

# OCEANOGRAPHY

## THE SURFACE OF THE SEA

Dr. Renu Devi



# Oceanography: The Surface of the Sea

Dr. Renu Devi



**RANDOM PUBLICATIONS**  
NEW DELHI (INDIA)

## **Oceanography: The Surface of the Sea**

---

ISBN 978-93-86372-36-9

© Reserved

All Rights Reserved. No Part of this book may be reproduced in any manner without written permission.

Published in 2018 in India by

**RANDOM PUBLICATIONS**

4376-A/4B, Gali Murari Lal, Ansari Road  
New Delhi-110 002

Phone : +9111-43580356, 011-23289044, 011-43142548

e-mail: sales@randompublications.com,

info@randompublications.com, randomexports@gmail.com

Type Setting by : Friends Media, Delhi-110089

Printed at : Sanat Printers

# Contents

---

<i>Preface</i> .....	v-vi
----------------------	------

<b>1. Oceanography</b> .....	<b>1</b>
Connection to the Atmosphere .....	7
Ocean Circulation .....	9
Deep Circulation in the Ocean .....	14
Importance of the Deep Circulation .....	15
Theory for the Deep Circulation .....	22
Observations of the Deep Circulation .....	25
Regional Oceanic Modelling System ROMS .....	32
Comments on Coastal Models .....	35
<b>2. Marine Archaeology and Conservation</b> .....	<b>39</b>
Maritime Archaeology .....	39
Preservation of Material Underwater .....	41
Coastal and Foreshore .....	43
Marine Biology .....	46
<b>3. Biological Oceanography</b> .....	<b>52</b>
Tools and Technology .....	52
Areas of Research .....	53
Biology of the Oceans .....	54
Ocean-Floor Bathymetry .....	56
Connection to the Atmosphere .....	60
Sea Floor Features .....	69
Underwater Depth of Lake or Ocean Floors .....	71
Plankton, Nekton, and Benthos .....	72
Response of the Upper Ocean to Winds .....	77
Inertial Motion .....	78
Ekman Mass Transports .....	87
Application of Ekman Theory .....	89
<b>4. Oceans and Current Environmental Issues</b> .....	<b>93</b>
Temperature and Salinity of the Oceans .....	95

Indian and Pacific Oceans .....	100
Pacific Ocean .....	103
Oceanic Current Phenomena .....	110
Coral Reefs .....	113
Ocean Current and Tides .....	124
Ocean Deposits .....	134
<b>5. The Sea-Level.....</b>	<b>138</b>
World-Wide Transgressions and Regressions .....	138
THE Continental Margin .....	141
The Geophysical Side of the Problem .....	147
Theories of Subaerial Origin.....	155
The Influence of Changing Sea-Level .....	164
The Marginal Flexure of the Continents .....	167
<b>6. Marine and Water Pollution .....</b>	<b>172</b>
Sources and Control of Marine Pollution .....	172
Criteria Employed for Disposal of Pollutants in Marine System .....	174
Coastal Management.....	178
Water Pollution and its Effects Structure .....	181
Sources .....	183
Pollutants .....	184
Domestic Wastes .....	188
Agrochemicals .....	190
Eutrophication .....	192
Animals and Human Beings .....	199
Eutrophication .....	212
Wastewater Treatment .....	212
Indicator Orgnisms .....	215
Domestic Wastes .....	219
Agrochemicals .....	223
Effect of Pollutants on Plants .....	232
Water Pollution Analysis and Monitoring .....	233
<b>7. Ocean and Wave Spectra.....</b>	<b>236</b>
Wave Power .....	236
Wave Momentum .....	244
Pierson-Moskowitz Spectrum .....	246
Sea State Estimated by Observers at Sea .....	252
The Oceanic Topography .....	254
Geostrophic Currents from Hydrography .....	258
Transportation on the Oceans .....	259
<b>Bibliography.....</b>	<b>263</b>
<b>Index .....</b>	<b>265</b>

# OCEANOGRAPHY

## THE SURFACE OF THE SEA

Oceanography is the study of the deep sea and shallow coastal oceans: biology, chemistry, geology and physics together make oceanography a richly interdisciplinary science. Oceanography, also known as oceanology and marine science, is the branch of Earth science that studies the ocean. Marine mammals live, feed, and reproduce in a vast, three dimensional fluid environment—the ocean. Air-breathing necessitates frequent attendance to the sea surface for all marine mammals, whereas pinnipeds cannot reproduce in the water and have thus retained a close tie to land or ice. Despite these ties to the boundaries of the ocean environment, oceanography is an important part of the study of marine mammals. Marine habitats can be divided into coastal and open ocean habitats. Coastal habitats are found in the area that extends from as far as the tide comes in on the shoreline out to the edge of the continental shelf. Most marine life is found in coastal habitats, even though the shelf area occupies only seven percent of the total ocean area. Open ocean habitats are found in the deep ocean beyond the edge of the continental shelf. Oceanographic environment in its all dimensions is thoroughly discussed in this book.

**Contents:** Oceanography; Marine Archaeology and Conservation; Biological Oceanography; Oceans and Current Environmental Issues; The Sea-Level; Marine and Water Pollution; Ocean and Wave Spectra.

### About the Author



**Dr. Renu Devi :** (MA, Ph.D Geography) is presently working as Assistant Professor in D. J. College Baraut, Bagpat which affiliated to Ch. Charan Singh University Meerut Uttar Pradesh, India. She has more than five year teaching experience in UG/PG classes of geography and also supervise the project work at PG level. She has proposed the Nobel thought on "Integrated Rural Development and Regional Planning" in her Ph.D thesis. She is highly expertise in Agriculture geography, Environmental, and Medical geography and covered various national and international conferences on remote sensing and Geographic information system (GIS)". She has published various research paper in environmental geography, agriculture geography and advanced medical geography and climate changes. She has been awarded the honor of Rani Laxmibai SSDAT Award for outstanding contribution in the field of geography in 2010 by Society for Scientific Development in Agriculture and technology Jhansi UP (India) and Excellence Teaching award-2011 by Rastriya Shaikshik Mahasang, Uttar Pradesh.

**RP**  
**RANDOM**  
**RANDOM PUBLICATIONS**  
**PUBLISHERS • DISTRIBUTORS**

4376-A/4B, Gali Murari Lal, Ansari Road, Daryaganj  
New Delhi-110002, Ph : +91-11-43142548/43580356 / 23289044  
Email : [randomexports@gmail.com](mailto:randomexports@gmail.com),  
[sales@randompublications.com](mailto:sales@randompublications.com),  
[info@randompublications.com](mailto:info@randompublications.com)

