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| Sommario/riassunto | This book describes recent collaborations combining the expertise of applied mathematicians, engineers and geophysicists within a research training group (RTG) on "Modeling, Simulation and Optimization of Fluid Dynamic Applications”, funded by the Deutsche Forschungsgemeinschaft (DFG). The focus is on mathematical modeling, adaptive discretization, approximation strategies and shape optimization with PDEs. The balanced research program is based on the guiding principle that mathematics drives applications and is inspired |

by applications. With this leitmotif the RTG advances research in Modeling, Simulation and Optimization by an interdisciplinary approach, i.e., to stimulate fundamental education and research by highly complex applications and at the simultaneously transfer tailored mathematical methods to applied sciences. The reported research involves nine projects and addresses challenging fluid dynamic problems inspired by applied sciences, such as climate research & meteorology, energy, aerospace & marine engineering, or medicine. More fundamental research concerning analysis, approximation and numerics is also covered. The material represents a successful attempt to exchange research paradigms between different disciplines and thus displays a modern approach to basic research into scientifically and societally relevant contemporary problems.