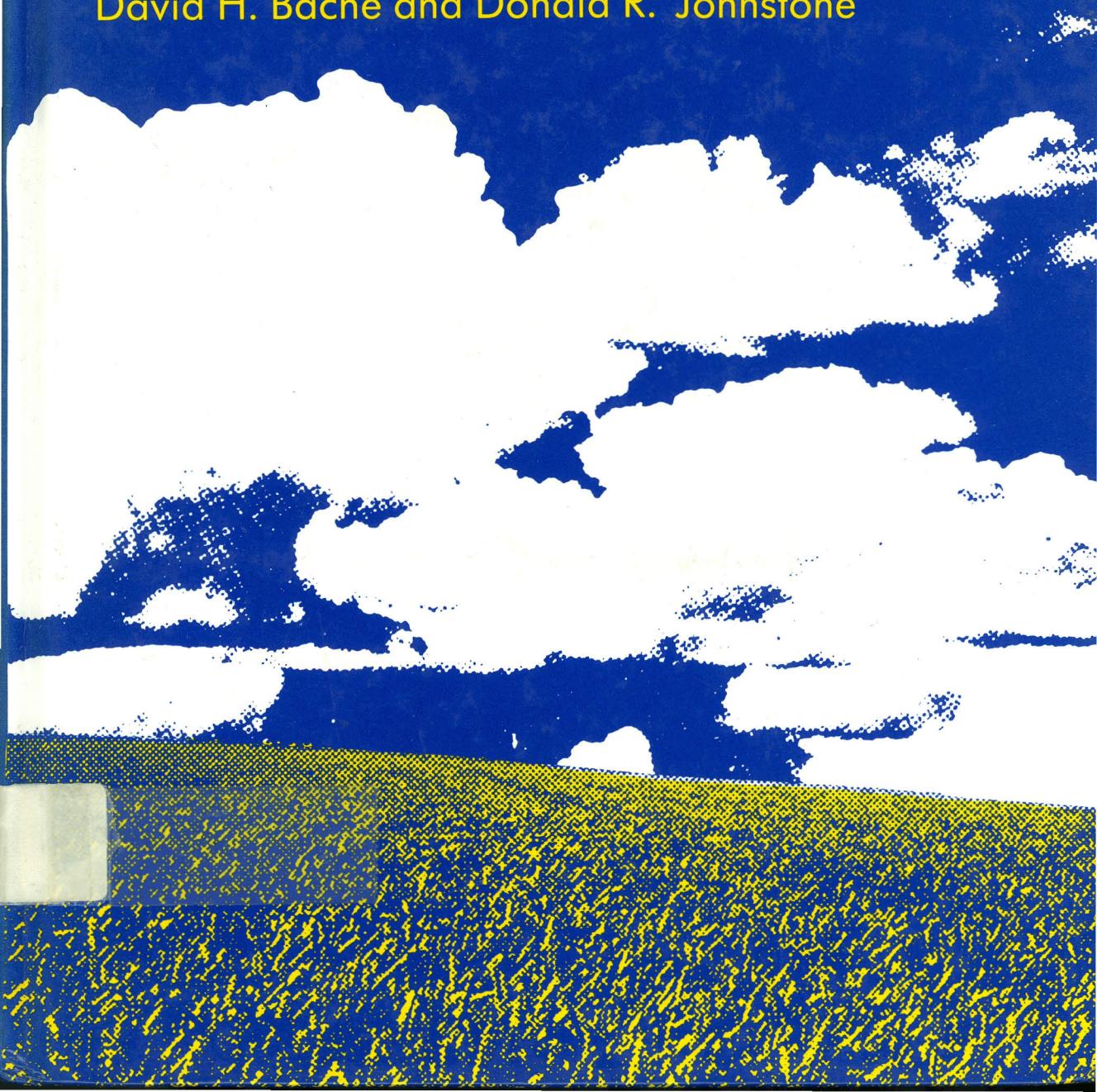


ELLIS HORWOOD SERIES IN  
ENVIRONMENTAL MANAGEMENT, SCIENCE AND TECHNOLOGY

# MICROCLIMATE AND SPRAY DISPERSION

David H. Bache and Donald R. Johnstone



# **MICROCLIMATE AND SPRAY DISPERSION**

**DAVID H. BACHE**

Department of Civil Engineering, University of Strathclyde,  
Glasgow

and

**DONALD R. JOHNSTONE**

Formerly Applications Technologies Problem Area Manager,  
Natural Resources Institute, Chatham Maritime, Kent



**ELLIS HORWOOD**

NEW YORK LONDON TORONTO SYDNEY TOKYO SINGAPORE

INSTITUT  
FÜR METEOROLOGIE U. KLIMATOLOGIE  
UNIVERSITÄT HANNOVER  
HERRENHÄUSER STR. 2 - 30419 HANNOVER

290 / 3597

## Table of contents

Preface	ix
Notation and symbols	xi
<b>1 The nature of chemical dispersions and their uses</b>	1
1.1 Introduction	1
1.2 Pesticides and other agents chiefly applied as sprays	2
1.3 Extent of use	5
1.4 Economic aspects	6
1.5 Approach to strategy	7
1.6 References	10
<b>2 Meteorology</b>	12
2.1 Introduction	12
2.2 Preliminary concepts	12
2.3 Surface shearing stress and wind	18
2.4 The Monin–Obukhov similarity	22
2.5 Stability classes	23
2.6 Profiles in the surface layer	26
2.7 Flows in complex terrain	30
2.8 Flows within plant canopies	39
2.9 References	43

vi Table of contents

<b>3 Sprays: specification, atomization and application systems</b>	45
3.1 Introduction	45
3.2 The application variables	45
3.3 Characterization of sprays	47
3.4 Sedimentation, inertia and evaporation	56
3.5 Atomization and atomizers	68
3.6 Application systems	73
3.7 Controlled droplet application	76
3.8 References	76
<b>4 Dispersion theory</b>	80
4.1 Introduction	80
4.2 Concept of diffusion	81
4.3 Gaussian distributions	84
4.4 Deposition of sedimenting material	89
4.5 Variability	111
4.6 Spray drift	115
4.7 Random-walk models	118
4.8 References	120
<b>5 Deposition</b>	123
5.1 Introduction	123
5.2 Aerodynamic aspects	124
5.3 Specification of particle deposition	125
5.4 Transport in a turbulent flow	137
5.5 Deposition in plant canopies	147
5.6 Deposition on insects	155
5.7 References	162
<b>6 Applications</b>	164
6.1 Introduction	164
6.2 Control of drift spraying	165
6.3 Containment spraying	180
6.4 Implications of evaporation	189
6.5 Optimum droplet size for contact effect of insecticides	197
6.6 References	202
<b>7 Monitoring techniques</b>	204
7.1 Purpose of monitoring	204
7.2 Some monitoring requirements	205
7.3 Meteorological measurements	205
7.4 Dispersion: sampling and measurement	211
7.5 <i>Ad hoc</i> and systematic sampling	216
7.6 References	217

<b>8 Epilogue</b>	220
8.1 Basic concepts	220
8.2 The future—themes, gaps	222
<b>Appendix</b>	224
Table A1 Properties of air	224
Table A2 Variation in saturation vapour pressure of water with temperature	225
Table A3 Error function erf(x)	226
Table A4 Chi-square distribution (values of $\chi^2_\alpha$ )	227
References	227
<b>Index</b>	228