

Hurricane Risk

Volume 1

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Hurricane Risk

 Springer

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Preface

This book comprises both extended versions of papers presented at the 6th International Summit on Hurricanes and Climate Change: from Hazard to Impact, held in Heraklion in June 2017, as well as some additional contributions. Talks presented at this conference ranged from numerical simulation of tropical cyclones through tropical cyclone hazard estimation to damage estimates and their implications for commercial risk. This series of conferences has evolved over time to include a substantial component on climate risk, and this shift in emphasis is reflected in the content of this new volume. This book provides a source reference for both risk managers and climate scientists for topics on the interface between tropical cyclones, climate, and risk.

These topics are of particular interest to the insurance industry, and Chap. 1 provides an overview of the tropical cyclone risk issues that are of concern to the industry, with a particular emphasis on the importance to industry of appropriate time horizons for prediction and risk management. A review of the development and processes of the reinsurance industry is also given, to provide useful background for the technical and scientific work required to address industry-specific concerns. Better estimates of tropical cyclone hazard are of course a key concern to industry and policy makers, and Chap. 2 details new methods for assessing the damage potential of tropical cyclones, a key input for estimates of tropical cyclone impacts. Another measure for assessing the intensity of tropical cyclones that is relevant to their total potential impact during a season, namely, their integrated kinetic energy, is discussed in Chap. 3 along with the climatology and year-to-year variations of this parameter. The links between tropical cyclone energy and wind hazards are investigated in Chap. 4, as a visualization tool for hazard impact assessment.

Accurate risk assessment of current tropical cyclone hazard involves an intimate understanding of the specific risks in a particular location, and Chap. 5 gives a detailed description of the current vulnerabilities in the Tampa Bay region, a location that seems particularly at risk due to a combination of substantial hurricane hazard, its geography and its vulnerable infrastructure. Studies of the year-to-year variations in tropical cyclone occurrence and the reasons for this variation are important for

understanding what leads to high-impact years, and Chap. 6 details the relationship between the climate conditions during the tropical cyclone season in 2015 and the observed tropical storm and hurricane occurrence in that year. There is a growing body of work on the relationship between variations in climatically important atmospheric conditions and tropical cyclone occurrence, and Chap. 7 investigates the possibility of the influence of dust particles on tropical cyclone incidence in the Australian region, since this continent is a considerable source of dust. While the influence of Saharan dust on Atlantic tropical cyclones appears to be noticeable and is a topic of active research, the effect in the Australian region appears to be much less.

While there have been advances in our understanding of the links between climate and tropical cyclones, we still do not have a general theory of the relationship between climate and tropical cyclones that would enable us to predict the number of tropical cyclones from the current climate, even to within an order of magnitude. Chapter 8 discusses some of the main issues in establishing such a theory, with particular relevance to the possible implications for tropical cyclone risk assessment. Any such well-established theoretical relationship would have implications for future predictions of tropical cyclones in a warmer world, and Chap. 9 provides new estimates of the potential tropical cyclone damage and loss of life due to future climate change. This chapter emphasizes the crucial role of adaptation to future changes in hazards in minimizing the increase in tropical cyclone risk. A possible outcome in a warmer world is the poleward movement of typical regions of tropical cyclone occurrence, a scenario that has received some support from recent research. Chapter 10 outlines some of the challenges for the built environment of this potential risk, with a consideration of possible adaptation options. In addition to possible effects of climate change on the land-based built environment, ocean infrastructure is potentially vulnerable to future changes in hurricane climate. Chapter 11 quantifies some of these future hazards for offshore infrastructure, with a focus on integrating projections of future wave hazards with engineering design. Finally, a tool that is increasingly being used for estimating the effects of climate change on tropical cyclones is the climate model, as constantly improving computing resources enable horizontal resolutions for these models to be increased to the point where their simulations of tropical cyclones are becoming more realistic. Chapter 12 outlines a method whereby very fine resolution simulations of tropical cyclones can be designed to test the hypothesized impact of climate change, including the possible effect on hurricanes of the global and regional warming that has already occurred to date.

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