INDO SWISS JOINT RESEARCH PROGRAMME (ISJRP)

RESEARCH FELLOWSHIPS

EXCHANGE GRANT REPORT

Grant No.: RF08

Part 1 - General Information

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>Black carbon analysis of Indian and Swiss soils to facilitate the interpretation of their PAH content (BLISS)</th>
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<tr>
<td>Keywords:</td>
<td>Black carbon, soot, polycyclic aromatic hydrocarbons, soil, source apportionment, chemothermal oxidation, CTO-375</td>
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<td>Start date:</td>
<td>July 1, 2009</td>
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<td>Duration:</td>
<td>12 months</td>
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Part 2 - Exchange Participant(s) Details

VISITING SCIENTIST

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HOSTING SCIENTIST

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Part 3 - Scientific & Technical Information

3.1 Purpose of visit

Black Carbon (BC) is the highly condensed carbonaceous byproduct of incomplete combustion of fossil fuels and biomass. It plays an important role in the global carbon cycle and carbon sequestration in soils. Moreover, it is a strong sorbent to many persistent organic contaminants, including polycyclic aromatic hydrocarbons (PAHs) and controls their fate and ecotoxicological risk in soil and sediments. BC is best understood as a continuum of combustion byproducts that makes it’s measurement in the environment challenging. The chemo-thermal oxidation method at 375°C (CTO-375; Gustafsson et al. 1997 ES&T, 31, 203-209) is one of the most commonly used techniques to quantify BC in environmental samples.

The purpose of the visit can be summarized in following points: 1) to learn the CTO-375 method, 2) to test the applicability of the CTO-375 method to soils, 3) to apply it to a unique set of samples from India and Switzerland, 4) to interpret the gathered BC data in a holistic manner, and 4) to publish the results in a peer-reviewed journal.

3.2 Short description of work carried out during the visit

The CTO-375 method has been widely used to quantify BC in sediments. In the present project, CTO-375 was tested and adapted for application to soil, accounting for some matrix specific properties. Standard addition experiments were performed to examine the efficiency of CTO-375 method and potential matrix effects. The adapted method was applied for BC quantification in a well-defined set of soil samples from Swiss soil monitoring network (NABO) and India earlier analyzed for PAHs and total organic carbon (TOC). The generated data was used to explain the distribution of PAHs in the respective soils.

3.3 Outcomes

BLISS revealed that the CTO-375 method is a robust method for BC quantification not only in sediments, but in soils as well. PAH distribution was better explained by BC in urban soils. In addition, it provided a deeper understanding about the relationship between PAH, molecular markers, BC, and TOC in soil systems. For more detailed results, we refer to the manuscripts mentioned below. These are available from both authors.

3.4 Future collaboration with host institution

Future collaboration is envisaged in various fields of research, e.g., fate and behavior of natural toxins in the environment, soil and sediment remediation, BC analysis to better understand pollutant exposure situations. The visiting fellow intends to write a research proposal in collaboration with the host institution to make this exchange more fruitful in long term.
3.5 Various comments

The project funded by ISJRP was successfully completed within time. My visit to ART was highly productive, scientifically successful and socially pleasant. I would like to take this opportunity to acknowledge Dr. Thomas Bucheli, whose wide knowledge, experience and logical way of thinking has been of great value for me. His guidance and encouraging behaviour has enhanced my level of confidence. I extend my sincere thanks to all the lab members for providing a good working environment and to make my stay pleasant and successful. At last, I would like to acknowledge and thank the ISJRP to provide me this very useful platform. Due to this platform, I got the opportunity to work in a scientifically excellent laboratory. Dr. Barbara Baumann is acknowledged for her pragmatic and helpful administrative support for the successful completion of the BLISS.

3.6 Projected publications/articles resulting or to result from the exchange

Conference contributions:


Research articles submitted to peer reviewed international journals: