# InGOS – Integrated non-CO2 Observing System

Detailed workplan, appendix to the online application. Request for access to an infrastructure (TNA1-TNA2-TNA3). The plan must not exceed 6 pages in 12 pt single line spacing, applications exceeding this limit will not be evaluated. The following information should be included in order to be evaluated:

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| 1. | **Project name (acronym), name and contact information of the researcher(s), duration of the project (dates, number of working days), type and name of the infrastructure requested** |
|  | **Project name:**  Soil N2O chamber inter-comparison campaign 2014, Hyytiala, Finland |
|  | **Name and contact information of the researcher(s)**  Mrs Shirley Cade,  Earth Science Department  Royal Holloway, University of London  Egham Hill  Egham  TW20 0EX  Email: [Shirley.Cade.2008@live.rhul.ac.uk](mailto:Shirley.Cade.2008@live.rhul.ac.uk) |
|  | **Duration of the project (dates, number of working days)**  Full project lasts 16 June – end July 2014  My participation will be 9-11 July 2014, 3 working days + 1 day travel beforehand |
|  | **Type and name of the infrastructure requested**  Infrastructure is being set up by the University of Helsinki for comparison of multiple soil chambers at SMEAR II,Hyytiala, including a large tank containing a known concentration of N2O onto which soil chambers are placed for measurements made by a N2O analyser. |

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| **2.** | **Background** |
| a | **Significance of the research**  This is part of InGOS task 5.2, for QA/QC of chamber flux measurements. Soil chamber measurements are subject to both random and systematic errors. The main sources of these erros are:   * Methods used to estimate the flux; for N2O these have commonly involved sampling gas within a soil chamber at intervals over a fixed time period and analyzing the samples by gas chromatography * The large natural spatial variability of the N2O flux combined with a low spatial distribution of measurements.   If soil chambers of different designs are compared using reproducible conditions and the same gas analyser, then correction factors can be applied in order to compare results and facilitate use of relatively cheap methods to increase the spatial coverage of measurements. |
| b | **Previous research relevant to the topic and how the proposed project links to this**  Similar inter-comparison projects have taken place for soil flux measurements of CO2 (Pumpanen et al, 2004) and CH4 (Christiansen et al, 2011 and Pihlatie et al, 2013)). This project uses the same principles of measurement from known gas concentrations and the same tank set up. |
| c | **Links with current research of the applicant**  The applicant is measuring NO and N2O fluxes from soils in an oak forest in the UK and using the data to validate a version of the DNDC process-based model, LandscapeDNDC (Haas et al, 2013) and compare its simulated daily flux values with those measured. The applicant is using the method of gas sampling followed by GC analysis described above (in 2a) and would like to be able to compare these data, collected in an oak forest over 12 months, with data collected from other types of forests and other parts of the world. |

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| **3.**  **a** | **Objectives**  **Hypothesis and research objectives**  The main objective of this campaign is to compare different soil chamber designs and N2O measurement methods using known concentrations of N2O so as to produce calibration factors to compare results from the various techniques. The best method for calculating flux from the concentrations will also be established. In addition, chambers will be subjected to leak tests. |
| **b** | **Connection with the InGOS objectives and the ‘fitness’ of the use of the requested infrastructure to the objectives**  The soil N2O chamber inter-comparison campaign in Hyytiälä, Finland, in 2014 is part of InGOS activities to standardise measurements of non-CO2 greenhouse gases. The specific task is Task 5.2, QA/QC chamber flux measurements. |

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| **4.** | **Methods and materials (legal and ethical issues)**  Some 20 chambers will be tested individually or in small groups where their size allows, placed over a calibration tank containing a known concentration of N2O.  Reference fluxes from the calibration tank will be calculated and measured independently to test emission into the chambers from a layer of sand placed over the tank. The final concentrations will be determined using the same continuous laser analyser (Los Gatos instrument) for all chambers. The applicant will also take gas samples for analysing with the same gas chromatograph used for her UK-based research for comparison and calibration purposes.  As well as changing soil chambers, a range of N2O concentrations will be used, together with different sand depths and external wind conditions (using fans inside the warehouse).  University of Helsinki will provide the bulk of materials and instrumentation at Hyytiala. The applicant will bring 2 soil chambers and frames to connect them to the sand, which are the property of Forest Research in the UK. These both have the same dimensions (40x40x25cm) but have different methods of forming a seal with the frame placed in the soil. |

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| **5.**  **a** | **Implementaton: timetable, budget, distribution of work**  **Timetable for the research including personnel efforts, favorably table wise**  The applicant will travel to Hyytiala on 8 July and leave on 11 July.  Two soil chambers will be delivered independently.  The applicant will test these chambers as part of the inter-comparison campaign and take gas samples away for analysis at Forest Research where analyses are carried out for her own research. |
| **B** | **Total budget for travel and logistical support as requested**  Flights are being funded by a grant from the University of London  Additional travel by train from Helsinki to Orivesi and bus to Hyytiala will be required.  The applicant will require accommodation and subsistence at Hyytiala for the duration of her stay. Cost of shipping chambers will be met by University of London grant.  Budget requested:  Train Helsinki-Orivesi return (flexible) 120 Euros  Accommodation and subsistence (@60Euros/day) 3 days 180  Total: **300 Euros** |
| **c** | **Plan for specific logistical needs like visa, import/export licenses etc**.  None anticipated |

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| **6.**  **a** | **Expected results and possible risks**  **Expected scientific impact of the research**  The soil N2O chamber inter-comparison campaign will provide recommendations for soil chamber design, sampling procedures, and flux calculation methods, which will contribute to improved soil chamber measurements in the future. |
| **c** | **Publication plan**  One joint peer-reviewed publication with results of the inter-comparison campaign is expected to be published. |
| **d** | **Data access plan**  Results of the inter-comparison campaign will be submitted to the InGOS database of  specific measurements. |

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| **7.**  **a** | **Key literature**  **List of references used in the working plan**  Christiansen J R, Korhonen JFJ, Juszczak R, Giebels, M, Pihlatie M (2011) Assessing the effects of chamber placement, manual sampling and headspace mixing on CH4 fluxes in a laboratory experiment. Plant and Soil 343: 171-185.  Haas E, Klatt S, Frohlich A, Kraft P, Werner C, Kiese R, Grote R, Breuer L, Butterbach-Bahl K. (2012) LandscapeDNDC: a process model for simulation of biosphere-atmosphere-hydrosphere exchange processes at site and landscape scale. Landscape Ecol. (doi:10.1007/s10980-012-9772-x)  Pihlatie M K, Christiansen J R, Aaltonen H, Korhonen JFJ, Nordbo A, Rasilo T, Benanti G, Giebels M, Helmy M, Sheehy J, Jones S, Juszczak R, Klefoth R, Lobo-do-Vale R, Rosa AP, Schreiber P, Serca D, Vicca S, Wolf B, Pumpanen J (2013) Comparison of static chambers to measure CH4 emissions from soils. Agricultural and Forest Meteorology 171: 124-136.  Pumpanen J, Kolari P, Ilvesniemi H, Minkkinen K, Vesala T, Niinisto S, Lohila A, Larmola T, Morero M, Pihlatie M, Janssens I, Yuste JC, Grunzweig JM, Reth S, Subke JA, Savage K, Kutsch W, Ostreng G, Ziegler W, Anthoni P, LindrothA, Hari P (2004) Comparison of different chamber techniques for measuring soil CO2 efflux. Agricultural and Forest Meteorology 123: 159-176. |