending on the parameters range, the two models can show up a recurrence/transience transition and, in the critical case, a positive/null recurrence transition. The collapse transition probabilities are chosen in such a way that the models are exactly solvable and, in case of positive recurrence, intimately related to the extended Sibuya and Pareto-Zipf distributions whose divisibility and self-decomposability properties are shown relevant. The study includes: existence and shape of the invariant measure, time-reversal, return time to the origin, contact probability at the origin, extinction probability, height and length of the excursions, a renewal approach to the fraction of time spent in the catastrophic state, scale function, first time to collapse and first-passage times, divisibility properties.

J Stat Physics 178, 499–531 (2020), <https://doi.org/10.1007>

- **William Kengne**, THEMA-CYU, Cergy, joint work with Jean-Marc Bardet and Kamila Kare, Université Paris 1, Panthéon-Sorbonne:

*Model selection for common time series models.*

We study the model selection problem in a large class of causal time series models, which includes both the ARMA and GARCH-type models. To tackle this issue, we consider a penalized contrast based on the quasi-likelihood of the model. We provide sufficient conditions for the penalty term to ensure the consistency of the proposed procedure as well as the consistency and the asymptotic normality of the quasi-maximum likelihood estimator of the chosen model. Some simulation results and real data application are also provided.

- **Yves Lebras**, Biotope, Mèze:

*Bat mortality in wind farms: assessment and mitigation*

Among the 45 bats species in Europe, 34 are present in France. All of them are strictly protected. After a marked decline in the second half of the 20th century the populations stabilised, but many species remain threatened. Combined with decreasing insect abundance, light pollution, scarcity of hedgerows in agricultural landscapes and other existing threats,

the rapid development of wind energy production rises a new challenge in bats conservation. In this context, we will introduce two work avenues for bats conservation (along with their context and available data) that could benefit from the ECODEP project. As the size of a population decrease the extinction risk related the natural stochasticity increases. Furthermore, bats exhibit " $K$  demographic strategies" characterised by long lifespan and low fertility, which makes them vulnerable to excess mortality such as collisions with wind turbine blades and barotraumas. In response to these issues, baseline acoustic surveys and mortality monitoring are required to assess the impacts of wind energy facilities. Engineering consultants such as Biotope and research institutes has gathered a large quantity of such survey data. Nonetheless, the demographic impacts on the viability of bat populations are still too poorly understood to allow informed environmental management of wind energy production. Simulations or data-driven studies could provides new insights into this problem. One mitigation method that has been successful so far is the use of turbine curtailment algorithms. While such algorithms already exists they are still simplistic. This results in bat fatalities and economic loss which delays widespread use of these algorithms in wind energy facilities. Improvements, such as the inclusion of species specific responses, dealing with spatial heterogeneity at various scales, detecting extreme events (such as peak activities in migration periods) or fine-tuning of the algorithm during its deployment, would help to further reduce the number of fatalities and to promote the usage of this mitigation solution.

- **Morgan Mangeas**, IRD, Nouméa:

*New mathematical approaches for modelling dengue fever dynamics at global and local scales.*

The study of the current and future dynamics of environment-related diseases requires innovative mathematical approaches. The focus here is on the interannual epidemic dynamics of dengue fever at local and global scale. At the world scale, we used available time series of the number of annual dengue cases from 63 different countries to determine the influence of forcing variables on the dengue dynamic. The novelty of this approach lies in modelling the dynamics by approximating the probability distributions of the time series, and for this purpose, a new probability distribution is designed, derived from the exponential distribution  $e(\lambda)$ , which describes the epidemic and endemic situations with only 2 parameters. The relationship between the estimated parameters and some explanatory variables (climate, socio-economic situations...) are then analysed using nonparametric regression. At a local scale, in New Caledonia, a non-linear modelling of the climatic periods favourable to the development of epidemics ( $R_0 > 1$ ) will be described based on two climate variables.

- **Pablo Marquet**, Departamento de Ecología, Facultad de Ciencias Biológicas, Pontificia Universidad Católica de Chile, joint work with Rolando Rebolledo, Instituto de Ingeniería Matemática, Facultad de Ingeniería, Universidad de Valparaiso, Chile:

*Reconstructing complex ecological networks.*

The development of ecological sciences has been accompanied by an increase in the dimensionality of the problem under analysis, from the study of single species or autoecology, to interacting species pairs, to similar species using the same resources to networks of interacting species. Networks, however, are difficult to describe and study, as most of the time only a fraction of the total number of interactions is observed. In this context, we will address some of the ecological and statistical problems facing the study of networks: the link between network structure and dynamics, and the possibility of reconstructing one from the other.

- **Sylvie Méléard**, Polytechnique, Palaiseau:

*Adaptation to a gradual environment - Research of lineages.*

Directional environmental changes, such as caused by climate warming, imposes strong selection on many living organisms, which need to evolve fast enough to keep track of their changing environment. We introduce a quantitative genetics model exploring this question and consider some phenotypic trait subject to stabilizing selection around some optimal phenotype, which value is shifted continuously through time. We construct the stochastic individual based model and its deterministic PDE approximation for which we exhibit a stationary distribution. Assuming now that the density profile stays at this equilibrium, we are interested in the lineage of an individual uniformly sampled at a fixed time. Our aim is to capture the distribution of the initial value of this trajectory and to exhibit a bias in the distribution. We use a spinal approach classical for branching processes. We will also give the equation of such lineage.

- **Hélène Morlon**, ENS, Paris:

*Stochastic models in (macro)evolution.*

The mathematical frameworks of stochastic birth-death processes and diffusion processes are central to population dynamics, macroevolution, and phylodynamics. I will present recent developments in macroevolution, where the birth-death process is adjusted to the phylogenetic trees of extant species to infer past diversification dynamics, and diffusion processes are adjusted to comparative trait data to infer past phenotypic evolution. I will start by illustrating how the birth-death process can be used to understand the macroevolutionary consequences of ecological and evolutionary processes acting at the individual level, with an application on the evolutionary emergence of ecological networks. Next, I will present a recent model that allows estimating lineage-specific diversification rates, and that illustrates the use of Bayesian inference and data augmentation in the field. I will then discuss why evolutionary biologists are interested in introducing covariates of evolutionary rates in such analyses, how they currently do so, the types of results they obtain, and ways forward for improving such approaches. Then, I will present recent developments in the treatment of high-dimensional comparative datasets that illustrate the use of penalized-likelihood. Finally, I will discuss potential applications to epidemiology.

- **Sergio Navarette**, Catholic University, Santiago:

*The wonderful complexity of coastal marine ecological networks.*

The talk will show the construction of these networks from empirical observations, the distinction and importance between trophic and non-trophic type of interactions and the complexity of the latter when included into an ecological network. Spatial variability in structure of rocky shore networks and of the different types of interactions is examined in relation to environmental variability. In a separate part of the talk, we will also briefly present and discuss temporal trends in the recruitment of intertidal invertebrates (barnacles) over the past 20 years at multiple sites of central Chile, highlighting the potential connection to climate variability and long-term trends in productivity of the coastal ocean.



- **Michael Neumann**, Department of Mathematics, Jena:

*Multivariate isotonic regression for time series.*

We consider a general monotonous regression where we allow for independent and dependent regressors. We propose a modification of the classical isotonic mean squares estimator and establish its convergence rate for the  $L^1$ -loss function. The methodology captures the shape of the data without assuming additivity or a parametric form for the regression function. Furthermore the degree of smoothing is chosen automatically and no auxiliary tuning is required for the theoretical analysis.

The presentation is based on a joint paper with Konstantinos Fokianos and Anne Leucht published in IEEE Transactions on Information Theory (2020),

DOI: 10.1109/TIT.2020.3013390

- **Eric Renault**, Department of Economics, Warwick:

*Lag-augmented local projections and causality properties at different horizons.*

Jorda (2005) proposed a new method for estimating structural impulse responses based on the so-called local projections (LP). Relative to the conventional VAR-based estimator, the LP estimator is supposed to simplify inference and to be more robust to model misspecification. Montiel Olea and Plagborg-Moller (2020) have recently argued that lag-augmented LP have additional validity for both stationary and non-stationary data, as well as uniform validity over a wide range of impulse response horizons. Albeit important, the focus on classical impulse response functions overlooks the main reason why Dufour, Pelletier and Renault (2006) had introduced lag-augmented LP, namely inference on higher-order impulse response functions. Following Dufour and Renault (1998), when one wants to characterize causality properties from  $Y$  to  $X$  at different horizons  $h$ , it is misleading to consider only the impulse response coefficients that give the correction to be made on the forecast of  $X(t+h)$  when  $Y(t)$  is modified by one unit. The so-called higher order impulse response functions, namely the impact of  $Y(s)$ ,  $s < t$ , should also be taken into account. Lag-augmented LP provide the relevant tool for inference on these higher order impulse response functions. Beyond the well-documented advantages of LP (easy inference on polynomial functions of the VAR parameters, displaying multiple singularities under the null of non-causality), it allows to get robust assessments of causality at different horizons, in particular through estimation of Kullback causality measures (Gourieroux, Monfort and Renault (1987) and Dufour and Taamouti (2010)).

- **Joseph Rynkiewicz**, SAMM-Sorbonne, Paris:

*Mixtures of Nonlinear Poisson Autoregressions.*

We study non-linear infinite order Markov switching integer-valued ARCH models for count time series data. Markov switching models take into account complex dynamics and can deal with several stylistic facts of count data including proper modeling of non-linearities, overdispersion and outliers. We study structural properties of those models. Under mild conditions, we prove consistency and asymptotic normality of the maximum likelihood estimator for the case of finite order autoregression. In addition, we give conditions which imply that the marginal likelihood ratio test, for testing the number of regimes, converges to a Gaussian process. This result enable us to prove that the BIC provides a consistent estimator for selecting the true number of regimes. A real data example illustrates the methodology and compares this approach with alternative methods.

Based on a joint paper with Paul Doukhan and Konstantinos Fokianos, published in the Journal of Time Series Analysis, 2020.

- **Yahia Sahli**, ISFA, Lyon, joint work with Victor de la Pena and Paul Doukhan.

*Dynamical Taylor's laws.*

Cohen and Xu (2015) introduced Taylor's law for purposes of the analysis of dynamic of populations. The present work aims at extending such Taylor's laws to weakly dependent time series, see de la Pena and Brown (2017) and Albrecher and Teugels (2006). To this aim the usual variance is replaced by the sum of the series of covariances, which is the standard limit variance in such cases when a CLT holds. We thus introduced self normalized corresponding expressions and we prove both that they are asymptotically Gaussian and asymptotically unbiased in order to derive suitable tests of goodness-of-fit for the corresponding Taylor's parameter. A data example will aim at comparing such laws to the usual ones. Dependence conditions under consideration will be both  $\theta$ -weak dependence and  $\alpha$ -mixing.

- **Viet Chi Tran**, Université Gustave Eiffel.

*User-driven exploration of social networks with application in epidemiology.*

To understand the spread of certain diseases such as HIV or HCV, the modelling of social networks (sexual partners or people who inject drug together) is important. In the case of HCV, the network is hidden since drug use is illegal. We have designed in Paris a 'Respondent-driven' study to discover the social network of people who inject drugs (PWIDs). The underlying idea is to have the graph explored by random (branching) walks: each interviewee receives a certain number of coupons that she/he distributes to her/his injection partners. After having described the general case, we focus on what happens for the family of Stochastic Block Model graphs. Which proportion of the graph can we discover and what can be said on the topologies that are found ?

Work in progress with Vo Thi Phuong Thuy.

- **Lionel Truquet**, CREST ENSAI, Rennes:

*Times series: exogeneity and random environment.*

Among the various theoretical contributions devoted to time series analysis, the inclusion of exogenous covariates in standard non linear time series models is a problem largely ignored in the literature. We address this problem when the covariates are exogenous in a strict sense, using the formalism of Markov chains in random environments. While strict exogeneity is quite restrictive for application of time series to econometrics, this notion makes more sense in the field of ecology. We will show that many examples of autoregressive models such as threshold models, count autoregressions or autoregressive logistic models can accommodate with strictly exogenous regressors under quite general assumptions which ensure usual stability properties.

## 4 Participants

Participants come from all over the world and to turn this conference in a link between researcher we thought that an easy access to all of them may be a successful tool for further contacts; people attending this conference are located in [Belgium](#), [Brazil](#), [Canada](#), [Chile](#), [China](#), [Cyprus](#), [Denmark](#), [Germany](#), [France](#), [Hong-Kong](#), [Hungary](#), [Indonesia](#), [Ivory Coast](#), [Japan](#), [Mauritius](#), [New Caledonia](#), [Pakistan](#), [Peru](#), [Poland](#), [Portugal](#), [Russia](#), [Singapore](#), [South Korea](#), [Spain](#), [Switzerland](#), [Ukraine](#), [United Kingdom](#), [United States of America](#), [Uruguay](#) and [Vietnam](#).

The fact that both the academic and the private sector as ([Biotope](#), [CDiscount](#), [La Capitale](#), [Phimeca Engineering](#), [Scor](#)) are represented is an additional chance for establishing links between people aiming at working out ecological questions.

To make the document efficient and in order to allow questions even if you are not in the same time zone as a speaker exchanges will be recorded and thus questions and comment may be addressed directly. For this:

- We set direct links to institutions of the participants.
- To email just click on the email of the participant.

Beyond the limit of 100 participants, the sessions will be broadcasted also available one for diffusion in different time zones.

### Alphabetical list of participants integrate universities and email links:

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