NUMERIC SIMULATION OF THE NATURAL CONVECTION IN A HORTICULTURAL GREENHOUSE HEATED FROM BELOW (BY THE USE OF THE CFD)

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ABSTRACT The analysis of the determinism of the climate under greenhouse confronts us to a very complex system composed of at least three compartments (the culture, the substrate or soil and air) and that exchange between them of the energy, the vapor of water and the CO_2.
The recent progression of greenhouse surfaces in the Mediterranean basin puts in first plan of problem of the air-conditioning that it is necessary to solve to improve the production so much at the level of the output that the quality.

In this work one treats the numeric simulation of the natural convection in the laminar regime in a closed greenhouses (tunnel greenhouse and single span greenhouse) of 25m of length, 6m of width and 3.5m of height, destitute of the plant table setting and heated by soil to a flux of 100W. The walls of single span greenhouse are adiabatic as well as the roof is maintained to a cold temperature of 280°K for the both greenhouses., Conditions of adhesion applied for all the walls of the two greenhouses as well as soil: $u = v = w = 0$ m/s. The model gotten representing the equation of motion associated to an equation of energy is solved, by means of a Computational Fluid Dynamic software (CFD2000) based on the PISO algorithm. Results are represented under the shape of stream lines, isotherms as well as profiles of velocity.

The found results permit the characterization of the general flow of air in the greenhouse. We also showed that for conditions of flux imposed to soil (case of heating by buried tube) the circulation of air is characterized by two cells of recirculation rotating the other way around. Therefore, this study should permit to improve to term the thermal design of greenhouses as well as the positioning of air-conditioning systems.