

Monitoring of indoor environmental conditions of the Kvernes (Norway) stave church.

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ABSTRACT

The term stave church refers to the way the structure was built up, since staves were used as load-bearing elements. A stave church is a frame construction resting on stone foundations consisting of horizontal and vertical wooden elements co-jointed to the staves placed in the corners. In most cases, they had a rafted roof, while corners and angles joints were strengthened thanks to brackets obtained by the wood from the transition zone between the roots and the trunk, whose fibers are stronger [1]. Norway is the only country that totally still owns 28 medieval stave churches. Two of these have been reconstructed from rediscovered elements, but others have survived *in situ* [1]. They underwent several interventions over centuries aimed to their renovation and modification, making nowadays the understanding of the structure original aspect and of the original material difficult to determine. Therefore the demarcation lines between what can be designated a stave church from a simple wooden church with stave elements is the reformation year in Denmark-Norway (1537). Notwithstanding, 4 main typologies of structures have been identified: i) simple; ii) Møre; iii) centre post; iv) churches with an elevated section in the nave and in the chancel [1].

The proposed study deals with environmental data collected in the Kvernes stave church, belonging to the Møre type. The nave and the chancel belong to the original structure, dated back to ~1300, and it is one of the few cases still maintaining the internal wall painting, realized with a *tempera* technique in 1633 in the nave and in the chancel [2]. Due to its geographical position the Kvernes church is particularly exposed to weather and consequently interventions have been carried out in 2015 (Stave Church Preservation Programme) foreseeing the substitution of small portions of the outer panels, while few years before the internal parts were restored [3]. In the frame of these campaigns, 4 data loggers were installed in the church and the analysis of obtained data is here presented for the first time. In fact, paradoxically, stave churches have been only empirically studied at national level for decades as from the perspective of the directorate of cultural heritage, stave church research is essential, applied research. Therefore, this is the first time that data from monitoring campaigns in stave churches are analyzed and presented at an international scientific community. Issues came from the different heating policy that the directorate of cultural heritage adopted: for the Kvernes church the electric heating systems normally installed in stave churches for their sporadic and intermittent heating during cold seasons was not introduced. Consequently, Kvernes maintains a “natural” microclimate in which variations registered are always referable to change in external climatic conditions, to the performance of liturgical functions and to the presence or absence of visitors.

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