ABSTRACT

CLIMATE TREND IN WINTER 2013-2014
The exceptional climate anomalies in North-Central Italy

by ArCIS working group

Exceptional precipitation amounts and mild temperatures: these are the main characteristics of the winter season 2013-'14, making it one of the most anomalous winters of the last 60 years over North-Central Italy. The heavy snowfalls on the Alps, in many cases even exceeding the already exceptional snow amounts observed in 1950-'51, caused several problems and damages to buildings and infrastructures.

The ArCIS working group presents a detailed description of the climatic anomalies observed using the meteo-climatic monitoring networks of the Regional Meteorological Services of North-Central Italy.

WINTER SEASON 2013-2014
Snowfalls and avalanches in the Alps

M. Valt, P. Cianfarra

In central and eastern Alps, the winter season 2013-2014 recorded the heaviest snowfalls since 1930, only preceded by winter 1951. From late December to mid-February, a long series of perturbations reached their highest in the first ten days of February, when in many alpine areas the avalanche hazard rating was 5 – very high - for several days. Average winter temperatures were mild, resulting in a higher rain/snow limit and exceptional snow accumulations, mainly over 1,600 of height.

The most frequently used avalanche hazard rating in avalanche bulletins was 2 – moderate, but there were also long periods with avalanche rating 3 - considerable, and with ratings 4 and 5 – high and very high. The most intense avalanche events were generally recorded from mid-December to late April.

SNOWFALLS AND AVALANCHES
Significant events and problems in the winter season 2013-2014

by AINEVA Avalanche Services

Winter 2013-2014 was characterised by exceptional climate trends, with a succession of particularly heavy snowfalls, especially over central-eastern Alps, that resulted in several significant spontaneous avalanches that also affected infrastructures and buildings. A snowy winter was also recorded in the western Alps, even though not being an exceptional one. Scarce snowfalls were recorded in the Marche Apennines, with no significant avalanche events.

This article presents the most interesting snow and weather events of the winter season recorded in the several Autonomous Regions and Provinces that work with AINEVA, and the main consequences these events had on territory. The reports, drawn up by the various regional avalanche services, are not certainly exhaustive in describing the winter season trend at local level, being rather targeted reports that aim at emphasizing the most prominent problems that have occurred in the various areas considered and that had major effects on economic-production activities and the civil defence system. The article also describes some particularly interesting phenomena that characterised the last winter season, such as glazed frost, glide avalanches, coloured snow, etc.

AVALANCHE ACCIDENTS
Overview of avalanche accidents in Italy in the 2013-2014 season

S. Pivot

Though figures are still partial, a first evaluation of the avalanche accidents taking place in Italy in the 2013-2014 winter season is presented in this article. About 62% of accidents took place in December and January, mostly on north facing slopes (42%).

As usual, the most concerned category was ski mountaineering (42% of all accidents). Avalanche fatalities were 22, a figure exceeding the thirty-year average (19).

A figure that makes us reflect is that 36% of avalanche fatalities were not equipped with an avalanche transceiver. Most of victims were recorded in central-western Alps (73%). The last winter season emphasized two particular issues associated with accidents: the first is the interaction among independent groups that follow the same routes, the latter is the number of fatal accidents that involved minors.

FORNI GLACIER EVOLUTION
A possible evolution of the largest Italian valley glacier through one-dimensional model-based approaches

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The dynamics of Forni Glacier, in the Ortles-Cevedale group, Alta Valtellina, has been simulated through a one-dimensional time-dependent flow model that measures ice thickness variations with time considering glacier flow, which is responsible for the mass movement from upstream to downstream, and mass balance. Studying phenomena underlying glacier dynamics is fundamental to analyse the evolution of an important share of freshwater supplies on earth. The model reproduces the glacier evolution corresponding to a central flow line through a simulation of geometrical variations of longitudinal profile and front location. A simplified mass balance module based on the equilibrium-line (ELA) position and associated with a balance gradient that relates mass balance variation with height was first implemented. Afterward, in order to provide the model with a more solid physical base, a second balance module based on the use of degree days associated with ice and snow was introduced.

Last but not least, the glacier response to several future precipitation and temperature scenarios has been simulated through the use of simulations provided by GCMs. It is thus possible to observe the possible future evolution stages of the glacier from the viewpoint of ice thicknesses and in relation with the front end changes, therefore providing a useful knowledge base for future decisions in terms of protection and management of this resource.