

## Preface

The hydrosphere is dynamic across the major compartments of the Earth system: the atmosphere, the oceans and seas, the surface waters over the emerged territories, and the groundwaters within diverse substrata below the two last compartments. The global geography of the hydrosphere essentially depends on thermodynamic and mechanical processes which develop within the latitudinal and geomorphological structure.

Interfaces between these major compartments are very diverse across the world, essentially depending on the particular structural settings of latitude and geomorphology. Water-related processes at these interfaces are complex, depending both on the interface itself (geometry, permeability, (an-)isotropy, ...), and on the characteristics of the particular interfaced compartments (governing processes, characteristic scales, size, remote drivers in time and space, associated biogeochemical flows, ...).

Functioning at and across the interfaces is also very diverse and contingent on time, because the influence of one of the interfaced compartments depends on the state of the others, as extreme events can involve one or several of the interfaced compartments, and extreme and cumulated events can themselves modify the interface itself.

At larger time scales, the issue of change is major and multi-faceted. The ageing of the interfaced compartments and the interface itself are very influential, yet have independent or dependent trajectories. More generally, various aspects of global change directly or indirectly impact the considered interfaces and interfaced compartments and processes. Climate, sea-level, oceanographic currents and hydrological processes are all more or less under change, while anthropogenic changes are often intense in the geographic settings corresponding to the considered interfaces, with explicit or implicit impacting and impacted effects.

The corresponding scientific questions and the world diversity are well covered by the scope of IUGG – the International Union of Geodesy and Geophysics. This book is the output of two symposia jointly organized by IAHS – the International Association of Hydrological Sciences and IAPSO – the International Association for the Physical Sciences of the Oceans, both constituent associations of the IUGG, at their joint scientific assembly (together with IASPEI – the International Association of Seismology and Physics of the Earth’s Interior) held in Gothenburg, Sweden, July 2013. The focus is thus on the corresponding oceanographic and hydrological compartments and interfaces, keeping aside the atmosphere and the cryosphere. The first symposium was focused on “*Land–Ocean Interaction – Hydrodynamics and Biogeochemistry*”. The second one focused on “*Implications of Sea Level Change for the Coastal Zone*”, and was a celebration of the 80th Anniversary of the PSMSL – Permanent Service for Mean Sea Level, as well as a contribution to the works of the recently set up CCEC – Commission on Climatic and Environmental Change of IUGG.

This joint output materializes in the IAHS Red Book Publication series, the oldest hydrological series dating back to 1924, recently re-launched as the open access journal *PIAHS*. It is another inter-association publication, following up on several previous ones, the last jointly published by IAHS and IAPSO being IAHS Publ. 312, edited by W. Sanford *et al.*, 2007: *A New Focus on Groundwater–Seawater Interactions* – for the IUGG General Assembly held in Perugia.

This book is also a contribution to both the recently completed IAHS decade on *PUB – Prediction in Ungauged Basins* (2003–2012) as processes are often un- or poorly gauged at the most relevant places or along the geometry of the interface, and the new IAHS decade, *Panta Rhei – Everything Flows* (2013–2022), focusing on the issues of hydrology and societal changes.

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#### **About the cover illustration**

The sculpture is an allegory of the meeting of the Charente River and the Atlantic Ocean, their collaboration and wrestling, with mixed water outflowing – which symbolizes many of the issues addressed in this volume.

The sculpture (erected in the 1750s by Bourguignon) is on top of the Colbert Square fountain in Rochefort city, Charente Maritime department, France. The city was built as a royal arsenal in 1666 on coastal marshland in a meander of the Charente River, close to the estuary and protected by islands, but with strong tidal currents. The fountain, made of limestone, used to be fed by a spring from groundwater flowing below the swamp. In addition to local urban uses, freshwater from springs nearby would be loaded onto vessels and so distributed across the world.

The Latin inscription on the fountain states:

*Laeta diu varios errabam nympha per agros, Laetior in vestris mœnibus ecce fluo*

which means:

*I used to flow happily in the countryside, I'm flowing more happily now in your walls*

*Autrefois je coulais joyeuse dans les campagnes, plus joyeuse encore je coule maintenant dans vos murs*

Photography by C. Cudennec.