1. Record Nr. UNINA9910790142003321

| | |
|---|---|
| Autore | Majda Andrew <1949-> |
| Titolo | Filtering complex turbulent systems / / Andrew J. Majda, John Harlim [[electronic resource]] |
| Pubbl/distr/stampa | Cambridge : , : Cambridge University Press, , 2012 |
| ISBN | 1-107-23048-9<br>1-280-39412-9<br>9786613572042<br>1-139-33781-5<br>1-139-34026-3<br>1-139-34184-7<br>1-139-33694-0<br>1-139-33868-4<br>1-139-06130-5 |
| Descrizione fisica | 1 online resource (vii, 357 pages) : digital, PDF file(s) |
| Disciplina | 660.2842450151 |
| Soggetti | Filters (Mathematics)<br>Dynamics - Mathematical models<br>Turbulence<br>Numerical analysis |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Title from publisher's bibliographic system (viewed on 05 Oct 2015). |
| Nota di bibliografia | Includes bibliographical references and index. |
| Nota di contenuto | 1. Introduction and overview: mathematical strategies for filtering turbulent systems -- 2. Filtering a stochastic complex scalar: the prototype test problem -- 3. The Kalman filter for vector systems: reduced filters and a three-dimensional toy model -- 4. Continuous and discrete Fourier series and numerical discretization -- 5. Stochastic models for turbulence -- 6. Filtering turbulent signals: plentiful observations -- 7. Filtering turbulent signals: regularly spaced sparse observations -- 8. Filtering linear stochastic PDE models with instability and model error -- 9. Strategies for filtering nonlinear systems -- 10. Filtering prototype nonlinear slow-fast systems -- 11. Filtering turbulent nonlinear dynamical systems by finite ensemble methods -- |

12. Filtering turbulent nonlinear dynamical systems by linear stochastic models -- 13. Stochastic parametrized extended Kalman filter for filtering turbulent signals with model error -- 14. Filtering turbulent tracers from partial observations: an exactly solvable test model -- 15. The search for efficient skillful particle filters for high-dimensional turbulent dynamical systems.

Sommario/riassunto

Many natural phenomena ranging from climate through to biology are described by complex dynamical systems. Getting information about these phenomena involves filtering noisy data and prediction based on incomplete information (complicated by the sheer number of parameters involved), and often we need to do this in real time, for example for weather forecasting or pollution control. All this is further complicated by the sheer number of parameters involved leading to further problems associated with the 'curse of dimensionality' and the 'curse of small ensemble size'. The authors develop, for the first time in book form, a systematic perspective on all these issues from the standpoint of applied mathematics. The book contains enough background material from filtering, turbulence theory and numerical analysis to make the presentation self-contained and suitable for graduate courses as well as for researchers in a range of disciplines where applied mathematics is required to enlighten observations and models.