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Plant diversity and annual layer counting based on pollen analyses of an Adamello Glacier ice core

Daniela Festi (1), Valter Maggi (2), Cristiano Vernesi (3), Antonella Cristofori (3), Stefan Zerbe (4), Camilla Wellstein (4), and Klaus Oeggl (1)

(1) Institute of Botany, University of Innsbruck, Innsbruck, Austria (daniela.festi@uibk.ac.at), (2) Earth and Environmental Sciences, Universitá Milano Bicocca, Milano, Italy, (3) Dept. of Biodiversity and Molecular ecology, Fondazione Edmund Mach, San Michele all'Adige, Italy, (4) Faculty of Science and Technology, Free University of Bolzano-Bozen, Bolzano, Italy

The Adamello glacier is the most extent (16,3 km^2) and deepest (270 m) glacier of the Southern European Alps. It is located in northern Italy at about 3100 m asl and it is considered a temperate glacier. Our study is part of the project CALICE - Calibrating biodiversity in glacier ice, which focuses on the Adamello Glacier as a biological paleo-archive and uses pollen grains and environmental DNA (eDNA) as main proxies to reconstruct changes in biodiversity. In this contribution, we present the first results of pollen analyses obtained from the deepest layers of a 46 m ice core extracted from Pian di Neve, where the glacier reaches its maximum depth.
First estimates of plant diversity, based on the pollen types found in the ice, reflect different natural and anthropic vegetation types, some located close to the glacier and others situated 100 or more km apart from the coring site. Pollen types of plants characterizing the high altitude above the timberline (Alnus viridis, Ericaceae, Poaceae) and the alpine forest (Pinus sp., Larix decidua, Picea sp., Betula sp., Corylus sp.) are found, as well as pollen grains of plants growing in the lower altitude (Quercus sp. Ostrya sp., Fagus sylvatica). Pollen of cultivated crops (Zea mais and other cereals) and trees (Olea europea, Castanea sativa) are also recorded. Furthermore, exotic pollen types like Eucalyptus have been found, testifying their transport from very long distance. The palynological diversity data will be complemented with eDNA results obtained from the ice in order to provide a more complete floristic list which will be correlated with biodiversity estimates observed on the field and from historical archives. This will allow verifying the potential of glaciers as archives to reconstruct past biodiversity changes on different spatial scales. Cryopalynology has also been proven to be a valid tool to detect seasonality in ice cores. Pollen is in fact released by plants in seasonal cycles and it is deposited on the glacier shortly after release. It is therefore possible to infer the time of snow deposition according to the pollen content of a glacier sample. In this respect, results of pollen analyses indicate that at 46 m of depth annual layers are preserved in the glacier despite its thermic state.