OnMaslov conjecture about the structure of weak point vortical singularities of the shallow water equations

S. Yu. Dobrokhotov

Institute for problems in mechanics of the Russian Academy of Sciences
dobr@ipmnet.ru

K. V. Pankrashkin

Institute for problems in mechanics of the Russian Academy of Sciences and Institut für Mathematik, Humboldt Universität zu Berlin
kpankrashkin@mail.com

E. S. Semenov

Insitute of ecology and natural sciences, Russian Research Center "Kurchatov institute"
stess@inse.kiae.ru

We prove Maslov's conjecture that the structure of the square root of a quadratic form is the unique structure of weakly singular solutions (with a point singularity) of the shallow water equations with the properties of structure self-similarity and stability [1]. Also we prove that these solutions descibe motions of the vortices [2, 3, 4]. This fact plays a key role in the study of the dynamics of vortical singularities and their applications to the trajectories of mesoscale atmospheric vortices (typhoons and hurricanes). In particular it results the description of possible trajectories of mesoscale vortices via the Hill and physical pendulum equations [2, 3].

References

[1] Dobrokhotov, S. Yu., Pankrashkin, K. V., Semenov, E. S. (2001). Proof of Maslov's conjecture about the structure of weak point singular solutions of the shallow water equations, *Russ. J. Math. Phys.*, vol. 8, no. 1, pp. 25–54.

[2] Dobrokhotov, S. Yu. (1999a). Hugoniót–Maslov chains for solitary vortices of the shallow water equations. I., *Russ. J. Math. Phys.*, vol. 6, no. 2, pp. 137–173.

[3] Dobrokhotov, S. Yu. (1999b). Hugoniót–Maslov chains for solitary vortices of the shallow water equations. II., *Russ. J. Math. Phys.*, vol. 6, no. 3, pp. 282–313.

[4] Dobrokhotov, S. Yu. (2000). Integrability properties of the truncated Hugoniót–Maslov chains for the trajectories of mesoscale vortices on shallow water, *Teor. Mat. Fiz.*, vol. 125, no. 3, pp. 591–517, in Russian.