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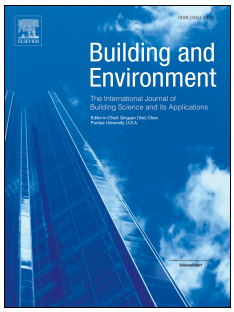

Courtyard microclimate ENVI-met outputs deviation from the experimental data

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Courtyard microclimate ENVI-met outputs deviation from the experimental data

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Abstract: It is necessary to determine if the tools used in the process of building performance calculation accurately reflect the real conditions, with the objective of introducing simulation in the design process of buildings. The aim of this study is the assessment of the effectiveness of the software ENVI-met v4 on the prediction of the thermodynamic performance of courtyards by means of comparing between field data obtained from simultaneous monitoring of three courtyards and the results obtained from the software simulations. The results of the study show a significant difference between monitored and simulated data for air temperature inside the courtyards. And the difference between outdoor temperature and courtyard temperature is too important not to be considered in building efficiency calculations. For that reason, ENVI-met it is not an accurate software to be used in the process of design of this kind of architectural transitional spaces that can be very important in order to design nZEB in some climates.

Keywords: inner courtyards; patio; simulation; ENVI-met; Mediterranean climate.

1. Introduction:

The sustainable development of our society is one of the main challenges we face nowadays. Considering a future of climate change, in which the reduction of the energy consumption will be needed, the research into ways of saving energy is essential. Within the European framework for 2030, sustainable cities and communities is one of the 17 goals of sustainable development. The Directive 2010/31/UE, EPBD, of the European Parliament, relative to the energy performance of buildings, declares that Member States must assure A fulfilment of the Zero Energy Consumption (nZEB) requirements by every new building by 31 December 2020).

There is a necessity of taking advantage of the opportunities to reduce the energy consumption of buildings both in the previous design and in the refurbishing of the existing ones. Geometry and surface properties of buildings generate microclimates, formerly analysed by Ogyay [1], Oke [2] and Givoni [3], which can be the key in the energy development of buildings. In this sense, special attention must be paid to the elements of the building that contribute to passive conditioning, such as courtyards.

The courtyard has been traditionally used in hot climates as an element providing light, ventilation and helps conditioning of the building. Previous research manifests the relationship between geometry, energy performance and the context of the architecture [4,5]. As an element of passive conditioning, the courtyard is especially relevant in the present situation of climate change, accelerated by the high energy consumption we are facing nowadays [6]. It has been proven to be a significant element with a cooling effect on buildings [7–10].

The thermodynamic effects explaining the performance of the courtyard are affected by a variety of factors such as geometry, the presence of vegetation or water, or wind among others [11,12]. All of them have an influence on the temperature distribution inside the courtyard. This