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# Stone weathering under Mediterranean semiarid climate in the fortress of Nueva Tabarca island (Spain)

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## Abstract

The Nueva Tabarca fortress constitutes an exceptional example of baroque architectural heritage. However, the aggressiveness of the local environment and the low suitability of the used building stone cause their fast deterioration. The hydro-mechanical properties of the building stones, the characteristics of their porous system (open porosity and pore size distribution), the global climate of the island and the particular microenvironmental conditions of each studied monument explain the weathering process acting on the porous limestone of Nueva Tabarca.

Results reveal that Halite crystallization and wind erosion are the main weathering agents. On the one hand, wind plays a critical weathering action because it controls the salt crystallization process, the abrasion by wind-blown particles, as well as the wind-driven rain impact. Different weathering forms are related to each erosion mechanism. On the other hand, the relative humidity in the island determines the aggressiveness of the halite crystallization process. Salt damage activity was calculated quantifying not only the number of halite crystallization-dissolution transitions, but also the duration of the driest periods.

Finally, a novel parameter (Equivalent Years,  $Y_{eq}$ ) is defined in order to quantify the representativeness of standardized artificial ageing tests.  $Y_{eq}$  expresses the number of years of natural ageing required for achieving the same weathered state of rocks after laboratory procedures. A wide range of  $Y_{eq}$  values are obtained for the studied rocks (from 8 to 165 years), showing a strong dependency with both the exposure time as well as the aggressiveness of the environment.

Key words: porous limestone, calcarenite, halite, aeolian erosion, salt crystallization,

## 1. Introduction

Porous limestones probably constitute the most important stone resource as building material in the architectural heritage of the coastal cities of the southwestern Mediterranean region. Tens of historic sites were built using this type of rock due to their workability, aesthetic appeal and availability. Some representative examples are: the use of Sabucina stone in Sicily

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