

Search of novel equilibrium and non-equilibrium phenomena caused by topological defects

Project Leader

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1. Objective

This project is aimed at:

Topological defects appear widely in nature. These include dislocations in crystals, disclinations in liquid crystals, magnetic domain wall in magnets, magnetic quantum fluxes in superconductors, quantum vortices in quantum fluid. Such defects often affect the properties of equilibrium and non-equilibrium of systems ranging in scale from microscopic to macroscopic. This project will search for novel phenomena that are triggered by topological defects, mainly using large-scale numerical simulations.

2. Project Outline

To that end, the project will consist of the following phases:

- (a) Search for new classes of Berezinskii-Kostelitz-Thouless phase transitions in low dimensional systems.
- (b) Perform quantum turbulence simulations with quantum vortices and find new features of turbulence.
- (c) Perform phase ordering simulations with many topological defects and find new universality.

3. Expected Performance

In this project, the successful candidate would be expected to:

- (a) Design and perform high-performance and large scale numerical simulations.
- (b) Plan new projects in terms of computations requiring a wide knowledge of physics and mathematics.
- (c) Maintain computers for numerical computations.

4. Required Skills and Knowledge

The successful candidate for this project will have the following knowledge and skills:

- (a) Elementary knowledge for programming (at least one of Fortran, C, C++, Python, Mathematica).
- (b) Basic knowledge of statistical physics, thermodynamics, and hydrodynamics.

References

http://smphys.env.kochi-tech.ac.jp/~michikaz/publication_e.html

See my webpage:

http://smphys.env.kochi-tech.ac.jp/~michikaz/index_e.html

See our admission guidelines:

http://www.kochi-tech.ac.jp/english/admission/ssp_aft19oct/ssp_application_guideline.html

Contact

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