Date of Submission	10/29/2020

IPL Project (IPL - 237) Annual Report Form 2020

1 January 2019 to 31 December 2019

1. Project Number (approved year) and Title

IPL-237 (2018) Title "The role of time-dependent rock mass deformations and landscape evolution rates as predisposing factors for massive rock slope failures"

2. Main Project Fields

Targeted Landslides: Mechanisms and Impacts

A. Catastrophic Landslides

3. Name of Project leader

Carlo Esposito. Affiliation: Sapienza University of Rome – CERI Research Centre. Associate Professor. Contact: P.le Aldo Moro 5 – 00185, Rome. Phone: +39 0649924925. Email: carlo.esposito@uniroma1.it Core members of the Project: Names/Affiliations: (4 individuals maximum)

4. Objectives: (5 lines maximum)

The research project, framed within an international agreement between Sapienza University of Rome and Kharazmi University of Teheran, has a two-fold objective: 1) back-analyze by means of a multi-modelling approach some representative case histories to provide hints about the long-term evolution of mass rock creep (MRC) processes, possibly evolving into catastrophic landslides; 2) assess the residual risk conditions in the present morpho-climatic setting, to properly address the forecasting of potential further failures resulting from the evolution of such time-dependent processes.

5. Study Area: (2 lines maximum)

The project will be conducted in the outer Zagros Mountains (Iran), which host the largest massive rock slope failures ever recorded on Earth surface, the Seymareh landslide.

6. Project Duration (1 line maximum)

The estimated duration of the research activity is 36 months

7. Report

1) Progress in the project: (30 lines maximum)

Objectives of the first year of activity were: collection, organization and validation of available data; data base integration (geomorphological and geological surveys); mapping of geomorphic markers and DEM-based Geo-morphometric analyses for assessing erosion/deposition dynamics of slope-to-valley-floor systems), related to some selected case studies. The latter have been selected considering the representativeness of the different evolutionary stages of the Mass Rock Creep (MRC) process, the evidence of geomorphic markers useful for reconstructions and the different types of gravitational deformation. The case studies include: i) the Seymareh rock avalanche; ii) the Loumar deep-seated gravitational deformation; iii) the ongoing lateral spread of Siah-kuh. Tools and methods adopted to reach the proposed goals can be summarized in:

1. detection and analysis of gravity-induced landforms through field and remote data
2. confirmation and quantification of the ground displacement through SAR interferometry
3. reconstruction of starting time of the mass rock creep process through geomorphometry
4. Identification, characterization and dating of geomorphic markers useful to reconstruct the main morpho evolutionary stages

As a result, for the three selected cases it was possible to:

1. Reconstruct the reference geological and kinematic models of the selected cases
2. Refine such models and assess the state of activity of the selected processes
3. Assess the starting time of the mass rock creep process through geomorphometry
4. Reconstruct and constrain the morpho-evolutionary models, which are crucial for the subsequent planned modeling phases.

2) Beneficiaries of Project for Science, Education and/or Society (15 lines maximum)

The methodology tuned in this project could be implemented by the technical/scientific community dealing with geo-hazard (and related risk) to better address hazard zoning and/or land-use planning in mountain environments affected by MRC processes.

3) Results: (15 line maximum, e.g. publications)

DELCHIARO M., DELLA SETA M., & MARTINO S. (2020). Quantification of the predisposing role of tectonics and landscape evolution in the occurrence of massive rock failures: the Loumar

landslide (Zagros Belt, Iran). Journal of Geophysical Research: Earth Surface (under review). https://doi.org/10.1002/essoar.10504320.1

DELCHIARO M., MELE E., DELLA SETA M., MARTINO S., ESPOSITO C., & MAZZANTI P. (2020). Quantitative investigation of a Mass Rock Creep deforming slope through A-Din SAR and geomorphometry. V. Vilímek et al. (eds.), Understanding and Reducing Landslide Disaster Risk, ICL Contribution to Landslide Disaster Risk Reduction, https://doi.org/10.1007/978-3-030-60319-9_18 (in press)

DELCHIARO M., ROUHI J., DELLA SETA M., MARTINO S., NOZAEM R., & DEHBOZORGI M. (2020). The Giant Seymareh Landslide (Zagros Mts., Iran): A Lesson for Evaluating Multi-temporal Hazard Scenarios. In Applied Geology (pp. 209-225). Springer, Cham. https://doi.org/10.1007/978-3-030-43953-8_13

DELCHIARO M., ROUHI J., DELLA SETA M., MARTINO S., DEHBOZORGI M, & NOZAEM R. (2019). Reconstruction of river valley evolution before and after the emplacement of the giant Seymareh rock avalanche (Zagros Mts., Iran). Earth Surface Dynamics, 7(4), 929-947. https://doi.org/10.5194/esurf-7-929-2019

Note:

1) If you will change items 1)-6) from the proposal, please write the revised content in Red.
2) Please fill and submit this form by 30 October 2020 to ICL Network <icl-network@iclhq.org>