1. Record Nr. UNINA9910349502903321

Autore	Vallejo Juan C
Titolo	Predictability of Chaotic Dynamics : A Finite-time Lyapunov Exponents Approach / / by Juan C. Vallejo, Miguel A. F. Sanjuan
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2019
ISBN	3-030-28630-4
Edizione	[2nd ed. 2019.]
Descrizione fisica	1 online resource (207 pages) : illustrations
Collana	Springer Series in Synergetics, , 0172-7389
Disciplina	003.857
Soggetti	Statistical physics Physics Space sciences Mathematical physics Applications of Nonlinear Dynamics and Chaos Theory Numerical and Computational Physics, Simulation Space Sciences (including Extraterrestrial Physics, Space Exploration and Astronautics) Mathematical Applications in the Physical Sciences
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Preface -- Forecasting and chaos -- Lyapunov exponents -- Dynamical regimes and timescales -- Predictability -- Chaos, predictability and astronomy -- A detailed example: galactic dynamics -- Appendix. .
Sommario/riassunto	This book is primarily concerned with the computational aspects of predictability of dynamical systems - in particular those where observations, modeling and computation are strongly interdependent. Unlike with physical systems under control in laboratories, in astronomy it is uncommon to have the possibility of altering the key parameters of the studied objects. Therefore, the numerical simulations offer an essential tool for analysing these systems, and their reliability is of ever-increasing interest and importance. In this interdisciplinary scenario, the underlying physics provide the simulated models, nonlinear dynamics provides their chaoticity and instability properties, and the computer sciences provide the actual numerical

implementation. This book introduces and explores precisely this link between the models and their predictability characterization based on concepts derived from the field of nonlinear dynamics, with a focus on the strong sensitivity to initial conditions and the use of Lyapunov exponents to characterize this sensitivity. This method is illustrated using several well-known continuous dynamical systems, such as the Contopoulos, Hénon-Heiles and Rössler systems. This second edition revises and significantly enlarges the material of the first edition by providing new entry points for discussing new predictability issues on a variety of areas such as machine decision-making, partial differential equations or the analysis of attractors and basins. Finally, the parts of the book devoted to the application of these ideas to astronomy have been greatly enlarged, by first presenting some basics aspects of predictability in astronomy and then by expanding these ideas to a detailed analysis of a galactic potential.