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Preface

This special issue of *Earth, Planets and Space* contains 8 papers related to the Workshop on Physical Processes in Non-Uniform Finite Magnetospheric Systems—50 Years of Tamao's Resonant Mode Coupling Theory, held in Fukuoka, Japan, in 12–15, September, 2011.

The resonant mode coupling is one of major physical processes in the space plasmas including the magnetic reconnection and collisionless shock wave. The field-line resonance describes the resonant interaction between compressional magnetohydrodynamic waves and shear waves in a non-uniform plasma such as the Earth magnetosphere. The concept of this resonant mode coupling was first outlined by Tsutomu Tamao in 1961 and later discussed in his seminal paper on hydromagnetic coupling resonances (Tamao, 1965). Experimental work by John Samson (Samson *et al*., 1971) made resonant mode coupling the current paradigm of planetary magnetospheric ULF-wave research.

As Tsutomu Tamao's original paper was published in a local journal its impact was limited at first, but its reputation spread broadly with time, and nowadays it is counted among the canonical papers that founded the field sketched above.

This international workshop was held on the occasion of the 50 years' anniversary of the publication of Professor Tamao's pioneering paper on the resonant mode coupling of magnetohydrodynamic waves in the magnetosphere. The workshop was proposed and organized by an international team of scientists who respected Prof. Tamao's great contribution. More than 60 participants from many countries discussed recent progress and future perspectives about the resonant mode coupling and other topics in which a non-uniform and finite system is essential. For example, the resonant mode coupling theory is applied to sounding of the Earth's magnetosphere, and the MHD waves in Herman and other planets' magnetospheres are studied in terms of this theory. In addition, the magnetosphere-ionosphere coupling study is now developed to research of the magnetosphere-ionosphere compound system in which many elementary processes are self-consistently coupled. The new method was also presented to separate upward and downward propagating Alfven waves from the wave signals observed above the ionosphere.

Unfortunately Prof. Tamao passed away in 2010, but he was informed of the planning of the workshop to be held in his honor.

This workshop was supported by Space Environmental Research Center, Kyushu University; Solar-Terrestrial Environment Laboratory, Nagoya University; National Institute of Polar Research; Society of Geomagnetism and Earth, Planetary and Space Sciences; Society for Promotion of Space Science. In addition, we note here that late Professor Tamao offered donation to this workshop.

We wish to thank all the participants of the workshop. We also gratefully acknowledge the authors and reviewers for their efforts in publishing this special issue.

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