

Generation of Large-Scale Flow in the Vicinity of Weakly-Rotating, Self-Gravitating Compact Object

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In this thesis we investigated the problem of formation of large-scale flow in the equilibrium relaxation model. The study focuses on weakly rotating, self-gravitating neutral fluid in the vicinity of a compact object, where gravitational effects of the compact object is neglected. For such model we employed the intermediate theory of gravity – the equations of Gravitoelectromagnetism [1][2]. Carrying out the equilibrium analysis, for which we derived the Double Beltrami equation for the velocity field, we demonstrated the possibility of a catastrophic relaxation of equilibrium [3][4] for the specific characteristic parameters of a chosen system. As a consequence, system undergoes the energy transformation [4]. We have shown the possibility of a catastrophic formation of the large-scale velocity field while the conversion of the fluctuation energy into flow energy.

References

- [1] C.T. Sebens. (2020), *The mass of gravitational field*. **Br. J. Philos. Sci.** The British Journal for the Philosophy of Science, **73(1)**, 2022, pp. 211-2948; doi:10.1093/bjps/axz002
- [2] K.S. Thorne. (1988), Gravitomagnetism, jets in quasars, and the Stanford Gyroscope Experiment. In *Near Zero: New Frontiers of Physics* (eds. J.D. Fairbank, B.S. Deaver Jr. C.W.F. Everitt & P.F. Michelson), pp.573-586. W.H. Freeman and Company.
- [3] S. Ohsaki N.L. Shatashvili, S.M. Mahajan & Z. Yoshida. (2001), *Magnetofluid Coupling: Eruptive Events in the Solar Corona*. **The Astrophysical Journal**, **559(1)**, pp. L61-L65.
- [4] S. Ohsaki N.L. Shatashvili, S.M. Mahajan & Z. Yoshida. (2002), *Energy Transformation Mechanism in The Solar Atmosphere Associated with Magnetofluid Coupling: Explosive and Eruptive Events*, **The Astrophysical Journal**, **570**, pp. 395-407.

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