



## Estimation of the influence of climate change on snow load on structures

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### Abstract

The aim of the present study is to set up a general procedure to predict future trends in snow loading on structures, taking into account the impacts of climate change according different emissions' scenarios, modelled at a global scale. The procedure is validated against high quality data series collected for at least 50 years at weather stations in Italy, well representative of the Mediterranean climatic features. In a second phase of the study, the procedure will be extended to all European climatic regions in view of the next revision of Eurocodes.

**Keywords:** Climate Change, Climate Models, Snow Loads, Extremes, Structures, Reliability.

### 1 Introduction

As structural design is often governed by climatic actions, alterations of climatic actions caused by climate change could significantly impact design of new structures as well as the reliability of existing ones, designed according previous or current codes' provisions.

Starting from the outcomes of different climate models for various CO<sub>2</sub> emissions scenarios, influences of climate change are widely investigated worldwide. Nevertheless, in these studies predictions of climate models cannot be directly applied, as the dimensions of geographical cells used in climate models themselves are generally too large to allow sound estimation of future trends of characteristic values of climatic actions, which require further elaborations.

More precisely, impact of climate change on snow loads have been recently investigated in Germany [1], Norway [2] and Canada [3], mainly focusing to its effect on the reliability of built environment.

The aim of the present study is to set up a general procedure allowing to estimate the influence of

climate change on characteristic values and future trends of ground snow loads to an adequate local geographical resolution, in order to take into account also micro-climate effects due to local orography. The proposed procedure, which combine measured data and models' predictions, is further motivated in view of the evolution of the second generation of Eurocodes, and more in particular of Eurocode EN 1991 - Part 1-3 - Snow loads [4], as requested by the Mandate M/515 of European Commission [5] to CEN (Comité Européen de Normalisation) [6].

#### 1.1 Snow load on structures: State of Art

In the current version of the structural Eurocodes, the definition of snow loads on structures is largely based upon the results of the European Snow Load Research Project (ESLRP) [7] and, in particular, on the European Ground Snow Load Map elaborated within that research, presented in the Annex C to the EN 1991-1-3 [4].

This map, elaborated in the years 1996-1999, is the first ground snow load map derived at European scale according common analytical procedure [7]. It was obtained suitably processing