



GLACIAL LAKE HAZARD ASSESSMENT USING REMOTE SENSING AND GIS: NEPAL

Dhulikhel, Nepal Nov 1 – 5th 2018

This workshop on remote sensing and GIS techniques for glacier lake hazard estimates with a focus on Nepal is a joint collaboration between the [‘Himalayan glaciers and risks to local communities’](#) project 672 funded by the International Geoscience Program (IGCP) at UNESCO (2018 – 2022) and the ‘Debris-cover on glaciers (DISCOVER GLACIERS) project funded by the European Commission Marie-Curie COFUND scheme (2017 – 2020), both conducted at Aberystwyth University in the UK. Both projects aim at facilitating knowledge and expertise exchange among Asian institutions in Nepal, India and Bhutan and beyond. Using various types of satellite imagery combined with terrain analysis, the DISCOVER GLACIERS project aims at characterizing the surface of debris covered glaciers and its changes over time. Using this knowledge, the IGCP 672/UNESCO project aims at assessing the potential glacier-related risks associated with glacier and climate changes, and at estimating risks to local communities. By combining science with community involvement, these projects aim to understand the socio-economic impacts of glacier hazards. This program is co-organized with the Himalayan Cryosphere, Climate and Disaster Research Center (HiCCDRC) at Kathmandu University (Dr. Rijan Bhakta Kayastha, coordinator and project collaborator) and the Centre for Climate Change and Spatial Information (CCCSI), Sherubtse College, Royal University of Bhutan (Dr. Pankaj Thapa, coordinator and Asian co-leader). The workshop is facilitated by Dr. Adina Racoviteanu, Ser Cymru II Fellow at Aberystwyth University, Department of Geography and Earth Sciences (DGES) (UK), IGCP project leader.

The IGCP/UNESCO project aims at establishing a collection of tutorials developed in ArcGIS/QGIS to allow students and staff to develop basic skills in the use of GIS for hazard monitoring, and to progress towards more advanced image processing techniques. This 5-day workshop is the first in a series aimed at establishing a standardized protocol for glacier lake mapping and glacier-related hazard estimates across the Eastern Himalaya.

Who can attend?

This workshop will focus on Nepal and it open to participants from local universities and institutes. Workshop is free to attend for participants from local institutions. Local stakeholders and interested UNESCO staff are also welcome to attend and participate in discussions.

Hardware/software needed:

- Laptop with GIS software (ArcGIS v 10 or later, with python 2.7 installed). The workshop will be taught in ArcGIS but could be adapted to QGIS if needed. Spatial analyst is needed on all licenses.
- At least 20 GB of free hard disk space

For info, and to confirm your participation, contact instructor at adr18@aber.ac.uk

Background

GIS and remote sensing are emerging as standard tools for terrain mapping, glacier monitoring, glacier risk assessment, land use mapping and change assessment. Large amounts of satellite imagery are increasingly made available at no cost, ranging from coarse multi-spectral imagery (500m) to high-resolution commercial satellite imagery (<1 m). GIS and remote sensing tools are evolving from commercial software to open source and freely available code. This workshop focuses on data availability and techniques for glacier and lake mapping. The workshop is entirely hands-on and is designed to be interactive; the training is conducted in ArcGIS but the tools can be adapted to open source software such as QGIS. Overall the purpose of this first workshop is to compile the existing data (remote sensing and field data) at the regional scale, and review pre-processing steps and existing glacier hazard ranking schemes.

Topics covered

Glacier hazards: an overview with focus on the E Himalaya

- Overview of existing hazard ranking schemes (Nepal, Bhutan, Sikkim)
- Status of glacier mass balance as it pertains to glacier hazards
- Overview of glacial hazard ranking schemes

Fundamentals of GIS and remote sensing

- Introduction to ArcGIS, ArcToolBox, ArcCatalog, python
- Satellite imagery: searching and ordering for data
- Image pre-processing steps
- Introduction to ArcGIS python and loop processing

Glacier mapping

- Glacier and lake delineation from satellite data (multi-temporal)
- Debris-cover mapping techniques
- Decadal change detection from remote sensing

Elevation data processing

- Searching and ordering for DEMs
- DEM pre-processing in ArcGIS python
- Topographic analysis

Climate data

- Searching and ordering climate data
- Downscaling tools
- Developing climate variables for glacier hazard estimates

Socio-economic data sources

- Searching and ingesting socio-economic data (population density, settlements, past hazard events)

Hazard ranking schemes: regional to local scale

- Developing criteria for hazard ranking
- Use of multi-resolution imagery for hazard mapping
- Implementing ranking schemes

Summary and Discussion topics (involving local stakeholders)

- Evaluating state of lake hazard inventories: what are the gaps?
- Progress radar
- Status of glacier hazard field studies
- Communicating results to local stakeholders; involving local communities and harvesting local knowledge about past GLOF events