

# **Application of Topological Flow Data Analysis to Meteorology and Oceanography**

Tomoki UDA (AIMR, Tohoku University)

## Abstract

Since 2013, Sakajo and Yokoyama have proposed a mathematical classification theory of 2D flows in multiply connected domains from the perspective of dynamical systems. They classified the topology of streamline plots and characterised them by unique tree representations, called Cyclically Ordered rooted Tree (COT) representations. The practical application of their theory to data science, called Topological Flow Data Analysis (TFDA), was realized by Uda, Sakajo and Yokoyama in 2018, utilising TDA. We have applied TFDA to meteorology and oceanography. TFDA is useful for extracting certain prominent vortex regions in streamline plots, such as high/low pressure regions in blocking phenomena in meteorology, and eddy regions trapped by Kuroshio meandering in oceanography. In this talk, we present a brief introduction to TFDA theory and its application to these two phenomena.