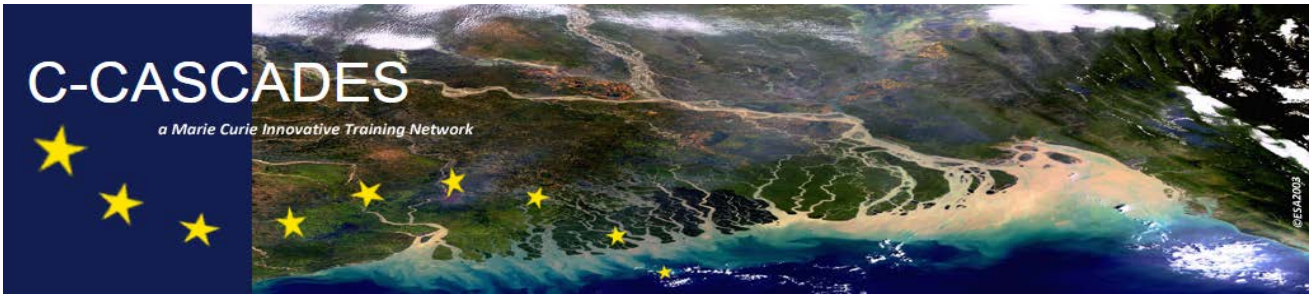


Training Workshop 1 Brief Description

Title: GIS and advanced statistical methods

Date(s): 2016/01/04 to 2016/01/08	**Location**: Brussels, Belgium
Lead institution: ULB	**Type**: Training Workshop
Contact name: Leo Rodrigues **Local contact**: Emily Mainetti-Cloarec	**Contact email**: J.Leandro-Rodrigues@exeter.ac.uk **Local contact email**: emily.mainetti-cloarec@ulb.ac.be

Description:
The objective of the training workshop is to provide the students with a practical introduction to the use of advanced statistical methods and geo-information systems (GIS) for the analysis of Carbon (C) fluxes through the Land-Ocean Aquatic Continuum.
The program will be divided in 5 blocks as follows:
- Short revision of basic statistical concepts and introduction to programming in Matlab (optional).
- Use of multivariate statics, with an emphasis on multiple regression analysis.
- Time-series analysis.
- Introduction to the use of neuronal networks as advanced interpolation methods.
- Use of GIS in hydrology and the analysis of lateral C transfers from soils to the coasts.

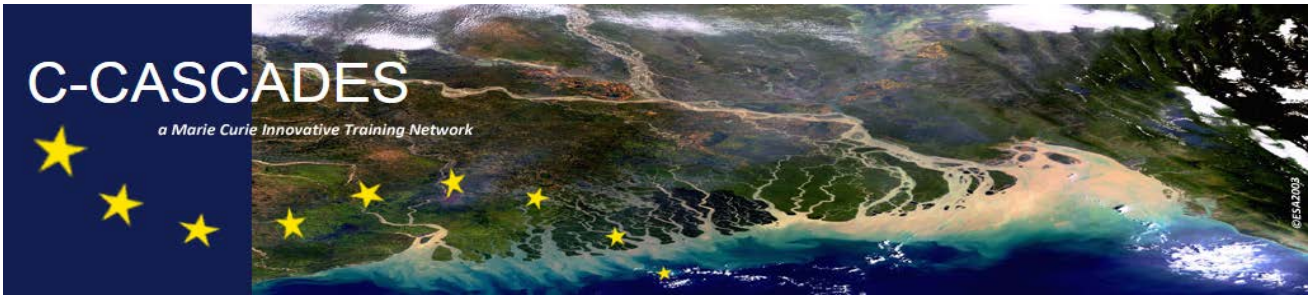
Each block will include a theoretical introduction presenting the methodology and an overview of scientific applications of these statistical methods to the C cycle. The emphasis, however, will be on hands-on exercises for which each participant will be provided with a workstation.
A detailed schedule and a detailed description of each block are available in Annex 1.
Matlab being necessary for the 4th block and a widely spread software within the research community, it will be used in most lessons. The 5th block will require specific GIS software. We selected QGIS/GRASS, which is open source, so that all students will be able to download and install it in their respective institutions. The first block is dedicated to learning the basis of Matlab and refreshing essential statistical principles. It is thus optional and intended for students with little to no experience with the software.

Outcome for all participants:
The participants are expected to acquire the following skills during the workshop:
- Understanding and basic level of computing in Matlab
- A solid overview of fundamental statistics principles related to multivariate statistics and trend analysis
- General understanding of the use of neural network algorithms for advanced interpolations
- Basic level in GIS and overview of its use in the field of geochemistry

Assessment criteria
Each ESR will produce a short, 1-2 pages report describing the potential applications to their own research project of the knowledge and methods acquired throughout the workshop. The submission deadline for reports is Friday, 5 February 2016 (a full month after the workshop).

ECTS awarded: 3	**Awarding institution**: ULB / UNEXE

If you wish to register for this event, please send an email (including a CV and a motivation letter for non-C-CASCADES students), before **November 15th 2015**, to the "**Contact email**" above and add to the subject line the "**Title**". Maximum participants: 20.
If you want more information about this event, please contact the '**Local contact**'.



TWI: Annex 1

AGENDA

Monday, January 4th 2016

14:00-15:30	: Basics & Matlab (optional)
16:00-17:30	: Basics & Matlab (optional)
break	
19:30	: Welcome dinner
evening	

Tuesday, January 5th 2016

9:00-9:20	: Workshop Opening (P. Regnier)
9:30-10:30	: Multivariate Statistics
11:00-12:30	: Multivariate Statistics
12:30-14:00	: Lunch
14:00-15:30	: Multivariate Statistics
16:00-17:30	: Multivariate Statistics
evening	(dinner at 19:30)

Wednesday, January 6th 2016

9:00-10:30	: Time-series analysis
11:00-12:30	: Time-series analysis
12:30-14:00	: Lunch
14:00-15:30	: Time-series analysis
16:00-17:30	: Neural Networks
evening	(dinner at 19:30)

Thursday, January 7th 2016

9:00-10:30	: Neural Networks
11:00-12:30	: Neural Networks
12:30-14:00	: Lunch
14:00-15:30	: GIS
16:00-17:30	: GIS
evening	(dinner at 19:30)

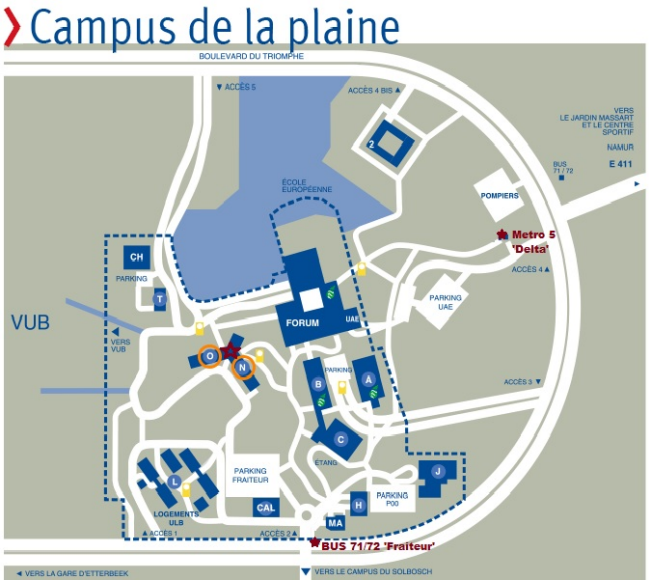
Friday, January 8th 2016

9:00-10:30	: GIS
11:00-12:30	: GIS
12:30	: Lunch and departure

Location:
Université Libre de Bruxelles
Campus La Plaine
Boulevard du Triomphe
1050 Brussels, Belgium
Building NO, 4rd floor, **Room NO4.008**.

Access by public transport:
- by metro: line 5, station 'Delta'
- by bus: lines 71/72, stop 'Fraiteur'

Map:



DETAILED CONTENT OF THE WORKSHOP	
Block 1: Basics & Matlab	
Length: 2 x 90 minutes	**Time slot**: Monday afternoon
Trainer: Goulven Laruelle (ULB)	**Requirement**: Matlab
Description: This introductory course will be optional and aims at insuring that all ESRs are comfortable with basic statistical concepts that are required to follow the workshop. It will also include an initiation to programing in Matlab. The course will refresh fundamental statistical notions (mean, standard deviation, normality etc…) and teach how to calculate basic statistical descriptors from a given dataset using Matlab. The use of functions in Matlab will then be taught and applied to datasets and perform simple statistical tests. By the end of the lesson, all ESRs should be able to write simple routines, load and export data, produce simple graphics and will be able to perform the tasks required by the following courses.	
Block 2: Multivariate statistics	
Length: 4 x 90 minutes	**Time slot**: Tuesday all day
Trainer: Goulven Laruelle/Ronny Lauerwald (ULB)	**Requirement**: Matlab
Description: This course will first teach how to identify statistical relationships between several independent variables. It will include simple and multiple linear regressions as well as techniques to normalize the input parameters. In the applications, a variable (riverine pCO_2) will be related to several environmental factors which will be used as predictors. Using those relations and the uncertainties associated to each predictor, Monte Carlo simulations will be performed to quantify the uncertainty of the predicted pCO_2.	
Block 3: Time series analysis	
Length: 3 x 90 minutes	**Time slot**: Wednesday Morning/Early afternoon
Trainer: Sandra Arndt (UNIBRIS)	**Requirement**: Matlab
Description: This course will deal will the analysis of time series using several concrete examples of field data such as temperature, salinity, pCO_2…Building on the previous block and the example of simple linear regressions, this course will teach how to identify trends and test their statistical significance. It will cover various types of trends (linear, seasonal…) and, through examples, illustrate how time-series can reveal several signals at different time scales. Applications will include removal of seasonal signals from times series to analyse multi-annual trends.	
Block 4: Neural networks	
Length: 3 x 90 minutes	**Time slot**: Wednesday afternoon/Thursday morning
Trainer: Peter Landschützer (ETZH)	**Requirement**: Matlab
Description: This course will initiate people to the use of neural networks. The course will focus on the example of Self Organising Maps as a tool to interpolate incomplete datasets and fill gaps in maps. This method will allow using pCO_2 data from SOCAT and various easily accessible environmental parameters as a concrete example to produce a continuous regional pCO_2 map.	
Block 5: GIS	
Length: 4 x 90 minutes	**Time slot**: Thursday afternoon/Friday morning
Trainer: Ronny Lauerwald (ULB)	**Requirement**: QGIS/GRASS
Description: This course will deal with the use of GIS in hydrology and the analysis of lateral C transfers from soils to the coasts. We selected QGIS/GRASS, which is open source, so that all ESRs will be able to download and install it in their respective institutions. We would like to teach the basics of GIS and give an overview of applications in hydrology, soil erosion, etc.; and then do some hands on exercises on a medium sized river basin using freely available data sets. Useful applications to be taught comprise e.g.: - to derive a river network and catchment boundaries from a digital elevation model (DEM) and to calculate catchment properties, - to derive important terrain variables from a DEM (e.g. slope, CTI, LS factor of the universal soil loss equation), - spatial interpolation of point data (for instance to be used with precipitation data).	