

**J o u r n a l   o f**  
**P o r o u s M e d i a**

---

---

**Volume 8**

**ISBN 1091-028X**

**2005**



# Contents of Volume 8

## Number 1

Numerical Study of the Effects of Geometric Dimensions on Liquid-Vapor Phase Change and Free Convection in a Rectangular Porous Cavity . . . . .	1
<i>Mustapha Najjari and Sassi Ben Nasrallah</i>	
Numerical Solution of Turbulent Channel Flow Past a Backward-Facing Step with a Porous Insert Using Linear and Nonlinear $k-\epsilon$ Models . . . . .	13
<i>Marcelo Assato, Marcos H. J. Pedras, and Marcelo J. S. de Lemos</i>	
Experimental Study of Non-Fourier Thermal Response in Porous Media . . . . .	31
<i>A. G. Agwu Nnanna, A. Haji-Sheikh, and K. T. Harris</i>	
Effect of Fouling on Stability of Bioconvection of Gyrotactic Microorganisms in a Porous Medium . . . . .	45
<i>A. V. Kuznetsov and A. A. Avramenko</i>	
Natural Convection from a Discrete Heater in a Square Cavity Filled with a Porous Medium . . . . .	55
<i>Nawaf H. Saeid and Ioan Pop</i>	
Laminar Natural Convection Heat and Mass Transfer from a Horizontal Surface in Non-Darcy Porous Media . . . . .	65
<i>V. J. Bansod, P. Singh, and B. V. Rathishkumar</i>	
Uniform Lateral Mass Flux on Natural-Convection Flow over a Vertical Cone Embedded in a Porous Medium Saturated with a Non-Newtonian Fluid . . . . .	73
<i>M. Kumari and S. Jayanthi</i>	
Validity of the Local Thermal Equilibrium Assumption in Natural Convection from a Vertical Plate Embedded in a Porous Medium . . . . .	85
<i>O. M. Haddad, M. A. Al-Nimr, and A. N. Al-Khateeb</i>	

## Number 2

<b>Hot-Wire Method for Measuring Effective Thermal Conductivity of Porous Media . . . . .</b>	<b>97</b>
<i>Latifa Sassi, Foued Mzali, Abdelmajid Jemni, and Sassi Ben Nasrallah</i>	
<b>Theoretical and Experimental Investigation of the Channeling Effect in Fluid Flow through Porous Media . . . . .</b>	<b>115</b>
<i>M. R. Shahnazari and M. Zia Bashar Hagh</i>	
<b>Analytical Solutions and Estimates for Microlevel Flows . . . . .</b>	<b>125</b>
<i>F. G. Avkhadiev and A. R. Kacimov</i>	
<b>Natural Convection in Nonhomogeneous Heat-Generating Media: Comparison of Continuum and Porous-Continuum Models . . . . .</b>	<b>149</b>
<i>A. A. Merrikh, J. L. Lage, and A. A. Mohamad</i>	
<b>Transient Forced Convection in an Isothermal Fluid-Saturated Porous-Medium Layer: Effective Permeability and Boundary Layer Thickness . . . . .</b>	<b>165</b>
<i>António F. Miguel and A. Heitor Reis</i>	
<b>Radon-222 Exhalation Rates from Phosphogypsum-Bearing Embankment Subjected to Constant Temperature and Fixed Activity Concentration . . . . .</b>	<b>175</b>
<i>J. A. Rabi and A. A. Mohamad</i>	
<b>Flow through a Tube with an Annual Porous Medium Layer . . . . .</b>	<b>193</b>
<i>Jacob H. Masliyah, Artin Afacan, and Shijie Liu</i>	
<b>Groundwater Parameter Estimation by Optimization and Dual Reciprocity Finite Differences Method . . . . .</b>	<b>211</b>
<i>Halil Karahan and M. Tamer Ayvaz</i>	
<b>Mixed-Convection Flow Adjacent to a Horizontal Surface in a Porous Medium with Variable Permeability and Surface Heat Flux . . . . .</b>	<b>225</b>
<i>I. A. Hassanien and Gh. M. Omer</i>	
<b>Effect of Variable Permeability and Viscous Dissipation on a Non-Darcy Natural-Convection Regime with Thermal Dispersion . . . . .</b>	<b>237</b>
<i>I. A. Hassanien, F. S. Ibrahim, and Gh. M. Omer</i>	

## Number 3

<b>Phase Flow Experiments in a Geocentrifuge and the Significance of Dynamic Capillary Pressure Effect . . . . .</b>	<b>247</b>
<i>Oubbol Oung, S. Majid Hassanizadeh, and Adam Bezuijen</i>	
<b>Role of Sorption Isotherms in the Analysis of Coupled Heat and Mass Fluxes in Porous Media . . . . .</b>	<b>259</b>
<i>A. Heitor Reis and Rui Rosa</i>	
<b>Effects of the Darcy–Prandtl Number on the Linear Stability of Stationary Convection in Rotating Mushy Layers . . . . .</b>	<b>271</b>
<i>Yeshern Maharaj and Saneshan Govender</i>	
<b>Role of Flow Enhancement Network during Filling of Fibrous Porous Media . . . . .</b>	<b>281</b>
<i>B. Markicevic, D. Litchfield, D. Heider, and S. G. Advani</i>	
<b>Modeling the Loading Stage Coalescence Process in Fibrous Media . . . . .</b>	<b>299</b>
<i>G. Vasudevan, S. I. Hariharan, and G. G. Chase</i>	
<b>Transient Buoyant Convection in a Porous-Medium Enclosure by Sudden Imposition of Gravity . . . . .</b>	<b>311</b>
<i>Ki Hyun Kim, Jae Min Hyun, and Jae Won Kim</i>	
<b>Flow Instabilities in a Horizontal Dendrite Layer Rotating about an Inclined Axis . . . . .</b>	<b>327</b>
<i>D. N. Riahi</i>	

**Number 4**

<b>Transport across Atomic Pores . . . . .</b>	<b>343</b>
<i>M. Kaviany</i>	
<b>Porous Solid Model to Describe Heat-Mass Transfer near Phase Transition Interface in Crystal Growth from Melt Simulations . . . . .</b>	<b>347</b>
<i>V. P. Ginkin</i>	
<b>Coriolis Effect on Flow Stability in Mushy Layers Solidifying in a Microgravity Enviroment . . . . .</b>	<b>355</b>
<i>S. Govender</i>	
<b>Transverse Dispersion in Open-Cellular Metallic Foams . . . . .</b>	<b>365</b>
<i>J. G. Fourie and J. P. Du Plessis</i>	
<b>Computer Simulation of Ordinary Gas Transfer in Tubes . . . . .</b>	<b>379</b>
<i>G. Aryanpour and M.-H. Abbasi</i>	
<b>Thermosolutal Convection in a Ferromagnetic Fluid Saturating a Porous Medium . . . . .</b>	<b>393</b>
<i>Sunil, Divya, and R. C. Sharma</i>	
<b>Effect of the Macroscopic Local Inertial Term on the Non-Newtonian Free-Convection Flow in Channels Filled with Porous Materials . . . . .</b>	<b>409</b>
<i>M. A. Al-Nimr, T. K. Aldoss, and M. M. Abuzaid</i>	
<b>Simultaneous Thermal and Mass Diffusion on Three-Dimensional Mixed Convection Flow through a Porous Medium . . . . .</b>	<b>419</b>
<i>P. K. Sharma</i>	

**Number 5**

<b>Academician Vladimir Nakoryakov . . . . .</b>	<b>429</b>
<b>Application of a Dewatering Model for Fibroporous Media under Constrained Uniaxial Compression . . . . .</b>	<b>431</b>
<i>M. Duan and J. G. Lounghran</i>	
<b>Flow and Heat Transfer in an Inclined Channel Containing Fluid Layer Sandwiched between Two Porous Layers . . . . .</b>	<b>443</b>
<i>M. S. Malashetty, J. C. Umavathi, and J. P. Kumar</i>	
<b>Hydrodynamic Boundary Conditions Effects on Soret-Driven Thermosolutal Convection in a Shallow Porous Enclosure . . . . .</b>	<b>455</b>
<i>M. Bourich, M. Hasnaoui, M. Mamou, and A. Amahmid</i>	
<b>Liquid Flow Analysis in Concentric Annular Heat Pipes Wicks . . . . .</b>	<b>471</b>
<i>A. Nouri-Borujerdi and M. Layeghi</i>	
<b>Combined Forced-Convective and Radiative Heat Transfer in Cylindrical Packed Beds with Constant Wall Temperatures . . . . .</b>	<b>481</b>
<i>S. S. Yee and K. Kamiuto</i>	
<b>Unsteady Combined Heat and Moisture Transfer in Unsaturated Porous Soils . . . . .</b>	<b>493</b>
<i>G. H. Santos and N. Mendes</i>	
<b>Porous Medium Model for Investigating Transient Heat and Moisture Transport in Firefighter Protective Clothing under High-Intensity Thermal Exposure . . . . .</b>	<b>511</b>
<i>P. Chitrphiromsri and A.V. Kuznetsov</i>	
<b>Effect of Converging Boundaries on Flow through Porous Media . . . . .</b>	<b>529</b>
<i>N. B. P. Reddy</i>	
<b>Mixed Convection Heat and Mass Transfer with Thermal Radiation in a Non-Darcy Porous Medium . . . . .</b>	<b>541</b>
<i>P. V. S. N. Murthy , M. K. Partha, and G. P. Rajasekhar</i>	

## Number 6

<b>A Note on the Swimming Problem of a Singly Flagellated Microorganism in a Fluid Flowing through a Porous Medium . . . . .</b>	<b>551</b>
<i>A. M. Siddiqui and A. R. Ansari</i>	
<b>Darcy's Law for Immiscible Two-Phase Flow: A Theoretical Development . . . . .</b>	<b>557</b>
<i>F. J. Valdés-Parada and G. Espinosa-Paredes</i>	
<b>Effect of Magnetic-Field-Dependent Viscosity on a Rotating Ferromagnetic Fluid Heated and Solved from Below, Saturating a Porous Medium . . . . .</b>	<b>569</b>
<i>Sunil, Divya, and R. C. Sharma</i>	
<b>Sound Absorption Properties of Porous Aluminum . . . . .</b>	<b>589</b>
<i>H. Siyuan, G. Xiaolu, and C. Feng</i>	
<b>Numerical Study of Liquid Thermal Pumping in Porous Media . . . . .</b>	<b>599</b>
<i>M. Najjari and S. Ben Nasrallah</i>	
<b>Extended Pressure Application for Transient Seepage Problems with a Free Surface . . . . .</b>	<b>613</b>
<i>M. T. Ayvaz, M. Tuncan, H. Karahan, and A. Tuncan</i>	
<b>Thermal Development of Forced Convection in a Channel or Duct Partly Occupied by a Porous Medium . . . . .</b>	<b>627</b>
<i>D. A. Nield and A. V. Kuznetsov</i>	
<b>Following page 638:</b>	
<i>Title Page to Volume 8</i>	
<i>Contents of Volume 8</i>	
<i>Author Index to Volume 8</i>	
<i>Subject Index to Volume 8</i>	
<i>Reviewers for Volume 8</i>	

## **Author Index to Volume 8**

- Abbasi, M.-H., 379  
Abuzaid, M. M., 419  
Advani, S. G., 281  
Afacan, A., 193  
Agwu Nnanna, A. G., 31  
Aldoss, T. K., 419  
Al-Khateeb, A. N., 85  
Al-Nimr, M. A., 85, 419  
Amahmid, A., 455  
Ansari, A. R., 551  
Aryanpour, G., 379  
Assato, M., 13  
Avkhadiev, F. G., 125  
Avramenko, A. A., 45  
Ayvaz, M. T., 613  
Bansod, V. J., 65  
Bourich, M., 455  
Chase, G. G., 299  
Chitrphiromsri, P., 511  
de Lemos, M. J. S., 13  
Divya, 393, 569  
Du Plessis, J. P., 365  
Duan, M., 431  
Espinosa-Paredes, G., 557  
Feng, C., 589  
Fourie, J. G., 365  
Ginkin, V. P., 347  
Govender, S., 271, 355  
Haddah, O. M., 85  
Haji-Sheikh, A., 31  
Hariharan, S. I., 299  
Harris, K. T., 31  
Hasnaoui, M., 455  
Hassanien, I. A., 225, 237  
Hassanizadeh, S. M., 247  
Heider, D., 281  
Hyun, J. M., 311  
Ibrahim, F. S., 237  
Jayanthi, S., 73  
Jemni, A., 97  
Kacimov, A. R., 125  
Kamiuto, K., 481  
Karahan, H., 211, 613  
Kaviany, M., 343  
Kim, J. W., 311  
Kim, K. H., 311  
Kumar, J. P., 443  
Kumari, M., 73  
Kuznetsov, A. V., 45, 511, 627  
Lage, J. L., 149  
Layeghi, M., 471  
Litchfield, D., 281  
Liu, S., 193  
Loughran, J. G., 431  
Maharaj, Y., 271  
Malashetty, M. S., 443  
Markicevic, A. B., 281  
Masliyah, J. H., 193  
Mendes, N. 493  
Merrikh, A. A., 149  
Miguel, A. F., 165  
Mohamad, A. A., 149, 175  
Murthy, P. V. S. N., 541  
Mzali, F., 97  
Najjari, M., 1, 599  
Nasrallah, S. B., 1, 97, 599  
Nield, D. A., 627  
Nouri-Borujerdi, A., 471  
Omer, Gh. M., 225, 237  
Oung, O., 247  
Partha, M. K., 541  
Pedras, M. H. J., 13  
Pop, I., 55  
Rabi, J. A., 175  
Rajasekhar, G. P., 541  
Rathishkumar, B. V., 65  
Reddy, N. B. P., 529  
Reis, A. H., 165, 259  
Rosa, R., 259  
Riahi, D. N., 327  
Saeid, N. H., 55  
Santos, G. H., 493  
Sassi, L., 97  
Shahnazari, M. R., 115  
Sharma, P. K., 409  
Sharma, R. C., 393, 569  
Siddiqui, A. M., 551  
Singh, P., 65  
Siyuan, H., 589  
Sunil, 393, 569  
Tamer Ayvaz, M., 211  
Tuncan, A., 613  
Tuncan, M., 613  
Umaopathi, J. C., 443  
Valdés-Parada, F. J., 557  
Vasudevan, G., 299  
Xiaolu, G., 589  
Yee, S. S., 481  
Zia Bashar Hagh, M., 115

## **Subject Index to Volume 8**

- air concentration, 299  
air gap, 115  
asymptotic behavior, 455
- bioconvection, 45  
boundary layer, 165
- capillary pressure, 247  
cavity scale, 311  
channeling, 115  
cylindrical packed bed, 481  
coalescence, 299  
computer simulation, 379  
continuum model:  
    numerical, 193  
    porous, 149  
convection  
    DRFDM, 211  
    mixed, 225, 409, 541  
    forced, 627  
    free, 421  
    stationary, 271, 393  
    thermosolutal, 393, 455  
    transient forced, 165  
    transient buoyant, 311  
convergent flow, 529  
Coriolis effects, 355  
coupled heat  
    mass fluxes, 259  
    mass transfer, 493  
crystallization, 347
- Darcy  
    law, 557  
    model, 85  
    number, 165  
    term-effect, 311  
dewatering analysis, 431  
discrete heater:  
    isoflux, 55  
    isothermal, 55  
dispersion, 125
- dual reciprocity, 211  
effective permeability, 165  
effective thermal conductivity, 97  
Ergun number, 73  
extended pressure method, 613
- ferrofluids, 393, 569  
fibrous porous media, 281, 299, 431  
filters, 299  
finite difference, 613  
finite element analysis, 431  
firefighter protective clothing, 511  
flow  
    enhancement network, 281  
    fluid, 115, 431, 455, 551  
    patterns, 13, 311, 329  
    rates, 193  
    stability, 355  
    structures, 1  
    two-phase, 247, 557  
    transient, 421  
    free convection, 1  
    friction factor, 529
- gas transfer, 379  
geocentrifuge, 247
- heat and mass transfer, 65, 347, 455,  
  541, 599  
heat flux to skin, 511  
heat generation, 149  
heat pipes, 471  
heat transfer, 443  
heat transfer characteristics, 481  
high-intensity thermal radiation, 511  
horizontal dendrite layer, 327  
hot-wire method, 97  
hydraulic head, 211  
hydraulic radius, 529  
hydrodynamic dispersion, 481
- inclined axis, 329
- inclined channel, 443  
isoperimetric estimations, 125  
isotherm, 165
- kinematic channeling, 125
- linear stability analysis, 271, 569  
liquid  
    flow analysis, 529  
    pressure drop, 471  
    vapor phase change, 1, 599
- local inertial term, 421  
local thermal equilibrium, 85
- macroscopic local inertial term, 421  
magnetic-field-dependent viscosity, 569  
mass dispersion, 365  
micro-gravity, 355  
microscopic organisms, 45, 551  
multiphase, 299  
mushy layer, 271
- natural-convection flow, 73, 97, 175, 237  
non-buoyancy magnetization, 393  
non-Darcy porous media, 65  
non-Fourier heat conduction, 31  
non-Newtonian fluids, 421  
nuclear fuel storage, 149  
numerical simulation, 97, 175  
Nusselt number, 55
- open-cellular, 365  
optimization, 211  
oscillatory instability, 327
- parallel-plate channel, 627  
permeability, 115, 281, 393, 409, 599  
phase transition interface, 347  
phosphogypsum, 175  
porosity, 589  
porous  
    aluminum, 589

- crystals, 344  
media, 421, 493, 529, 599  
medium, 31, 45, 97, 193, 443, 471,  
    511, 627, 551  
medium/channel, 281  
solids, 347  
Prandtl number, 271  
pressure gradient, 481  
  
radon exhalation, 175  
random mat, 281  
Rayleigh number, 55, 73, 85, 311  
Reynolds number, 529  
rotating flows, 355  
  
soil simulation, 493  
similarity solution technique, 541  
sorption isotherms, 259
- sound absorption, 589  
spatial velocity, 193  
spreadsheet, 211, 613  
surface heat flux, 225  
  
thermal  
    dispersion, 237  
    energy, 31  
    radiation, 481, 541  
transient seepage, 613  
transmissivity, 193  
transport of porous media, 344  
transverse dispersion, 365  
turbulence  
    channel flow, 13  
    fully-developed flow, 481  
    models, 13
- uniform lateral mass flux, 73  
unsaturated mesoporous media, 259  
  
variable permeability, 225, 237  
velocity, 225, 409, 443, 541, 627  
vertical plate in porous medium, 85  
viscosity, 13, 125, 443  
viscous  
    dissipation, 237  
    fluid, 551  
volume-average, 149, 557  
  
zero-equation turbulence model, 481

## **Reviewers for Volume 8**

The Editorial Board of the Journal of Porous Media would like to thank the following reviewers for their reviews and their help in establishing a high-quality review process. We add particular thanks to MANY reviewers who did multiple reviews.

A. Abbassi	M. F. El-Amin	A. Khaled
B. Abu-Hijleh	J. R. Figueiredo	A. Khalili
B. Alazmi	M. Firdaouss	K. Khanafer
T. K. Aldoss	R. Gharbi	J. M. Khodadadi
M. A. Al-Nimr	J. Giuliani	S. J. Kim
H. I. Andersson	R. S. R. Gorla	H. Kubota
A. Bahloul	S. Govender	M. Kumari
A. C. Baytas	J. Grunewald	A. V. Kuznetsov
A. Bejan	P. Guba	J. L. Lage
R. Bennacer	A. G. Gutierrez	F. C. Lai
E. Blums	L. Hadji	D. Lasseux
E. Bonet	H. A. Hadim	G. Lauriat
O. C. Candia	M. Hasnaoui	M. Layeghi
Y. Cao	I. A. Hassanien	G. Lebon
A. J. Chamkha	T. Hayat	D. Leppinen
G. G. Chase	C. E. Hickox	M. S. Malashetty
F. Civan	M. Hoffmann	K. S. Mekheimer
M. M. Costa	A. Holm	N. Mendes
K. D. Cole	M. A. Hossain	H. Meng
M. Daguenet	C. T. Hsu	B. Minaie
B. S. Dandapat	D. B. Ingham	A. A. Mohamad
M. J. S. De Lemos	T. Jaroszczyk	R. V. Mohan
R. K. Deka	K. H. Jensen	A. Montillet
H. Deping	A. Kacimov	P. V. S. N. Murthy
G. P. J. Diedericks	K. Kamiuto	A. Nakayama

V. E. Nakoryakov	J. Roux	R. Van Genuchten
S. B. Nasrallah	N. Rudraiah	L. L. Vasiliev
F. M. Neto	Z. Saghir	B. Verdegan
D. A. Nield	A. Sheshukov	S. M. Walsh
J. A. Ochoa-Tapia	H. F. Smirnov	C.-Y. Wang
R. Parnas	C. W. Somerton	Y. Wang
P. R. Patil	P. Strangfeld	N. E. Wijeyesundera
R. Pitchumani	H. Stopp	D. Wildenschild
I. Pop	L. Tadrist	N. Yang
A. Raptis	H. S. Takhar	K. A. Yih
D. A. S. Rees	A. S. Telles	Y. A. Zeigarnik
A. H. Reis	E. Tsotsas	S. Zhenlun
M. Reeves	R. Tzou	
P. Reynor	P. Vadasz	