

Chapter 1

Introduction

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1.1 AIMS OF THE HANDBOOK

Every year, countless articles, books, social media, and TV programs debate the importance (or not) of sea-level change; the change debated is mainly sea-level rise, but sea-level fall is also possible and important. Millions of people live along the coast, estuaries, and adjacent coastal lowlands and many will concur with the view that “Due to sea level rise projected throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion.” (IPCC 2014, page 17). Significant debate over some of the causes and consequences of recent and future sea-level change remains within and between many communities including science, the media, coastal residents, industry, politics, and governments. Environments, communities, livelihoods, real-estate, and cash are all at stake. While improved understanding of the causes, impacts, and responses to sea-level change are of undeniable importance in many disciplines, these are not the subject of this book. With the range of technology available today, we can measure changes every few minutes with tide gauges and across entire oceans using satellites. Yet these offer only a small part of the wider picture. How does the variability we observe using these technologies fit with longer-term trends? Do our decades of instrumental observations adequately cover the natural variability and extreme events of the past and those we are likely to experience in the future? Most researchers would probably give a very guarded answer; some would give a forthright “No”. We need to bring together the evidence across a greater range of timescales, from seconds to millennia or even longer, for a complete analysis.

The aims of this book are therefore to entice and guide the reader beyond their initial interest and

discipline, to enable them to tackle new questions. This will hopefully also lead to the reader asking new questions and, ultimately, proposing new answers based on carefully collected observations, analyses, and models developed in the field and the laboratory from sites all over the world.

1.2 SEA-LEVEL RESEARCHERS

Sea-level research is primarily an observational science and we must realize what imperfect observers we are. Unlike experimental science where observations can usually be replicated and verified by others using the same or equivalent methods, we frequently deal with observations that have incomplete distributions through time and/or space. When looked at by another researcher, objectively and dispassionately, how many interpretations deteriorate into a collection of inferences, guesses, or hunches based on too little data, much of which is inconclusive or influenced by decisions made by the original author? With this in mind, it is easy to state that one clear recommendation of this Handbook is to encourage all researchers to make available their data for others to use as the basis for alternative analyses and interpretation. If we are fortunate to act as a reviewer or an editor for a peer-reviewed publication, we must ask authors to include the raw data either in the paper or an online repository linked to the article.

While our interpretations may remain unchallenged or un-falsified for only a few years, we should aim for our data to stand the test of time and be readily available. After all, digital media, international data repositories, and scientific journals encouraging online supplementary information files make this much more feasible than it has ever

been. But the reality is that we are human beings, living in different socio-economic and political environments where different pressures may work against this aspiration of openness. Career progression and demands from employers, research funding bodies, government, peers, students, and the media may all influence a researcher at different times throughout their career; we cannot hide from this fact. Similarly, our educational background, training, and experiences will influence the approach we take.

A review of sea-level research since the publication of Orson's original Manual (van de Plassche, 1986) will quickly reveal examples of how theories we thought we had right were in fact wrong. As a consequence, this Handbook does not set out to promote a single paradigm for sea-level research or a single "right" way of doing things. Rather, it aims to illustrate approaches and methods that have produced observations, analyses, and interpretations which have then stood the test of scrutiny by peers, mainly through the review process of scientific journal publication, but also at conferences and field discussion meetings. For many sea-level researchers we should acknowledge that defending one's work in the field or at a small workshop may well be more intimidating and rigorous than at an international meeting or through the journal review process. Despite the need to publish for career progression, we should not underestimate the value of field meetings and workshops, through international organizations such as the International Geoscience Programme

(IGCP) and the International Union for Quaternary Science (INQUA), to generate open debate and different perspectives on the way we make observations. Such debates and perspectives can provide the catalyst for new ideas and the development of new methods and techniques for data collection, analysis, and hypothesis testing. Attendance at such meetings can however be difficult due to their location, their cost, or other reasons. This is where we hope that this handbook will serve a real purpose by making available to readers many of the approaches and methods of sea-level research developed at such events in a single volume. If we come close to achieving this aim, we will have achieved one of the prime motivations of the first Manual and produced something that is fitting testimony to Orson's original vision.

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