CONTEMPORARY CLIMATOLOGY

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Preface

The study of climate has always been challenging because it draws upon many disciplines. We set out to write a book for undergraduates about the Earth's climate which reflects the various disciplines involved, provides the basic factual information, suggests ways in which this information can be used and indicates where the challenges, and excitement, lie. We have tried to emphasise the importance of climatic information without making its acquisition and understanding seem too daunting. To assist those who are less well acquainted with meteorological and climatological terminology there is a glossary at the end of the book. Information about Système Internationale (SI) units is given in an appendix.

People who study or need to be able to understand the climate come from a wide range of backgrounds with a large variety of motives. Indeed, one of the major difficulties which has beset the study of climate has been the naming of the people who do it! Speaking of climatology in 1978 in an address reported in the *Bulletin of the American Meteorological Society* (**10**, 1171–1174), Professor Kenneth Hare said, '. . . you hardly heard the word professionally in the 1940s. It was a layman's word. Climatologists were the halt and the lame . . . in the British service you actually had to be medically disabled in order to get into the climatological division . . . It was clearly not the age of climate. Now it is. It's the respectable thing to do . . . This is obviously the decade in which climate is coming into its own.' We hope that this text will encourage our readers in their quest for climatological excellence.

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Special thanks are due to Mr L. Dent, Principal Meteorological Officer, Manchester Airport and Mr Kiff at the Meteorological Office Training College at Shinfield, both of whom allowed us to photograph their operational meteorological equipment. The staff at the National Weather Service Forecast Office, Raleigh-Durham Airport and at the National Climatic Data Center, Asheville have unfailingly answered numerous questions with courtesy and wit.

Fortunately we, respectively, married spouses who can add up and integrate and spell and punctuate. For these and all the many efforts Brian and Shirley have made to help us complete this book we are indeed grateful.

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List of Symbols

All symbols used to represent constants and variables are defined at their first occurrence in the text. A limited number are used in other textual locations separate from this definition and these are collected here for easy reference.

Roman

	A	albedo
	c_p	specific heat at constant pressure
	C	specific heat
	C^*	conductive capacity
	E	energy
	E^*	radiant energy
	g	acceleration
	G	heat flux into the ground
	H	sensible heat flux
	K^*	thermal diffusivity
	K	thermal conductivity
or	K	solar radiation ($K\downarrow$ = downward, $K\uparrow$ = upward)
	L	longwave (terrestrial) radiation ($L\downarrow$ = downward, $L\uparrow$ = upward)
or	L	latent heat of vaporisation of water
	LE	latent heat flux (so defined because it equals the product of (L and rate of evaporation)
	p	pressure
	P	precipitation
	PET	potential evapotranspiration
	PWV	precipitable water vapour
	Q^*	net radiative flux at the surface
	$R\downarrow$ & $R\uparrow$	net incoming and outgoing planetary radiation
	S_F	solar (flux) constant (= 1370 W m^{-2})
	S	instantaneous top-of-the-atmosphere solar flux (= $S_F/4$)

t	time
T	temperature
T_d	dew point temperature
V_g	geostrophic wind
z	height (in the atmosphere)
Z	solar zenith angle

Greek

γ	environmental lapse rate
Γ_d	dry adiabatic lapse rate (DALR)
Γ_s	saturated adiabatic lapse rate (SALR)
$\triangle$	indicates a small change in the associated variable (e.g. $\triangle T$ = small change in temperature)
ϵ	emissivity
ϕ	potential temperature
λ	wavelength (when a subscript indicates occurrence at a specific wavelength)
ρ	density
σ	Stefan–Boltzmann's constant (= 5.67×10^{-8} W m^{-2} K^{-4})
or σ	standard deviation
τ	optical thickness (of atmosphere or cloud)
θ	latitude
Ω	angular rotation rate of the Earth

Contents

Chapter 1
The Scope and Controls of the Climate