



Job Description

Post: Research Associate (HypEx), ID 71760
Department: UCL Australia
Salary: \$64,978 to \$79,917 pa, plus 17% superannuation
Term: (Initial funding is for 18 months).
Grade: Grade 7
Reporting to: Professor Jan-Peter Muller (UCL-MSSL, UK) and
Ady James, MSSL Australia (UCL-A)
Role: Research

Responsible for: To set-up an optics laboratory in order to develop an optical prototype and field-deployable very high spectral resolution **imaging** instrument to detect and map Methane (CH₄) seeps. To assess the potential of existing technology to **image** isotopologues of C¹²/C¹³; to determine the contribution of the detected CH₄ from biogenic (flora and fauna) or abiogenic (geological, resource production or fugitive emission) sources.

Location: UCL Australia, Adelaide.

(A) Main duties and responsibilities

The Research Associate will work as part of a new activity at UCL-A concerned with the development of instrumentation and data reduction techniques for mapping and monitoring of Greenhouse Gas (GHG) emissions from natural and anthropogenic activities, particularly concerned with methane emissions. Unconventional gas may become a very significant part of Australia's economy and there is a need both to explore new sources as well as ensure that sensible practices are monitored regarding potential fugitive emissions. The role of wetland ecology and ruminant farming in Australia is also important to determine in the context of future Carbon trading.

Main purpose of the job:

Australia is currently engaged in a significant debate over the future of its gas resources, their availability and how they may be best used to benefit the country. A key question in this debate is about shale gas and whether Australia can (or in fact wants to) have the sort of 'shale gas revolution' which has occurred in the United States in recent years. Existing methane gas sniffer technology is limited to ocean-based applications or short ranges of a few km from vehicles based on land. There is a need to explore hyperspectral imaging and mapping of methane for exploring new gas resources over land. As and when the shale gas industry may develop commercial

exploitation, there is a need to monitor methane gas emissions to ensure that the operation of gas extractions fits into the “golden rules for the golden age of gas”, in particular related to measurement of possible leaks, elimination of venting and minimisation of flaring in order to achieve the highest possible environmental performance at the lowest cost.¹

This 18-month research project, will build upon previous work, which assessed the potential of space satellite instrumentation to monitor existing known seeps. The starting-point will be an assessment of the best wavelength region to employ in the SWIR for both initial imaging and eventual isotopologue mapping including horizon scanning of newly developed technologies, especially related to SWIR sensor cores, AOTFs and Etalons. A new laboratory will be established in the premises for optical measurement and construction of different laboratory instrument prototypes including small gas cells for validating the measurement capabilities. In the final part of the project, the laboratory prototype will be miniaturised to build a field deployable instrument, which will be tested on known seeps from fixed tower measurements.

Main duties and responsibilities

1. Assess the potential of measuring abiogenic and biogenic methane seeps from existing space and ground instrumentation, including isotopologues and specify the requirements for a field deployable and an airborne instrument based on this potential.
2. Assess, in collaboration with current and future planned missions, the best SWIR wavelength region to employ and specify the requirements for such imaging instruments.
3. Set-up an optics laboratory to build, calibrate and validate methane retrievals from the planned instrument.
4. Build a bench-based laboratory system for measuring methane concentrations at the level expected, based on satellite and in situ measurements.
5. Build a field-deployable system and test from a fixed tower site at suitable installations. Determine the requirements for a future airborne instrument and whether isotopologue measurements are feasible in the future.
6. Other duties include outreach and promotion of UCL-A/MSSL reporting to the Executive Director

This project may be supported by a parallel project conducted by a future student of UCL Australia's MSc in Energy and Resources or a possible PhD student. Hence, the successful applicant will be expected to provide partial supervision to such a project.

MSSL is a multi-disciplinary laboratory, with a long track record in the design, build, operation and exploitation of EO, space and astrophysics instrumentation. Further information about MSSL in general can be found at <http://www.ucl.ac.uk/mssl>

As the project proceeds, the job description may be reviewed and amended in consultation with the investigators.

(B) Person Specification

Knowledge

Essential: Experience in the development of hyperspectral imaging, instrument radiometric and geometric calibration. The writing of scientific articles in high impact journals.

- (i) Fluency in more than one of C, C++, Java, Python; (ii) strong knowledge of LabView; (iii) strong scripting and data analysis skills (ideally in IDL or MatLab or Python); (iv) use of computers for software development and as a data processing, handling and research tool; (v) knowledge of Red Hat Enterprise or equivalent linux OS; (vi) Experience & expertise in the areas of image analysis and vicarious

¹ http://www.worldenergyoutlook.org/media/weowebiste/2012/goldenrules/WEO2012_GoldenRulesReport.pdf

radiometric calibration; (vii) proven record of ability to conduct original research, as evidenced by the generation of one or more refereed publications in high quality journals; (viii) Good inter-personal and organisational skills including meticulous documentation of processes and procedures; (ix) A key visual and aesthetic sense to demonstrate complex scientific concepts to peers and the general public.

Desirable: Experience in the design of field-deployable imaging systems and in laboratory testing and calibration of hyperspectral instruments.

Qualifications

Essential: A PhD degree in physics, remote sensing, imaging, engineering or other relevant scientific field.

Skills

Essential: Understanding of complex physical and engineering concepts; willingness and demonstrated ability to work co-operatively within a team.
Ability to conduct high quality research to challenging deadlines.
Ability to think creatively and integrate knowledge from different disciplines.
Ability to present results clearly and accurately, both verbally and in writing.
Ability to use his or her own initiative.
Excellent interpersonal, oral and written communication skills.

Desirable: Experience with supervising student research projects.

Personal qualities

Essential: Commitment to high quality academic research

Commitment to UCL's policy for equal opportunities

Desirable: Commitment to knowledge transfer and making a difference to energy security and global carbon emissions via research and education.

(C) Application procedure

To apply please submit:

- a personal covering letter detailing why you feel you are the best person for our job and demonstrating how you meet the criteria for the position;
- a brief CV which summaries your academic record; and an appendix to this CV which provides a detailed background of your publishing record and other academic achievements;
- The names, telephone numbers and email addresses of three referees and their relationship to you.

You must provide sufficient information in your application to enable the selection panel to make an informed assessment of your suitability for this role at short-listing.

Enquiries, in the first instance, should be submitted by email to Professor Jan-Peter Muller, j.muller@ucl.ac.uk.

Applications should be submitted by email to Michaela Mocikova, m.mocikova@ucl.ac.uk.

Closing date for applications: 31 August 2013, 5pm (London time; GMT)