SGU 関連　研究活動実績（２０１８年）

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２０１８年度研究実績

１）　非平衡熱力学系の変分的定式化方法に関して，有限次元の開放系への拡張を行なった．これにより，外界との物質移動や熱エネルギーのやり取りのある熱力学系の組織的な定式化が可能となった．また，有限次元の非平衡熱力学系に現れる様々なディラック構造とそれに付随するディラック力学系の構造を明らかにした．

２）　非平衡孤立熱力学系において，離散的な変分原理を提案し，それに基づく構造保存型の数値積分法の開発を行なった．これにより，非平衡熱力学のための変分的積分法が，保存的力学系の場合の構造保存型の変分的積分法の自然な拡張となっており，エネルギー保存性の良い性質を持つことを示した．

３）　火星衛星サンプルリターン（MMX）計画に関する宇宙機の軌道設計を目的として研究を行なった．特に，太陽-火星-探査機系の三体力学系において，エネルギーと航行時間を減らすような火星の影響圏を脱出する火星離脱軌道の検討を行ない，シミュレーションによってその有効性を確認した．

Research Report 2018

1) We have extended the variational formulation of nonequilibrium thermodynamics to the case of open systems, in which mass and heat exchanges are occurred between the exterior and the system. We have also explored various classes of Dirac structures appeared in finite dimensional nonequilibrium thermodynamics and with the associated Dirac dynamical systems.

2) We have developed a variational discretization of nonequilibrium thermodynamics for the case of isolated systems in which the system has no heat and matter exchange nor mechanical power exchange with the exterior. We have clarified that the obtained variational integrator is a natural extension of the structure-preserving variational integrator for conservative mechanics.

3) We have studied the space mission for the Martian Moons eXplorer, in which our objective is to obtain a sample from a Martian moon. We have proposed the integrated three-and-two-body method, which uses three-body dynamics at the edge of the sphere of influence and integrates it into two-body dynamics in order to use a two-body-based low-thrust optimizer and have shown the validity of the proposed method by numerical simulations.

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(7) Hiroaki Yoshimura, Design of low energy Earth-Moon transfers in the 4-body system, AIMS 2018 Special session 25: Celestial mechanics and N-body problem, Taipei University, July 5, 2018.

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