



# CLOUDS

THEIR FORMATION,  
OPTICAL PROPERTIES,  
AND EFFECTS

EDITED BY

PETER V. HOBBS AND  
ADARSH DEEPAK

CLOUDS  
THEIR FORMATION, OPTICAL  
PROPERTIES, AND EFFECTS

Edited by

PETER V. HOBBS

Department of Atmospheric Sciences  
University of Washington  
Seattle, Washington

ADARSH DEEPAK

Institute for Atmospheric Optics and Remote Sensing  
Hampton, Virginia

280/3466

INSTITUT  
FÜR METEOROLOGIE U. KLIMATOLOGIE  
UNIVERSITÄT HANNOVER  
HERRENHAUSER STR. 2 • 3000 HANNOVER 91



ACADEMIC PRESS 1981

A Subsidiary of Harcourt Brace Jovanovich, Publishers  
New York London Toronto Sydney San Francisco



# CONTENTS

Participants	vii
Foreword	xi
Preface	xiii

## STRUCTURE OF CLOUDS

P. V. Hobbs, Chairman

Scales Involved in the Formation and Organization of Clouds and Precipitation	1
<i>Peter V. Hobbs</i>	
Techniques for Probing Cloud Microstructure	15
<i>R. G. Knollenberg</i>	
The Microstructure of Atmospheric Clouds and Precipitation	93
<i>H. R. Pruppacher</i>	
Fog Structure	187
<i>James E. Jiusto</i>	

## INTERACTION OF PASSIVE RADIATION WITH CLOUDS

S. K. Cox, Chairman

Radiation Characteristics of Clouds in the Solar Spectrum	241
<i>Stephen K. Cox</i>	
On the Diurnal Properties of Clouds from Geostationary Satellite Observations	281
<i>Garry E. Hunt</i>	

Some Aspects of the Optical Properties of Ice Clouds <i>Kuo-Nan Liou</i>	315
Open Discussion	361

INTERACTION OF ACTIVE RADIATION WITH CLOUDS  
A. I. Carswell, Chairman

Laser Measurements in Clouds <i>A. I. Carswell</i>	363
Transmission and Reflectivity of Ice Clouds by Active Probing <i>C. M. R. Platt</i>	407
A Review of the Theory of Multiple Scattering of Lidar Beams in Clouds <i>James A. Weinman</i>	437
Pulsed Blue-Green Propagation Through Cloud and Fogs <i>G. C. Mooradian and M. Geller</i>	465
Index	493