1. Research activity

In the first year of my research activity, I did a deep bibliographic research on topics related to the research project, that I continuously updated in order to collect all the previous works on specific case studies on landslide damming and on the methodological approaches for analyzing the associated hazards. I got the digital topographic data of 10-m contour intervals from the Survey Department of Iran and generate the digital elevation model (DEM) and I compared to DEM from remote sensing (SRTM DEM) to choose DEM with highest resolution, coverage and accuracy. Processing of DEM was conducted in a geographic information System (GIS) environment. For analysis the natural form of irregularities, surface water direction, hydrological characteristics of surface and 3D landscape visualization, raster images of slope degree, aspect, flow direction, flow accumulation and hill shade were produced from the projected DEMs in GIS using Arc Toolbox tools of the same names, respectively.
I divided the landslide deposit to different zones due to the subjective and objective criteria, the first was based on observational elements including: tone, texture and structure of aerial photos and the second on morphometric and terrain analysis including: density and azimuth of ridge and gullies and blocks larger than 10m.
Remotely sensed imagery has commonly been used for assessment of gigantic landslides. I got Large-scale (1: 20 000) aerial photographs acquired by the National Cartographic Center of Iran cover the landslide debris. I used a mirror stereoscope for manual interpretation of aerial photographs so that I delineated the boundary of the gigantic landslides deposit. Moreover, I recognized the main geomorphological features of the landslide deposit. According to tone, texture and structure of aerial images, and by using Google Earth and GIS, I divided the huge deposit into different zones to be investigated in the field.
In the second semester of the first year by using Google Earth and tools in ArcGIS I measured the max size of huge blocks. Wetlands areas and linear landforms, like gullies and ridges were recognized and digitized in ArcGIS. Remote sensing is not a replacement for field investigations, but rather a technique to expand the types and coverage of data available for investigation of large-scale landscape features.
After remote sensing I went to Iran in order to improve the zonation of the landslide deposit based on observations, direct geological and geo-mechanical survey on landforms. During field survey I verified the presence of landforms that I recognized by remote sensing. Moreover, I confirmed the size of some huge blocks in different regions and I did geo-mechanical survey such as: measuring joint orientation, spacing, roughness and alteration state, on huge blocks involved in landslide deposit and outcrops to evaluate the fracture state of rock mass. In order to understand how different rock formations are distributed on the landslide deposit, I got rock samples from different formations of Kabir-Kuh Mountain to be compared with the blocks surveyed in the landslide deposit. To quantify

the variability of the sedimentological characters of the rock-avalanche deposit I got soil samples from different zones of the landslide deposit for geochemical and grain-size analysis. Analyzing the grain size distribution and material properties of landslide dam helps to predict the hydrogeological behavior and seepage rate inside dam and is important in evaluating its stability and evolution. Also, I got photos from outcrops to determine abundances of all the grain fractions and determining the seepage rate.
Back from the field survey (Iran), in order to refine the landslide dam zonation, for each zone, I calculated the medium density and standard deviation of gullies, ridges and blocks bigger than 10m over the entire body by using Line and Point Density Tool in GIS. Moreover for doing the zonation more precisely and reducing the number of zones I calculated the azimuth of ridges and gully with Linear Direction Tool in GIS.

2. Research products

a) Abstracts

The giant Seymareh Landslide (Zagros Mts., Iran): a lesson for multi-temporal hazard scenario evaluation., Michele Delchiaro[1], Javad Rouhi[1], Marta Della Seta[1], Salvatore Martino[1], Maryam Dehbozorgi[2] , Reza Nozaem[3] , [1]Department of Earth Sciences, Sapienza University of Rome, Rome, Italy; [2]Department of Earth Science, Kharazmi University, Tehran, Iran; [3]School of Geology, College of Science, University of Tehran, Iran. VI Congresso Nazionale AIGA 2018.