



**AAPPS-DPP 2018 Plenary speaker Name:** Prof. Michio Yamada

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**Rationale:** Professor Michio Yamada is well known for various important contributions to applied mathematics. His background is fluid mechanics, but his rigorous methods and profound considerations are respected in wide area of theoretical physics including plasma physics. Among his diverse works, his recent theory of “zonal flows” is attracting much interest in planetary fluid mechanics. It is needless to emphasize that the zonal flow is a topic of primary relevance to experiments and of great theoretical interest in many areas of plasmas physics. He will be able to give an insightful and accessible plenary talk on this fundamental and important topic. The lecture will also provide many of the audiences with idea how rigorous theories may be developed so as to influence other disciplines.

**Talk Title:** Zonal Flows in Rotating Fluids: phenomenological interest and theoretical problems

**Short abstract:** Eastward or westward zonal flows are frequently observed in planetary atmosphere. But their generation mechanism is not fully understood yet. After describing some characteristic features of zonal flows observed on planets and in numerical simulations, we discuss some related theoretical problems which includes roles of viscosity, wave resonance and the energy transfer to zonal modes, showing that the zonal flow formation persists in the limit of small viscosity and converges to that in the inviscid fluids.

**List of related published papers**

1. K.Obuse, S.Takehiro and M.Yamada, Linear stability of steady zonal jet flows induced by a small-scale forcing on a beta-plane, *Physica D*, 240, 2011, 1825--1834. DOI:10.1016/j.physd.2011.08.009
2. K.Obuse, S.Takehiro and M.Yamada, Weak interaction between zonal jets on a beta plane, *Japan Industrial and Applied Mathematics*, 30 (2013), 111-127, DOI: 10.1007/s13160-012-0086-9
3. M.Yamada and T. Yoneda, Resonant interaction of Rossby waves in two-dimensional flow on a beta plane, *Physica D*, 245(1), 1-7, 2013. DOI: 10.1016/j.physd.2012.11.001
4. E.Sasaki, S.Takehiro and M.Yamada, Bifurcation structure of two-dimensional viscous zonal flows on a rotating sphere, *Journal of Fluid Mechanics*, 774, pp 224- 244, 2015  
DOI: <http://dx.doi.org/10.1017/jfm.2015.262>
5. K.Obuse, S.Takehiro and M.Yamada, Effect of turbulence on zonal jet flows in equivalent-barotropic quasi-geostrophic model, *ANZIM J.* 58 (CTAC2016) p.C175-C188, 2017. 10.21914/anziamj.v58i0.11782