Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Topological Flow Data Analysis Part 3- Foundation of describing flows on 3D spaces[1] TOMOO YOKOYAMA, Kyoto University of Education / Japan Science and Technology Agency, TAKASHI SAKAJO, Kyoto University, TOMOKI UDA, Tohoku University — Topologies of flows on 3D spaces are quite complicated. Though every loop (e.g. periodic orbit) separates surfaces but chaotic stationary 2D flows on surfaces do not appear, no loops separate any 3D spaces but chaotic behaviors appear in stationary flows on 3D spaces. Moreover, periodic orbits are unknotted in 2D spaces but they can be easily linked in 3D spaces. Therefore we need the information both of chaos and of linking of infinitely many periodic orbits to analyze flows on 3D spaces. Hence it's very hard to describe topology of flows on 3D spaces in general. However, if there is uniformity (resp. symmetry) of flows, we can use slices of flows on 3D spaces to analyze the topology of such flows as medical doctors use X-ray photographs or computerized tomography images to analyze blood currents. On the other hand, the resulting flows on the slices are not incompressible even if the original 3D flow is incompressible. Thus we need to describe generic 2D flows. Therefore we constructed a classification of generic surface flows, which are called flows of finite type. In the third part of this sequential talks, we will explain the background of representations of 2D flows and introduce a representation of 2D flows of finite type and analyze topologies of flows on 3D spaces.

[1]This work is supported by Japan Science and Technology.

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Date submitted: 16 Jul 2019 Electronic form version 1.4