Università
Ca'Foscari
Venezia

PROJECT ACRONYM AND TITLE: **SKYNET – Estimating the ice volume of Earth's glaciers via Artificial Intelligence and remote sensing**

FUNDING PROGRAMME: **Horizon Europe**

CALL: **Marie Skłodowska-Curie Postdoctoral Fellowships**

DESCRIPTORS: **Cryosphere, dynamics of snow and ice cover, sea ice, permafrost and ice sheets, earth observations from space/remote sensing, artificial intelligence, intelligent systems, multi agent systems, machine learning, statistical data processing and applications using signal processing (e.g. spee), climatology and climate change**

HOST DEPARTMENT: **Department of Environmental Sciences, Informatics, and Statistics**

SCIENTIFIC RESPONSIBLE: **Carlo Barbante**

FELLOW: **Niccolò Maffezzoli**

FINANCIAL DATA:

Project total costs	Overall funding assigned to UNIVE
€ 288.859,19	**€ 288.859,19**

ABSTRACT:
Estimating the ice volume of Earth's glaciers is a grand challenge of Earth System science. Besides being a critical parameter to model glacier evolution, knowledge of glacier volume is fundamental to quantify global sea level rise and available freshwater resources. Under current global warming glaciers are losing mass, making improved glacier ice volume estimates a top-priority to constrain future climate scenarios. Direct glacier ice volume estimates are limited by difficulty in directly measuring the ice thickness. As a result, estimates rely on models, many of which depend on explicit physical laws but require parameters often poorly constrained. Today, the amount of satellite data is increasing at such a rate that it cannot be efficiently exploited by traditional processing pipelines. At the same time, Artificial Intelligence techniques are becoming increasingly dominant problem-solving techniques. In particular, deep learning models have recently shown the ability to surpass human accuracy in many scientific tasks. The goal of the SKYNET project is to develop an innovative deep learning-based model capable of exploiting the huge amount of available satellite data to improve the current estimates of ice volumes of all Earth's glaciers, from continental alpine glaciers to polar glaciers, including those in the periphery of Greenland and Antarctica. The proposed methodology makes use of state-of-the art image inpainting architectures fed with satellite-based digital elevation models (TanDEM-X,REMA), altimetry (NASA's ICESat-2), gravity and ice surface velocity data to infer subglacial topographies hence ice volumes. Modelled topographies will be constrained towards realistic solutions using glacier ice thickness measurements (GlaThiDa repository) from in-situ and remotely sensed

observations. SKYNET will be jointly developed by two leading institutions in glaciology and remote sensing: the University of Venice and the University of California Irvine.

Planned Start date	Planned End date
01st September 2023	31st August 2026

PARTNERSHIP:

1	Università Ca' Foscari Venezia	Venice (IT)	Coordinator
2	The Regents of the University of California	Oakland (USA)	Partner