

# Contents

|          |  |            |
|----------|--|------------|
| <b>1</b> | <b>A Survey of Observers for Nonlinear Dynamical Systems .....</b>                                   | <b>1</b>   |
|          | Wei Kang, Arthur J. Krener, Mingqing Xiao, and Liang Xu  |            |
| <b>2</b> | <b>Nudging Methods: A Critical Overview .....</b>  | <b>27</b>  |
|          | S. Lakshmivarahan and John M. Lewis  |            |
| <b>3</b> | <b>Markov Chain Monte Carlo Methods: Theory and Applications .....</b>                               | <b>59</b>  |
|          | Derek J. Posselt   |            |
| <b>4</b> | <b>Observation Influence Diagnostic of a Data Assimilation System .....</b>                          | <b>89</b>  |
|          | Carla Cardinali  |            |
| <b>5</b> | <b>A Question of Adequacy of Observations in Variational Data Assimilation .....</b>                 | <b>111</b> |
|          | John M. Lewis and S. Lakshmivarahan  |            |
| <b>6</b> | <b>Quantifying Observation Impact for a Limited Area Atmospheric Forecast Model .....</b>            | <b>125</b> |
|          | Clark Amerault, Keith Sashegyi, Patricia Pauley, and James Doyle                                     |            |
| <b>7</b> | <b>Skewness of the Prior Through Position Errors and Its Impact on Data Assimilation .....</b>       | <b>147</b> |
|          | Daniel Hodyss and Alex Reinecke  |            |
| <b>8</b> | <b>Background Error Correlation Modeling with Diffusion Operators .....</b>                          | <b>177</b> |
|          | Max Yaremchuk, Matthew Carrier, Scott Smith, and Gregg Jacobs  |            |
| <b>9</b> | <b>The Adjoint Sensitivity Guidance to Diagnosis and Tuning of Error Covariance Parameters .....</b> | <b>205</b> |
|          | Dacian N. Daescu and Rolf H. Langland  |            |

|           |  |     |
|-----------|--|-----|
| <b>10</b> | <b>Treating Nonlinearities in Data-Space Variational Assimilation</b> .....  | 233 |
|           | Brian S. Powell  |     |
| <b>11</b> | <b>Linearized Physics for Data Assimilation at ECMWF</b> .....   | 251 |
|           | Marta Janisková and Philippe Lopez   |     |
| <b>12</b> | <b>Recent Applications in Representer-Based Variational Data Assimilation</b> .....  | 287 |
|           | Boon S. Chua, Edward D. Zaron, Liang Xu, Nancy L. Baker, and Tom Rosmond   |     |
| <b>13</b> | <b>Variational Data Assimilation for the Global Ocean</b> .....  | 303 |
|           | James A. Cummings and Ole Martin Smedstad  |     |
| <b>14</b> | <b>A 4D-Var Analysis System for the California Current: A Prototype for an Operational Regional Ocean Data Assimilation System</b> .....     | 345 |
|           | Andrew M. Moore, Christopher A. Edwards, Jerome Fiechter, Patrick Drake, Emilie Neveu, Hernan G. Arango, Selime Gürol, and Anthony T. Weaver |     |
| <b>15</b> | <b>A Weak Constraint 4D-Var Assimilation System for the Navy Coastal Ocean Model Using the Representer Method</b> .....                      | 367 |
|           | Hans Ngodock and Matthew Carrier   |     |
| <b>16</b> | <b>Ocean Ensemble Forecasting and Adaptive Sampling</b> .....  | 391 |
|           | Xiaodong Hong and Craig Bishop   |     |
| <b>17</b> | <b>Climate Change and Its Impacts on Streamflow: WRF and SCE-Optimized SWAT Models</b> .....   | 411 |
|           | Shie-Yui Liong, Srivatsan V. Raghavan, and Minh Tue Vu   |     |
| <b>18</b> | <b>Entropic Balance Theory and Radar Observation for Prospective Tornado Data Assimilation</b> .....   | 429 |
|           | Yoshi K. Sasaki, Matthew R. Kumjian, and Bradley M. Isom   |     |
| <b>19</b> | <b>All-Sky Satellite Radiance Data Assimilation: Methodology and Challenges</b> .....  | 465 |
|           | Milija Zupanski  |     |
| <b>20</b> | <b>Development of a Two-way Nested LETKF System for Cloud-resolving Model</b> .....  | 489 |
|           | Hiromu Seko, Tadashi Tsuyuki, Kazuo Saito, and Takemasa Miyoshi  |     |
| <b>21</b> | <b>Observing-System Research and Ensemble Data Assimilation at JAMSTEC</b> .....   | 509 |
|           | Takeshi Enomoto, Takemasa Miyoshi, Qoosaku Moteki, Jun Inoue, Miki Hattori, Akira Kuwano-Yoshida, Nobumasa Komori, and Shozo Yamane          |     |

22 Data Assimilation of Weather Radar and LIDAR for Convection Forecasting and Windshear Alerting in Aviation Applications ..... 527  
Wai Kin Wong and Pak Wai Chan

23 Ensemble Adaptive Data Assimilation Techniques Applied to Land-Falling North American Cyclones ..... 555  
Brian C. Ancell and Lynn A. McMurdie

24 The Advances in Targeted Observations for Tropical Cyclone Prediction Based on Conditional Nonlinear Optimal Perturbation (CNOP) Method ..... 577  
Feifan Zhou, Xiaohao Qin, Boyu Chen, and Mu Mu

25 GSI/WRF Regional Data Assimilation System and Its Application in the Weather Forecasts over Southwest Asia ..... 609  
Jianjun Xu and Alfred M. Powell, Jr.

26 Studies on the Impacts of 3D-VAR Assimilation of Satellite Observations on the Simulation of Monsoon Depressions over India ..... 643  
A. Chandrasekar and M. Govindan Kutty

27 Parameter Estimation Using an Evolutionary Algorithm for QPF in a Tropical Cyclone ..... 707  
Xing Yu, Seon Ki Park, and Yong Hee Lee

Index ..... 717