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Energy flux vectors in two-dimensional anisotropic turbulence[1]
MASANORI TAKAOKA, Department of Mechanical Engineering, Doshisha University, NAOTO YOKOYAMA, Department of Mechanical Science and Bioengineering, Osaka University, EIICHI SASAKI, Department of Engineering Science, Akita University — Identification of energy flow in the Fourier space is one of the most important problem in turbulence research. In isotropic turbulence, owing to its symmetry, energy flow is one-dimensionalized and treated as scalar. To investigate anisotropic turbulence, on the other hand, it is indispensable to understand its energy flux as a vector field. Although it is required to determine energy budget among three wave modes constituting a triad, solution cannot be determined uniquely. Our idea here is to obtain a flow of energy in the Fourier space similar to the energy cascade in isotropic turbulence. To solve the continuity equation for enrgy flow, we have proposed two idea: use of the Moore-Penrose inverse matrix and potential flux vector. In this talk, we will report the results for the application of our idea to two-dimensional anisotropic turbulence. The Rhines "lazy eight" spectrum in β-plane turbulence is one of the most conspicuous anisotropy. Charney-Hasegawa-Mima equation and Hasegawa-Wakatani equation in plasma physics also have similar anisotropic term. We have simulated these equations to calculate energy changing rate at each wave number, and then apply our idea to obtain the energy flux vectors in the Fourier space.

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