

## Preface

Historically, the disciplines of oceanography, meteorology and engineering have developed in relative isolation from each other. The interrelationships between the fields have mostly consisted of the mutual use of the results of relatively focused studies into specific processes. Occasionally, research outputs from various disciplines are used in a multi-disciplinary way, to address issues of local or regional concern. Contemporary Earth Science, however, is evolving towards more and more systematic, interdisciplinary research, in which elements from different disciplines are brought together early in the research process to maximize the understanding of complex physical, chemical, geological and ecological systems.

Changes in the way science is conducted are demonstrated in the history of the special issues of the *Estonian Journal of Engineering* and its predecessors on oceanography, meteorology and coastal engineering. A short overview of such special issues in the scholarly journals of the Estonian Academy of Sciences since 2000 is found in the preface to issue 3 of volume 14 of the *Estonian Journal of Engineering*.

The first issue covered a wide range of relatively narrow-scoped papers: long-term changes in the sea ice regime and safety of icebound shipping, the experimental investigation of the structure of breaking wave boundary layers, the characteristics of contemporary wind measurements, the statistics of extreme wet and dry weather conditions, and the time series of the outgoing long-wave radiation. The second issue was more focused on oceanography but still presented a selection of examples of research on discrete problems. In the field of hydrodynamics, an analysis of travelling wave solutions in inhomogeneous media, simulation of patterns of wakes from high-speed ferries and a comparison of two versions of circulation models of the Gulf of Finland were presented, and in meteorology there were papers examining synoptic weather types associated with heavy precipitation and wind properties at coastal stations.

The significant feature of the present issue is that it mostly comprises papers that present analysis of several elements of the earth's environment, such as bringing together research into the dynamics of both the water and the air in the coastal environment, or examining the consequences of human intervention on the dynamics of natural systems. The key words are wave measurements and modelling, wind and ship waves, wave asymmetry, fast ferries, littoral drift, coastal erosion, sedimentation processes, port terminals, underwater irradiation, coastal winds and off-shore wind parks. Many papers express a pleasing

tendency towards uniting fundamental research in different fields of earth sciences and their practical applications in coastal and civil engineering.

The issue begins with an analysis of the driving forces and recent developments in the understanding of coastal processes in the eastern Gulf of Finland by D. Ryabchuk et al. This is an extremely vulnerable area, in which relatively small changes in both the natural and anthropogenic forcing factors may lead to significant consequences in terms of coastal and nearshore processes. An attempt to quantify the potential local changes in the properties of wave fields due to vessel wakes, and the effect of these changes is presented in three following papers that focus on changes in the magnitude and direction of littoral sediment transport (L. Kelpšaitė and T. Soomere), variations in wave shape and its consequences (D. Kurennoy et al.) and monitoring of wave-induced sediment resuspension by means of optical methods and sediment trapping (A. Erm et al.). A broader description of large-scale effects of construction of port facilities in generally similar locations, but with substantially different local hydrodynamic loads, is presented by A. Sergeev et al., with examples from two sites in the eastern Gulf of Finland. Finally, an analysis of diurnal variations of the mean wind speed at a coastal site has been performed by S. Keevallik and T. Soomere from the viewpoint of the effectiveness of a planned nearshore wind park.

Last but not least, this special issue considerably differs from those preceding it with a wider international authorship. While the majority of contributions to the former issues were written by researchers from Estonian institutions, only two papers in this issue are led by local authors. Two papers are written by experts from Saint-Petersburg and the leading authors of two other papers are international PhD students who participate in the doctoral programme within the framework of the Marie Curie Research and Training Network SEAMOCS at the Institute of Cybernetics at Tallinn University of Technology. This widening of the authorship highlights the importance and universality of coastal research in geographically separated but contextually similar coastal locations.

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