

CLIMATE DATA AND RESOURCES

A REFERENCE AND GUIDE

EDWARD LINACRE



CLIMATE DATA AND RESOURCES

A reference and guide

Edward Linacre

INSTITUT
FÜR METEOROLOGIE U. KLIMATOLOGIE
UNIVERSITÄT HANNOVER
HERRENHÄUSER STR. 2 3000 HANNOVER 21

286 / 3550



London and New York

CONTENTS

<i>Figures</i>	vii
<i>Tables</i>	xii
<i>Preface</i>	xvi
<i>Acknowledgements</i>	xviii

Part I Climate data

1 INTRODUCTION	3
<i>Climate and climatology</i>	3
<i>History of climatology</i>	4
<i>Scales of climate</i>	9
<i>Units</i>	13
<i>Climate change</i>	19
2 MEASURING CLIMATE DATA	23
<i>Climate stations</i>	23
<i>Measurement accuracy</i>	31
<i>Measurement of temperature</i>	35
<i>Measurement of humidity</i>	39
<i>Stevenson screen</i>	44
<i>Measurement of wind</i>	47
<i>Measurement of rainfall</i>	51
<i>Archiving</i>	61
<i>Relevance to climate change</i>	63
3 ESTIMATING CLIMATE DATA	64
<i>Estimating in general</i>	64
<i>Errors of estimation</i>	67
<i>Estimating screen temperature</i>	72
<i>Estimating dewpoint temperature</i>	85
<i>Estimating net irradiance</i>	89
<i>Estimating evaporation</i>	105
<i>Estimating and climate change</i>	106

CONTENTS

4 ANALYSING CLIMATE DATA	109
<i>Climate data</i>	109
<i>Presentation of data</i>	110
<i>Typical values</i>	117
<i>Scatter of values</i>	126
<i>Periodic variations</i>	134
<i>Persistence</i>	135
<i>Relationships</i>	138
Part II Climate resources	
5 SOLAR RADIATION	147
<i>The nature of solar radiation</i>	147
<i>Attenuation of solar radiation</i>	156
<i>Measuring solar irradiance</i>	164
<i>Estimating the solar irradiance of level ground</i>	175
<i>Values of solar irradiance</i>	184
<i>Solar irradiance of sloping surfaces</i>	193
<i>Solar energy</i>	197
<i>Radiation and climate change</i>	201
6 WIND	202
<i>Causes of wind</i>	202
<i>Surface winds</i>	211
<i>Wind profile</i>	216
<i>Time variations</i>	220
<i>Frequencies of various wind speeds</i>	225
<i>Gusts</i>	225
<i>Estimating extreme winds</i>	231
<i>Spatial variation of winds</i>	239
<i>Wind power</i>	245
7 PRECIPITATION	250
<i>Introduction</i>	250
<i>Precipitation processes</i>	252
<i>Spatial variation of rainfall</i>	264
<i>Estimating the total rainfall within a catchment</i>	270
<i>Long-term, annual and seasonal rainfalls</i>	276
<i>Monthly and short-term rainfalls</i>	283
<i>Heavy rainfalls</i>	296
<i>Dew</i>	300
<i>Snow</i>	305
<i>Precipitation and climate change</i>	310
8 NOTES	312
<i>Bibliography</i>	342
<i>Index</i>	356