

Published: 02 November 2010

Computational-theoretical investigation of buoyant jet flows

O. G. Martynenko &

V. N. Korovkin

Journal of Engineering Physics and Thermophysics volume 83, pages 934–941 (2010) [Cite this article](#)

The results of mathematical simulation of fully developed plane buoyant jet flows are presented. The solution is found within the framework of the model of a laminar boundary layer in the Boussinesq approximation using the method of matched asymptotic expansions. Analytical dependences of the basic characteristics of a jet flow on the Prandtl number and density parameter have been constructed.

This is a preview of subscription content, [access via your institution](#).

References

1. J. S. Turner, *Buoyancy Effects in Fluids* [Russian translation], Mir, Moscow (1977).
[Google Scholar](#)
2. Y. Jaluria, *Natural Convection. Heat and Mass Transfer* [Russian translation], Mir, Moscow (1983).
[Google Scholar](#)
3. V. P. Kashkarov, *Heat and Mass Transfer in Viscous Fluid Jets* [in Russian], Nauka, Alma-Ata (1984).
[Google Scholar](#)
4. A. S. Kabanov, *Theory of Free Convection from Local Sources with Meteorological Applications* [in Russian], Gidrometeoizdat, Leningrad (1984).
[Google Scholar](#)

5. O. G. Martynenko and Yu. A. Sokovishin, *Free-Convection Heat Transfer: Handbook* [in Russian], Nauka i Tekhnika, Minsk (1982).

[Google Scholar](#)

6. O. G. Martynenko, V. N. Korovkin, and Yu. A. Sokovishin, *Theory of Buoyant Jets and Wakes* [in Russian], Nauka i Tekhnika, Minsk (1991).

[Google Scholar](#)

7. J. C. Mollendorf, R. S. Johnson, and B. Gebhard, Several plume flows in pure and saline water at its density extremum, *J. Fluid Mech.*, 113, No. 2, 269–282 (1981).

[MATH Article](#) [Google Scholar](#)

8. O. G. Martynenko and V. N. Korovkin, Toward calculation of the free-conductive motion of liquid over a linear heat source, *Inzh.-Fiz. Zh.*, 80, No. 4, 69–73 (2007).

[Google Scholar](#)

9. O. G. Martynenko and V. N. Korovkin, Application of the method of asymptotic expansions for the analysis of free-conductive jet flows, *Inzh.-Fiz. Zh.*, 81, No. 6, 1142–1147 (2008).

[Google Scholar](#)

10. H. K. Kuiken and Z. Rotem, Asymptotic solution for plume at very large and small Prandtl numbers, *J. Fluid Mech.*, 45, No. 3, 585–600 (1971).

[MATH Article](#) [Google Scholar](#)

11. R. Hunt and G. Wilks, Note on the computation of the similarity solution for the two-dimensional buoyant plume, *Numer. Heat Transfer*, 11, No. 4, 499–503 (1987).

[Article](#) [Google Scholar](#)

[Download references](#)

[Author information](#)

Affiliations

1. A. V. Luikov Heat and Mass Transfer Institute, National Academy of Sciences of Belarus, 15 P. Brovka Str., Minsk, 220072, Belarus
O. G. Martynenko & V. N. Korovkin

Additional information

Translated from Inzhenerno-Fizicheskii Zhurnal, Vol. 83, No. 5, pp. 878–884, September–October, 2010.

Rights and permissions

Reprints and Permissions

About this article

Cite this article

Martynenko, O.G., Korovkin, V.N. Computational-theoretical investigation of buoyant jet flows. *J Eng Phys Thermophy* 83, 934–941 (2010). <https://doi.org/10.1007/s10891-010-0417-0>

Download citation

- Received 14 October 2009
- Published 02 November 2010
- Issue Date November 2010
- DOI <https://doi.org/10.1007/s10891-010-0417-0>

Keywords

vertical plane jet flows
free-convective heat transfer
laminar regime
mathematical simulation