## PRESSURE FIELD ON A LOW-RISE BUILDING ROOF SUBMITTED TO WIND ACTION

Hernâni Theias, Greece

Supervisors: J.P.A.J.van Beeck & P. Corieri

The determination of wind action on structures is a major question in civil engineering. Wind effect represents an important load and cannot be omitted in dimensioning.

The wind can lead to global collapse by direct action on the structure but also by the vibrations it induces due to its fluctuating nature.

In the case of low-rise buildings vibration is not an issue, because the body can be considered rigid.

However, low pressures existing over the roof are responsible for different kinds of damage, like trusswall failures, or roof elements removal, and should then be avoided.

This project consists in the numerical study of pressure distributions on roofs for different wind conditions and geometries.



The final aim is to calibrate and validate a numerical approach to solve this problem, by comparison with laboratory data obtained with wind tunnel testing at VKI.

In order to achieve this validation, different grids, numerical schemes and turbulence models (mainly k- $\epsilon$ ) are employed and data compared with experimental measurements.

An analysis of pressure coefficients and velocity field is made.

The project confirms the ability of the k- $\epsilon$  turbulence model to produce reasonable results in an effective way, which means reproducibility of the results and fastness of execution. However the results cannot be considered accurate, as deviations from experimental results often exceed 15%.

This model also solves main patterns of the flow, but shows to be sensitive to mesh improvements. In conclusion, the k- $\epsilon$ ?seems to be appropriate at least for a qualitative analysis of the flow, and for a preliminary quantitative description of the pressure field over the roof that can be useful for preliminary design.