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Journal of Marine Systems 66 (2007) 1–3
JOURNAL OF MARINE SYSTEMS
www.elsevier.com/locate/jmarsys

Editorial

37th International Liège Colloquium on Ocean Dynamics, Liège, Belgium, May 2–6, 2005, 5th International Symposium on Gas Transfer At Water Surfaces

The 37th Liège Colloquium on Ocean Dynamics hosted the 5th International Symposium on Gas Transfer at Water Surfaces in Liège, Belgium from May 2 to 6, 2005. These successful symposia series that started in 1983 are unique in that they are the only venues that specifically focus on advances in research on gas transfer across water surfaces.

The "First International Symposium on Gas Transfer at Water Surfaces" was held at Cornell University in Ithaca, New York, 13–15 June 1983, organized by Drs. Brutsaert and Jirka (Brutsaert and Jirka, 1984). The "Second International Symposium on Gas Transfer at Water Surfaces" was held in Minneapolis, 11–14 September 1990, organized by Drs. Gulliver and Holland (Wilhelms and Gulliver, 1991). The third conference was held in Heidelberg, Germany, 24–27 July 1995 (Jähne and Monahan, 1995) and the fourth conference was held in Miami in June 2000 (Donelan et al., 2002). At the meeting in Miami, Dr. Nightingale and Prof. Liss were nominated for the position of conference organizers with the conference to be held in Europe in 2005. Fortuitously and independently, the Liège Colloquium organizers proposed a focus on gas exchange processes in their long-running Ocean Dynamics conference series. It was decided to join the conferences and Dr. Borges took the lead of the organizing effort, with the help from the steering committee of 28 experts well versed in all aspects of gas transfer research. This meeting at the University of Liège attracted 100 participants with a similar amount of presentations. The present volume reflects the broad spectrum of theoretical, laboratory and field research that was presented during the meeting. While no specific themes were assigned for the presentations, the papers in this volume are loosely ordered under current overlapping research thrusts in the study of gas transfer.

Modelling of the processes controlling air–sea gas transfer is making steady advances. Papers by Tsumori and Sugihara (2007-this issue) and Soloviev (2007-this issue) focus on experimental and modelling approaches to characterize the transfer of gases across the aqueous boundary layer. Hwang (2007-this issue) models the spectral signature of breaking waves.

Investigations of breaking waves and bubbles, and their effect on air–sea gas transfer are detailed in several publications in this volume. Lafon et al. (2007-this issue) and Sugihara et al. (2007-this issue) provide complementary observations of enhancement of gas transfer by breaking waves. Leifer et al. (2007-this issue) and Woolf et al. (2007-this issue) present experimental and modelling results of bubble mediated gas transfer.

Through novel experimental techniques and observations the first estimates of air–sea gas transfer under hurricane and typhoon conditions, extend the range of gas transfer velocity (k) measurements up to wind speeds of 50 m s^{-1}, are presented in this volume in work by D'Asaro and McNeil (2007-this issue), McNeil and D'Asaro (2007-this issue) and Chu and Cheng (2007-this issue).

Quantifying gas exchange in field settings remains an important validation and application of gas transfer parameterizations. Papers by Weiss et al. (2007-this issue) and Tokoro et al. (2007-this issue) show studies of extended duration and in coastal, estuarine and riverine environments. Ho et al. (2007-this issue) investigate the effect of rain and its combined effect with wind on k, while Guérin et al. (2007-this issue) confirm laboratory findings on the effect of rain on k based on field measurements in a tropical reservoir.

It is widely recognized that upscaling of results to regional and global scale will have to rely on remote

0924-7963/$ - see front matter
doi:10.1016/j.jmarsys.2006.07.004

(satellite) sensing data. The manuscripts from Fangohr and Woolf (2007-this issue), Soloviev et al. (2007-this issue) and Glover et al. (2007-this issue) address different aspects of utilizing scatterometer and altimeter signals to infer air–sea gas exchange rates over decadal timescales.

Several papers discuss estimates of regional fluxes with focus on controls of surface water and air concentrations of the gases of interest. While the intensity of gas exchange across the air–sea interface is largely controlled by k, the direction of the exchange is thermodynamically driven by the gas air–water concentration gradient. The latter in turn depends on a combination of chemical, biological and physical processes acting from sub-daily to climatic time scales. During the meeting, emphasis was given to the growing research field of climatically active gases in coastal and high latitude environments. Semiletov et al. (2007-this issue) and Shakhova and Semiletov (2007-this issue) report respectively, extended CO_2 and CH_4 data sets in the fast-changing and the seldom investigated Arctic Ocean. Ferrón et al. (2007-this issue) investigate CH_4, CO_2 and N_2O in a strongly anthropogenically impacted estuary. Kitidis et al. (2007-this issue) also investigate CH_4 dynamics in an estuarine-like environment. Using Voluntary Observing Ships, Wanninkhof et al. (2007-this issue) and Padín et al. (2007-this issue-a,b) report high temporal and spatial resolution CO_2 data sets in, respectively, the Caribbean Sea and the English Channel.

This volume presents cutting edge research on air–sea gas transfer over the past 5 years. The different research avenues will be the foundation of continued work that has received increasing attention in programs addressing feedbacks in the climate system such as the Surface Ocean Lower Atmosphere Study (SOLAS). The next meeting will be held in Kyoto, Japan in 2010 to be hosted by Prof. Komori.

Acknowledgement

We thank the reviewers for relevant and timely comments on the manuscripts. The meeting received financial support from the Ministère de l'Emploi et de la Formation du Gouvernement Wallon, the Ministère de l'Enseignement Supérieur et de la Recherche Scientifique de la Communauté Française de Belgique, the Fonds National de la Recherche Scientifique and the Université de Liège, and was internationally publicized by SOLAS. We gratefully acknowledge the financial and logistic support from these agencies and organizations.

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