

IMPLICATION OF CLIMATE CHANGE ON CLIMATIC ACTIONS ON STRUCTURES: THE UPDATE OF CLIMATIC LOAD MAPS

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SUMMARY

Climate change could heavily affect climatic actions on structures. Indeed, the current definition of climatic actions in structural codes, snow wind thermal and icing loads, is based on the assumption of stationary climate conditions but climate is not stationary and the observed accelerated rate of changes must be considered. A proper evaluation of the consequences of climate change requires the set-up of procedures able to deal with the analysis of climate projections and their intrinsic uncertainties. In the paper, a general methodology is illustrated, aiming to evaluate the impact of climate change on structural design. The proposed procedure is based on the definition of factors of change for climate extremes in moving time windows derived from the analysis of an ensemble of climate projections according different greenhouse gas emission scenarios, combined with an innovative weather generator to obtain a probabilistic description of future changes. The definition of a suitable envelope of characteristic values, provide guidance for a better estimation of climatic action in structural codes taking into account their evolution with time.

Keywords: *Climate Change, Climatic Loads, Structural Safety, Structural Codes.*

1. INTRODUCTION

The magnitude of climatic actions, thermal, wind, snow and icing loads that structures shall withstand during their lives, has a significant impact on structural design. Moreover, unexpected changes in the magnitude and frequency of climate extremes may potentially affect the reliability of existing structures and infrastructures designed according to current and past codes [1, 2]. The definition of climatic actions is based on the analysis of past observation assuming that the climate is stationary. Even if Earth's climate has always changed throughout its history, the assumption of stationary climate has been considered acceptable for design criteria of engineering works due to the expected minor changes around the observed climate. However, the current warming trend and its consequences are becoming of particular significance because many of the observed changes are unprecedented over decades to centuries [3]. Climate change may alter the relevant weather extremes making the assumption of stationary climate debatable. Moreover, structures and infrastructures shall withstand climatic loads not only during the design service life, notionally 50 years for buildings and other common structures or 100 years for monumental buildings and bridges, but during their whole life, which could be significantly greater [4]. The challenge to adapt, new and existing structures to climate change implications is thus becoming increasingly relevant [5].

The impact of climate change on climatic actions and the study of its influence on structural design is then a key aspect in the future evolution of standards in order to provide increased resilience of long-life structures and infrastructures to climate change consequences. In the paper, a general methodology to evaluate the impact of climate change on climatic actions is presented. The procedure is based on the analysis of observed data series and high resolution climate projections, which represent our major source of knowledge about future climate, and it is able to provide a probabilistic description of future changes in characteristic load values implementing an innovative weather generator.