Preface

This volume contains the 2015 annual research briefs that summarize the research activities at the Center for Turbulence Research (CTR) in its twenty-ninth year of operation.

The objective of CTR continues to be the fundamental understanding of turbulent flows along with the development of physics-based models and predictive tools for multi-scale engineering analysis. The investigations reported in this volume have been supported by a number of different organizations, including programs sponsored by the Department of Energy's National Nuclear Security Administration (NNSA), Air Force Office of Scientific Research (AFOSR), Office of Naval Research (ONR), and National Aeronautics and Space Administration (NASA), as well as industrial partners and international research agencies.

There are 21 reports contained in this volume covering a wide range of topics related to multi-physics effects in turbulent flows. The first group of reports in this volume is focused on multi-phase flows, including particles and sprays. In particular, the topic of particle-laden turbulent flows is central to the Predictive Science Academic Alliance Program (PSAAP-II) Center at Stanford. The overarching problem of the PSAAP-II Center involves full-scale computation, and uncertainty-quantification analysis of solar-power receivers based on distributed absorption of thermal radiation by small particles in the bulk of the turbulent co-flowing air. The reports in the second group focus on combustion physics and modeling by addressing the dynamics of thermo-acoustic instabilities and high-speed turbulent flames. The reports in the third group are dedicated to wall modeling in turbulent boundary layers, which is a pacing item for large-eddy simulation. Uncertainty quantification of turbulent flows is the topic of the fourth group of reports. Lastly, the development of numerical methods for fluid and solid mechanics problems occupy the attention of the last group of reports.

Last year CTR hosted fourteen resident Postdoctoral Fellows, one Research Associate, three Senior Research Fellows, one Visiting Scholar, and one Visiting Student Researcher. The CTR roster for 2015 is provided in the Appendix. Also listed are the members of the CTR Steering Committee, which has met quarterly to act on fellowship applications.

It is a great pleasure to thank Pamela Nelson, Corinne Beck and Vi Nguyen for their help on the day to day management of CTR, and Jerry Tegno and Steve Jones for their assistance in the production of this volume. This volume is available online, including color versions of the figures in the reports, at the CTR website:
`http://ctr.stanford.edu/publications.html`

Parviz Moin
Javier Urzay