

## Stochastic perturbation of the two-body problem

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In this study we present the impact of a stochastic perturbation on the classical two-body problem. First, we discuss the existence of first integrals by introducing a new kind of conservation laws. Second we show how to define a Hamiltonian structure under stochastic perturbation. Finally, we illustrate numerically the stochastic variation of osculating elements as the semi-major axis, the eccentricity and the pericenter. We conclude with an analysis on how to construct a new set of Gauss’s equations in the planar case.

*Joint work with Jacky Cresson and Bénédicte Puig from Université de Pau.*

### References

- [1] S. Sharma and H. Parthasarathy, *Dynamics of a stochastically perturbed two-body problem*, Proc. R. Soc. A, 2007.
- [2] F. Pierret, J. Cresson, and B. Puig, *Stochastic perturbation of the two-body problem* (in preparation).
- [3] F. Pierret, *Stochastic perturbation equations of celestial mechanics* (in preparation).