



## **Acoustic Emission monitoring of the Cathedral of Palma de Mallorca (Spain)**

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The Cathedral of Palma de Mallorca shows evidences of having being subjected to anomalous stresses, since many fractures and fissures can be observed in the walls. The fractures have been mapped on the front elevation maps of the Cathedral to know their origin and the location of the most damaged zones. Some of them can be attributed to differential ground settlements, to overloading and to strains of the central part of the large windows. But the most important open fractures, some of them with shear displacements, have a seismic origin, due to an earthquake in 1851. In some of these open fractures, some of them reaching more than 1 cm in thickness, 44 plaster witnesses have been located and after 7 months 17 have been broken. The strain (opening and closing) of some open fractures has been monitored with mechanical displacement gauges during the day and strains of more than 250  $\mu\text{m}$  have been measured and have been attributed to the thermal expansion of the walls, since a good correlation between the environmental temperature and the strain has been obtained. The strain was higher in those fractures where the plaster witnesses were broken. The acoustic emission generated between 100-300 kHz has also been monitored in 75 stations near these open fractures. The monitored acoustic emission rate is low and is more important during the day and in the sunnier South façade; at night the monitored acoustic emission is almost null. Its origin can be assigned to the thermal movements of the walls.