water

Turbulence in River and Maritime Hydraulics

Edited by
Michele Mossa, Donatella Termini and Peter A. Davies

Printed Edition of the Special Issue Published in *Water*

www.mdpi.com/journal/water

MDPI

Turbulence in River and Maritime Hydraulics

Turbulence in River and Maritime Hydraulics

Special Issue Editors

Michele Mossa
Donatella Termini
Peter A. Davies

MDPI • Basel • Beijing • Wuhan • Barcelona • Belgrade

Special Issue Editors
Michele Mossa
Polytechnic University of Bari
Italy

Donatella Termini
University of Palermo
Italy

Peter A. Davies
University of Dundee
UK

Editorial Office
MDPI
St. Alban-Anlage 66
4052 Basel, Switzerland

This is a reprint of articles from the Special Issue published online in the open access journal *Water* (ISSN 2073-4441) in 2018 (available at: https://www.mdpi.com/journal/water/special_issues/turbulence)

For citation purposes, cite each article independently as indicated on the article page online and as indicated below:

LastName, A.A.; LastName, B.B.; LastName, C.C. Article Title. *Journal Name* **Year**, *Article Number*, Page Range.

ISBN 978-3-03897-594-6 (Pbk)
ISBN 978-3-03897-595-3 (PDF)

© 2019 by the authors. Articles in this book are Open Access and distributed under the Creative Commons Attribution (CC BY) license, which allows users to download, copy and build upon published articles, as long as the author and publisher are properly credited, which ensures maximum dissemination and a wider impact of our publications.
The book as a whole is distributed by MDPI under the terms and conditions of the Creative Commons license CC BY-NC-ND.

Contents

About the Special Issue Editors

Michele Mossa is Professor of Hydraulics at the Polytechnic University of Bari (Italy). He is chief scientist of the Coastal Engineering Laboratory—LIC and a member of the board of directors of the National Consortium of Universities for Marine Sciences (CoNISMa) for the Polytechnic University of Bari. The main topics of his research are related to environmental and maritime hydraulics.

Donatella Termini is Professor of Hydraulics at the University of Palermo (Italy). Her research activity mainly regards fluvial processes and water distribution network models. Her present research efforts include the prediction of river morphological evolution, both through experimental investigations and by the development of numerical simulation codes.

Peter A. Davies is Professor of Fluid Dynamics at the University of Dundee (UK), where he works in environmental and geophysical fluid mechanics, including buoyancy-driven flows, rotating flows, turbulent mixing, internal waves, and wastewater disposal.

Preface to "Description of the Cover Image"

Starry Night, Vincent van Gogh, 1889 Oil on canvas, 73 × 92 cm, 28¾ × 36¼ in
Museum of Modern Art, New York City.

Art experts have long marvelled at the emotional chaos apparent in the later paintings of the Dutch artist Vincent Van Gogh. Perhaps that is because the images reflect light in a way that mimics the physics of turbulence. At least that is the view of a team of physicists led by Jose Luis Aragon of the National Autonomous University of Mexico, who analysed several of VanGogh's later paintings, including Starry Night, Road with Cypress and Star and Wheat Field with Crows. Mathematically, they studied how the luminosity, which is a measure of the total amount of visible light reflected off the paintings, varied across the canvas. Specifically, they analysed the likelihood that two points a distance D apart would have the same, or similar, brightness. In each of the paintings, they found that points further apart were statistically less likely to have similar luminosities. This in itself is not surprising. But this probability decreased in a very simple way, in proportion to the distance between the points, D, raised to some power. This pattern is significant. The very same pattern characterizes variations in fluid velocity at different points in a churning, turbulent liquid, a property called Kolmogorov scaling, after the Russian physicist Andrei Kolmogorov. "Some art critics, have said that Van Gogh's paintings give the impression of looking through a turbulent atmosphere," says team member Gerardo Naumis. "But we were very, very surprised by the close link to Kolmogorov's theory."

Also surprising is the difference between Van Gogh's later and earlier work .The pattern of luminosity in the paintings Van Gogh created during periods of emotional calm bears little resemblance to real-world turbulence. A strong visual sense of turbulence, apparent also in the mathematical analysis, appeared only in paintings created during times when he was psychologically disturbed. Van Gogh painted his famous Starry Night, for example, during a year spent in an asylum. In contrast, he completed his Self-Portrait with Pipe and Bandaged Ear in a state of self-described "absolute calm". Mathematically, this work lacks the signature of turbulence. Naumis speculates that there could be some link between fluid turbulence and the dynamics of neural processes in disturbed individuals, and that mathematics might provide a means for detecting psychic disturbance through the analysis of drawings. "The work so far is only a first step," he says. "We need to apply it to patients and see if it works".

(By Mark Buchanan, New Scientist, 15 July 2006)

Preface to "Turbulence in River and Maritime Hydraulics"

Understanding of the role of turbulence in controlling transport processes is of paramount importance for the preservation and protection of aquatic ecosystems, the minimization of the deleterious consequences of anthropogenic activity, and the successful sustainable development of river and maritime areas. In this context, the present Special Issue collects 15 papers which provide a representation of the present understanding of turbulent processes and their effects in river and maritime environments. The presented collection of papers is not exhaustive, but it highlights the key priority areas and knowledge gaps in this field of research.

Michele Mossa, Donatella Termini, Peter A. Davies
Special Issue Editors