A CFD-based method for Biodeterioration Process Prediction in Historical Libraries and Archives

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This research provides a method, based on Computational Fluid Dynamics (CFD), that allows the prediction of damage-related and biodeterioration processes in materials and human health risks. The suggested method facilitates knowledge of the incidence and correlated effects of indoor air movement, air temperature and humidity distribution over time, in different air volume sub domains and on different surfaces (i.e. wooden shelving units and books, paper collections and incunabula) to fundamental parameters of microorganism growth, i.e. the water activity number and logarithmic growth rate. Comprehensive literature on biodeterioration and health problems associated with building moisture and biological agents was used as scientific evidence for the proposed methodological approach. CFD transient simulations applied to a real case study (the Palatina Libraryin Parma, Italy) suggested the most important means for predicting interior surfaces, building structures, zones and air volumes of persistent dampness and microbial growth adverse for human health prevention and cultural heritage conservation.