# DQM SOLUTION OF NATURAL CONVECTION FLOW OF WATER-BASED NANOFLUIDS

**Nagehan Alsoy-Akgün**[1]

[1] *Department of Mathematics*
*Yüzüncü Yıl University, Van, Turkey*

## Abstract

In this study, unsteady natural convection heat transfer of water-based nanofluid in a square cavity with heat source at the left vertical wall is studied by solving the equation of conservation of mass, momentum and energy. Stream function-vorticity form of the governing equations are solved by using the differantial quadrature method (DQM). Vorticity transport and energy equations are transformed to the form of modified Helmholtz equations by discretizing the time derivative terms first. This procedure eliminates the need of another time integration scheme in vorticity transport and energy equations, and has the advantage of using large time increments. The computational results are obtained for Rayleigh number values between $10^3$ and $10^6$, volume fraction of nanoparticals changing from 0 to 0.2 and the length of the heater varying from 0.25 to 1.0. Also, two types of nanoparticals ($Al_2O_3$ and Cu) are tested. The results are show that the type of the nanoparticles and the length of the heat source affect the flow and temperature flow.

**Keywords:** DQM, Natural Convection, Nanofluid

## References

[1] S. Gümgüm, M. Tezer-Sezgin, DRBEM solution of natural convection flow of nanofluids with a heat source, *Engineering Analysis with Boundary Elements* **34** (2010) 727-737.

[2] E. Büyük Öğüt, Natural convection of water-based nanofluids in an inclined enclosure with a heat source, *International Journal of Thermal Sciences*, **48** (2009) 2063-2073.

[3] H. F. Oztop, E. Abu-Nada, Numerical study of natural convection in partially heated rectangular enclosures filled with nanofluids, *International Journal of Heat and Fluid Flow*, **29** (2008) 1326-1336.

[1]First Author's e-mail: nagehanalsoyakgun@yyu.edu.tr