Preface

Water and chemical fluxes across the sea bottom provide an important linkage between terrestrial and marine environments. From the marine perspective, these water fluxes, commonly referred to as submarine groundwater discharge (SGD), may contain elevated nutrient concentrations or high levels of other potentially harmful contaminants. Terrestrially derived SGD can also be an important source of freshwater for estuarine ecosystems that require relatively low salinities. For these reasons, the past decade has shown a rapid increase in the level of interest from estuary and marine scientists toward a better understanding of SGD. From the terrestrial perspective, SGD has also been a topic of interest to those studying saltwater intrusion and management of coastal aquifers. Saltwater intrusion studies commonly employ some form of a water balance method, whether through numerical modelling or volumetric calculations, to explain intrusion patterns and develop predictions and management plans. In developing a water balance for a coastal aquifer, estimates for all of the key components, including SGD, are synthesized. Although the motivation may be different depending on whether one works from the marine or terrestrial perspective, both groups have a common goal of obtaining accurate SGD estimates.

Unlike rivers and streams, where discharges to the ocean can be observed and quantified using proven techniques, estimates of SGD are much more difficult to obtain. Not only are there issues with making accurate field measurements in difficult environments where wind, waves and storms pose logistical concerns, but upscaling field measurements to other spatial and temporal scales significantly increases the uncertainties associated with those estimates. Consequently, a diverse suite of methods and approaches has evolved to characterize, quantify, and better understand the exchange of water and chemicals across the sea floor. For example, marine scientists have developed sophisticated strategies for using the chemical isotopes of radium to estimate SGD. From the terrestrial side, the same variable-density flow models used to simulate saltwater intrusion are also capable of providing quantitative estimates of SGD. Both groups rely on physical methods using head measurements, seepage meters or electromagnetic geophysical techniques to obtain qualitative and quantitative SGD estimates. As this diverse suite of techniques continues to improve, so does our ability to quantify the interaction between seawater and groundwater.

To unify the broad interest in the subject of SGD and groundwater–seawater interactions, a symposium entitled: *A New Focus on Groundwater–Seawater Interactions* was held during the 24th General Assembly of the International Union of Geodesy and Geophysics (IUGG) in Perugia, Italy, from 2–13 July 2007. The symposium was organized by the International Association of Hydrological Sciences (IAHS) International Commission on Groundwater (ICGW) and by the International Association for the Physical Sciences of the Oceans (IAPSO). Members from both the marine and terrestrial groups elected to participate in the exchange. This IAHS Redbook contains 38 peer-reviewed papers on one or more aspects of water and chemical fluxes across the sea floor. The papers have been organized into three general categories: physical, chemical, and modelling.

The editors are grateful to the symposium participants for their scientific contributions, which together form an impressive volume on the topic of groundwater–seawater interactions. We also thank symposium participants for their prompt submission of manuscripts and adherence to a tight publication schedule. Cate Gardner and her colleagues at IAHS Press are graciously thanked for their tireless effort in preparing the papers for publication. Lastly, the editors thank Mary Hill (President of ICGW) for suggesting this topic for the IUGG meeting in Perugia and Pierre Hubert (Secretary General of IAHS) for coordinating the symposium details.

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