

MANUELA PELFINI (*) & GIOVANNI LEONELLI (*)

FIRST RESULTS OF THE PARTICIPATORY APPROACH FOR MONITORING SUPRAGLACIAL VEGETATION IN ITALY

ABSTRACT: PELFINI M. & LEONELLI G., *First results of the participatory approach for monitoring supraglacial vegetation in Italy.*

The relationship between glacier fluctuations and vegetation dynamics makes the vegetation system a precious archive of data not only for studying climatic trends but also for assessing glacier history and recent movements. The increasing supraglacial debris coverage, that is currently affecting many glaciers, offers new habitats for animals and plants, including trees. On this basis, since 2011 the Italian Glaciological Committee has started a participatory project for annually monitoring the Italian supraglacial vegetation in order to record the progressive debris covered glacier surfaces colonization, in relation with glacier location, altitude, aspect. In the first three years of monitoring, the 27 observed glaciers have allowed to add new information for those glaciers where supraglacial vegetation was already known or studied (Miage, Brenva and Belvedere Glaciers) and to detect new glaciers presenting vegetation colonization.

KEY WORDS: Supraglacial vegetation, Debris covered glaciers, Italian Glaciological Committee, European Alps.

RIASSUNTO: PELFINI M. & LEONELLI G., *Primi risultati dell'approccio partecipativo per il monitoraggio della vegetazione epiglaciale in Italia.*

Fluttuazioni glaciali e dinamica della vegetazione presentano legami molto stretti tanto che i sistemi vegetazionali costituiscono un prezioso archivio di dati sia per l'analisi delle variazioni e delle tendenze climatiche, sia per la ricostruzione della storia glaciale e lo studio della dinamica attuale. Il progressivo incremento della copertura detritica epiglaciale che si sta verificando sui ghiacciai alpini, consente la colonizzazione da parte di specie animali e vegetali, inclusa la vegetazione arborea, ove le condizioni lo consentono. Nell'ambito delle attività di monitoraggio del Comitato Glaciologico Italiano, dal 2011 è stata inclusa quella relativa al moni-

toraggio partecipativo della vegetazione epiglaciale, al fine di identificarne le fasi iniziali e la progressiva colonizzazione. Nei primi tre anni di monitoraggio, i 27 ghiacciai analizzati hanno permesso sia di aggiungere nuove informazioni per i ghiacciai per i quali la vegetazione epiglaciale era già nota o studiata (Miage, Brenva, Belvedere), sia di identificare nuovi ghiacciai interessati da colonizzazione da parte della vegetazione.

TERMINI CHIAVE: Vegetazione epiglaciale, Ghiacciai neri, Comitato Glaciologico Italiano, Alpi europee.

INTRODUCTION

Glacier fluctuations and vegetation dynamics are among the most evident responses to climate change in high mountains temperature-limited environments. For example, climate drives with a certain delay (response time) both glacier advancing or retreating phases (Benn & Evans, 2010) and vegetation changes like tree-line shifting (e.g. Nicolis & alii, 2005; Leonelli & alii, 2009a; 2011a; Pennisi, 2013). Within other climate-driven dynamics, the colonization of expanding proglacial areas (ecesis) during warming periods, when glacier shrinkage occurs (McCarthy & Luckman, 1993), is a topic of particular interest for studying the interactions between physical and biological components of the environment. Instead, during cooling periods of the Holocene and the Little Ice Age, glacier advances have destroyed trees and the forests growing in the proglacial areas. The retrieval of logs and wood remnants buried in till or into moraine systems has allowed important reconstruction of the Holocene glacier fluctuations (e.g. Holzhauser & Zumbuhl, 1999; Holzhauser, 2002; Coulthard & alii, 2013).

Overall, the vegetation system represents a precious archive of environmental data not only for studying the climate impacts but also for assessing the glacier history and recent dynamics (e.g. Reyes & alii, 2006; Johnson & Smith, 2012; Leonelli & Pelfini, 2013). Moreover, tree rings may record with annual and seasonal resolution, climatic and environmental information (e.g. Pelfini & alii, 2006; Speer, 2010) and changes in the climatic signal itself (Leonelli &

(*) Dipartimento di Scienze della Terra «A. Desio», via Mangiagalli 34 - 20133 Milano, Italy; manuela.pelfini@unimi.it

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