

Training Course on Remote Sensing for Assessing Glacier Dynamics

PROSPECTUS

<u>Project Number &</u> <u>Title:</u>	INT/5/153 - Assessing the Impact of Climate Change and its Effects on Soil and Water Resources on Polar and Mountainous Regions
<u>Place:</u>	Rio de Janeiro, Brazil
Dates:	4 – 8 April 2016
<u>Deadline for</u> <u>Nominations:</u>	13 February 2016
<u>Organizers:</u>	The International Atomic Energy Agency (IAEA) in cooperation with the Government of Brazil through the Rio de Janeiro State University and the National Institute of Science and Technology of the Cryosphere
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<u>Language</u>	The course will be conducted in English
<u>Background:</u>	Investigations carried out in the soils at the foot of retreating glaciers may provide vital clues as to what the future holds for farmers in high mountainous regions across the world. Examining the impacts of climate change in benchmark sites of the project can be particularly useful for a better understanding of the future impacts of climate change on landscape dynamics (including land degradation and resulting changes in land, water and ecosystem quality) in mountainous regions across the world. For instance, increasing soil temperatures results in continuously or seasonally frozen soils releasing more greenhouse gases into the atmosphere, but the magnitude of this effect remains highly uncertain. A recent publication in

Nature (Schuur et al., 2011) suggests that release will be faster than previously estimated, and at levels that are cause for serious concern. Increasing temperatures also make farming communities shift to higher altitudes, often in more fragile ecosystems, leading to severe land degradation and undermining food security. In addition, the United Nations Environment Programme (UNEP) reports indicate the need for getting better access to existing data, better knowledge of the data quality and the generation of new data in a manner that allows data sharing among researchers. The results of climate change impact assessments will enable the modelling of future trends and the effects of climate change which otherwise is difficult to acquire in a short period of time. This information will provide the basis for assisting upland farming communities and interregional policy-makers in the adaptation and mitigation of the impacts of climate change through improved soil and water management and conservation measures. In particular, communities of mountain ranges in Africa, Asia, Europe, and Northern and Southern America (e.g. Alps, Caucasus, Hengduan, Himalaya, Andes, Tibetan Plateau, Rocky Mountains, Sierra Nevada, Cascades, Alaska, Tien-Shan, mt Kilimanjaro and Pamir) will benefit from this information.

Purpose: The course aims to provide basic knowledge and skills on the different kinds of remote sensing techniques to assess the impact of modern climate change on glacier retreat and dynamics in fragile polar and altitude regions geographically distributed within the interest of the project. These skills will help complement the use of nuclear techniques for better understanding of climate change impacts on soil and water resources. For instance, glacier dynamics (i.e. retreat) are at the origin of changed sediment redistribution patterns which are measured in the project by the use of fallout radionuclides.

The two-week technical training course consists of lectures and exercises with respect to geo-referencing, geo-processing and satellite image classification of glacier fronts, dry snow and wet snow and identification of the equilibrium line. It Discussions and digital image processing will focus on:

i) Glacier response to modern climate changes at fragile polar and high mountain regions (front glacier retreat per decade and compose historical information on retreat);

ii) Image processing strategies to support glacier monitoring at benchmark sites of special interest of the project, such as variability of the equilibrium line altitude, download and processing of digital elevation model and possibly the use of a surface melting model. The workshop will be divided in 2 parts:

PART 1 :

Make use of FREE available satellite images (LANDSAT 4, 5, 7, 8, SRTM, and, possibly, ASTER GDEM) and use a FREE software for digital image processing, the Q-Giss (Quantum-Giss). More details are found at http://earthexplorer.usgs.gov/ (for the images galleries) and http://www2.qgis.org/en/site/ for the software (with a registration). Prior to and during the course, participants may download the software and work with the images of their related benchmark site of interest under the supervision of tutors. The basic idea is the sustainability of the program to promote the dissemination of a FREE and easy-handling monitoring program of glaciers employing simple computational tools.

The main image / GIS data processing techniques that will be taught will include:

- 1. satellite images, DEM and other GIS data geo-referencing
- 2. image processing and enhancement methods
- 3. basic techniques for terrain analysis based on DEM
- 4. image classification method(s) for glacier detection
- 5. methods for determining ELA
- 6. construction of glacier database as a composition of available historical information for tracking glacier changes
- 7. basic techniques for DEM comparison and analysis of glacier volume change

PART 2 (specific topics) :

- a) Snow cover dynamics employing AVHRR and MODIS data;
- b) Glacier surface elevation from KH9 (1970s to 1980s), ALOS PRISM (late 2000s and after) and SPOT 5;
- c) Orthorectification and accurate generating DEM (provided in-situ dGPS data for GCPs);
- d) Use of ERDAS IMAGINE LPS for both of KH9 and ALOS PRISM (ref.: Surazakov and Aizen, 2010);
- e) Use of DEM data source (e.g.: WoldDEM from Tandem-X project).
- f) Learn how to use a glacier and snow melting model, assimilating climate data and mass balance measured data);
- g) Adding contents about ice flow velocity tracking.
- **Expected outputs:** Counterparts having the capacity for processing glacier image galleries interpret their dynamics and correlate with environmental and climatological databases.
- Participation:The course will be open to maximum of 20 junior scientists with strong
background in remote sensing and who will be working directly on the following
Benchmark Sites: Cordillera Blanca, Hengduan Mountain, Elbrus, Intersalar,
Patagonia, Kilimanjaro Mountain, Vakhsh, and Inylcheck.
- **<u>Participants'</u>** The participants should have academic background equivalent to a Bachelor's degree in Earth Science with remote sensing application such as geography, geology, cartography engineering, agriculture science, geophysics, computational science and equivalents. Knowledge of any "GISS-Software" is an advantage.

The participants must be directly involved in their national programme connected with climate changes, soil sciences, ecology and glaciological science as well as be involved directly in the INT/5/153 project activities.

Furthermore, participants must be proficient in English with good listening comprehension and communication skills. It is expected that the participants will have responsibilities for introducing and applying the techniques acquired from the workshop to their respective home institutes participating in the project INT5153.

Each participant should bring their own laptop, download the software and work with the images of their related benchmark site of interest under the supervision of experts.

<u>Nomination</u> <u>Procedure:</u>	Nominations should be submitted on the standard IAEA Nomination Form for Training Courses (available on the IAEA website: http://www.iaea.org/). Completed forms should be endorsed by relevant national authorities and returned to the Agency through the official channels, i.e. the designated National Liaison Office for IAEA Matters.
	It is strongly recommended that nominees register through the In-touch system using the following link: <u>http://intouch.iaea.org/</u> . Once linked to the homepage, they are advised to choose the first box "Register" as follows:
	1. "Register": Register to receive your user ID and password (help is available at: http://intouch.iaea.org/Portals/0/Help/How_to_sign_up.pdf
	2. "Profile": Complete your profile on InTouch (help is available at: http://intouch.iaea.org/Portals/0/Help/Profile_Help.pdf
	3. "Apply": Apply as a candidate for a meeting (help is available at: http://intouch.iaea.org/Portals/0/Help/InTouch%20Help%20%20Meeting %20Course%20Nomination.pdf
	Help for each step can be found under the "Help" tab at the top of the web page.
	Requests received after the deadline of <u>13 February 2016</u> will not be considered. Only applications submitted through the National Liaison Officer of your country will be accepted. Please indicate clearly the following reference: C7-INT/5/153- 003.
	Advance nominations through facsimile (+43-1-26007), or e-mail (official@iaea.org) are welcome. The facsimile/e-mail should contain the following basic information about the candidate: name, date of birth, academic qualifications, and current position including the exact nature of the duties carried out, proficiency in English and full contact address including telephone/ email/ facsimile numbers.
<u>Security in the</u> <u>Field:</u>	It is recommended that meeting participants complete the courses <i>Basic Security</i> <i>in the Field: Safety, Health and Welfare (BSITF) and Advanced Security in the</i> <i>Field (ASITF)</i> , prior to travelling to locations where UN security phases are in effect. The aim of these courses is to educate participants on how best to avoid or minimize potential dangers and threats, and to show what individuals can do if they find themselves in insecure situations.
	The courses are available on the following UN websites by using Microsoft Internet Explorer:
	• BSITF: <u>http://dss.un.org/BSITF/</u>
	• ASITF: <u>http://dss.un.org/ASITF/</u>
	If you have difficulty using the websites, a CD-ROM can be obtained from your IAEA National Liaison Officer, or from IAEA.
	Once the candidate has completed the courses and passed the accompanying

exams, certificates will be generated automatically and must be printed for submission to the IAEA (either as an e-mail attachment or by fax). Copies of the certificates should be kept by the candidate for his/her records, as they are valid for a period of three years.

Administrative and	Nominating Governments will be informed in due course of the names of the
<u>Financial</u>	candidates who have been selected and will, at that time, be given full details of the
Arrangements:	procedures to be followed with regard to administrative and financial matters.

Selected participants from countries eligible to receive technical assistance will be provided with a round trip economy class air ticket from their home countries to Vienna, Austria, and a Daily Subsistence Allowance (DSA) at the prevailing UN Rate. Shipment of accumulated meeting materials to the participants' home countries is not the responsibility of the IAEA.

The organizers of the workshop do not accept liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the workshop, and it is clearly understood that each Government, in nominating participants, undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.