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Nota di contenuto	Cover; Title Page; Copyright Page; Contents; Preface; Part 1: Applied Oil Spill Modeling (with applications to the Deepwater Horizon oil spill); 1 The 2010 Deep Water Horizon and 2002 Supertanker Prestige Accidents; 1.1 Introduction; 1.2 The Oil Spills Described; 1.3 How Much Material Remains in the Gulf?; 1.4 The Role of Ocean Models to Explain what Happened; References; 2 Gulf of Mexico Circulation; 2.1 General Characteristics; 2.2 Exchanges at Lateral and Surface Boundaries; 2.3 Loop Current Eddies; 2.4 Blocking by the Pycnocline; 2.5 Fate of the Deepwater Horizon Well Blowout Material 2.6 SummaryReferences; 3 Geophysical Fluid Dynamics and Modeling Challenges; 3.1 Modeling the Circulation and Mixing of the Gulf Waters; 3.2 External Boundaries; 3.3 Addressing the Water Column Contamination and Fluxes; 3.4 Effects of Bottom Dynamics on Accumulated Hydrocarbons; 3.5 Churning by Extreme Weather Events; 3.6 Summary; References; 4 Flow and Oil Transport Model Choices, Setup and Testing; 4.1 The DieCAST Ocean Circulation Model; 4.2

Korotenko Oil Transport Module KOTM; 4.3 Gulf Modeling Approach; 4.4 Model Vertical Eddy Viscosity and Diffusivity 4.5 Surface Wind Driving and Open Boundary Conditions 4.6 Comments on Modeling Equatorial Dynamics and the Gulf of Mexico; 4.7 Modeling Multi-Century Gulf Currents; References; 5 Modeling the 2010 DWH Oil Spill; 5.1 Introduction: the BP/Deepwater Horizon Accident; 5.2 Deepwater Blowouts: Processes Affecting the Transport and Fate of Oil throughout the Water Column; 5.2.1 Crude Oil Composition; 5.2.2 Characteristics of Macondo crude oil; 5.2.3 Subsea Oil Plumes; 5.2.4 Surface oil slicks; 5.3 Oil Spill Model for Gulf of Mexico (GOSM); 5.3.1 Circulation sub-model for the Gulf of Mexico 5.3.2 Description of the GOSM 5.3.3 Wind and Wave Forcing; 5.3.4 GOSM Setup; 5.4 Results and Discussion; 5.4.1 Modeling the GoM Circulation; 5.4.2 Trajectory Modeling; 5.4.3 Ensemble Modeling; 5.5 Summary; References; Part 2: Special Topics in Oil Spill Modeling; 6 DieCAST Model Origin and Development; 6.1 Introduction; 6.2 Recent Model Attributes; 6.3 Challenges in Modeling the Gulf of Mexico Circulation; 6.4 Complications of Modeling near-Equatorial Circulation; 6.5 Non Hydrostatic Effects; 6.6 Sponge Layers in the Global Model; 6.7 Inflow Considerations; References 7 Brief History of the Community Ocean Modeling System (COMS) 7.1 COMS history; 7.2 Background and motivations; 7.3 COMS elliptic solver history; 7.4 Evolution of DieCAST; 7.5 Outlook; References; 8 DieCAST Model Equations; 8.1 Model Equations; 8.2 Model Layer Depths; References; 9 Some Basic Physical, Mathematical and Modeling Concepts; 9.1 Buoyancy, Density and the Hydrostatic Approximation; 9.2 Pycnocline Slope: Geopotential Surface as a Natural Vertical Coordinate; 9.3 Rotation and Coriolis Terms; 9.4 Pycnocline and the Florida Strait Sill Depth; 9.5 Surface and Bottom Mixed Layers References

Sommario/riassunto

This book is designed to help scientifically astute non-specialists understand basic geophysical and computational fluid dynamics concepts relating to oil spill simulations, and related modeling issues and challenges. A valuable asset to the engineer or manager working off-shore in the oil and gas industry, the authors, a team of renowned geologists and engineers, offer practical applications to mitigate any offshore spill risks, using research never before published.
