CAMBRIDGE MONOGRAPHS ON PHYSICS

THE PHYSICS OF THE STRATOSPHERE

THE PHYSICS OF THE STRATOSPHERE

BY

R. M. GOODY

Professor of Meteorology, Harvard University
Formerly Fellow of St John's College, Cambridge

CAMBRIDGE
AT THE UNIVERSITY PRESS
1958

CAMBRIDGE
UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

Published in the United States of America by Cambridge University Press, New York

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of education, learning and research at the highest international levels of excellence.

www.cambridge.org
Information on this title: www.cambridge.org/9781107696068

First printed 1954
Reprinted 1958
First published 1958
First paperback edition 2014

A catalogue record for this publication is available from the British Library

ISBN 978-1-107-69606-8 Paperback

GENERAL PREFACE

The Cambridge Physical Tracts, out of which this series of Monographs has developed, were planned and originally published in a period when book production was a fairly rapid process. Unfortunately, that is no longer so, and to meet the new situation a change of title and a slight change of emphasis have been decided on. The major aim of the series will still be the presentation of the results of recent research, but individual volumes will be somewhat more substantial, and more comprehensive in scope, than were the volumes of the older series. This will be true, in many cases, of new editions of the Tracts, as these are republished in the expanded series, and it will be true in most cases of the Monographs which have been written since the War or are still to be written.

The aim will be that the series as a whole shall remain representative of the entire field of pure physics, but it will occasion no surprise if, during the next few years, the subject of nuclear physics claims a large share of attention. Only in this way can justice be done to the enormous advances in this field of research over the War years.

N. F.
D. S.

CONTENTS

CHAPTER VI

Radiation

AUTHOR'S PREFACE

I wrote this monograph assuming that the reader would be a physicist who was interested to learn something of the progress in a subject outside his own field of study. I should point out therefore that there is a very great difference between the approach to a laboratory problem and the approach to a geophysical (or, for that matter, astronomical) problem. In geophysics, and particularly in atmospheric physics, experiments are either impracticable or of limited value. Controlled conditions are essential for a successful experiment, while with the atmosphere it is only possible to observe and to hope that the conditions relevant to a unique interpretation are either known or can be guessed. It is not surprising that this may lead to incompatible results from two apparently reliable observations, each intelligently interpreted, and there are examples of this kind in the following pages. While the laboratory worker would wisely reject such results as untrustworthy, the atmospheric physicist must often accept them as the only results he is likely to obtain.

Every research has its own difficulties, and atmospheric physics is not unique in the effort, expense and even personal discomfort that may be involved in gathering representative observations. However, once again, it differs from most branches of physics in working with a system which is very far from equilibrium. As a result it is very difficult to specify just how many observations are desirable, and, moreover, when it comes to theoretical interpretation, equilibrium hypotheses, which are normally so valuable, turn out to be useful for a rough superficial examination only.

In presenting this subject to those who have not studied geophysics, I have sought to emphasize characteristic features where they appeared to be instructive, but to avoid issues which seemed to me to be particularly confusing. If this monograph had been written for the geophysicist, I would have had to consider in greater detail the differences of opinion which exist upon nomenclature, the relative importance of different topics, the relative reliability of different observations, etc. The meteorologist,

for example, might well consider that my treatment of dynamical matters is most inadequate. I hope, however, that those who specialize in this subject will derive some of the interest from reading this monograph that I have derived from writing it.

I am indebted to Drs G. K. Batchelor, M. V. Wilkes and T. W. Wormell for commenting upon some sections. Mr C. D. Walshaw read the manuscript with care and found many minor errors and obscurities. Mr H. E. Goody has helped me greatly with his thorough reading of the proofs.

R. M. GOODY

Cambridge 1953