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# The onset of double-diffusive convection in a nanofluid saturated porous layer: Cross-diffusion effects

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**ABSTRACT**

The onset of double-diffusive convection in a horizontal porous layer saturated with a nanofluid with the Soret and Dufour effects is studied using both linear and nonlinear stability analyses in a three-dimensional way. The model used for the nanofluid incorporates the effects of Brownian motion and thermophoresis, and the modified Darcy model is used for the porous medium that includes the time derivative term to describe the momentum transport. The thermal energy equation includes the diffusion and cross-diffusion terms. The linear theory depends on the normal mode technique, and the nonlinear analysis depends on the minimal representation of double Fourier series. The