Appendix B

Acronyms, Symbols, and Constant Values

Comment [01]: Missing the many acronyms from the reanalysis data sources. See those tables in chapter 2. Such as AIREP, ACARS, AMDAR, ASDAR, TAO, TRITON, PAOBs, beta, cap U, k_sub beta, GPS/MET, LIMS, TCPW, RMS, See website list at bottom of table 2.1, WMO, more in Table 2.3 and 2.4

Purpose: Defines acronyms and symbols used throughout the book. Where relevant, the value of the constant is provided

AMIP Atmospheric model intercomparison project
C_p specific heat of dry air at constant pressure, = 1004 J K^{-1} kg^{-1}
C_{sd} specific heat estimate for dry soil, ~800 J K^{-1} kg^{-1}
C_{sw} specific heat estimate for wet soil, ~1500 J/(kgK)
C_v specific heat of dry air at constant volume, = 717 J K^{-1} kg^{-1}
C_w specific heat for water, ~4200 J K^{-1} kg^{-1} varies with temperature. This value for T~280K
DOE (U.S.) Department of Energy
DSE dry static energy, = $C_pT+\Phi$
ECMWF European Centre for Medium-range Weather Forecasts
ERA-40 ECMWF 40 year reanalysis datasets
E_w evaporation of liquid water
e vapor pressure
e_s saturation vapor pressure
F friction
f Coriolis parameter, = $2\Omega\sin\varphi$
f_o constant value of Coriolis parameter at latitude φ_o, = $2\Omega\sin\varphi_o$
g acceleration of gravity, = 9.81 m s^{-2}
HCBE hypothetical boundary between atmospheric regions where Hadley Cells dominate versus baroclinic eddies.
i square root of -1
i (bold) unit vector pointing eastwards
j (bold) unit vector pointing northwards
k (bold) unit vector pointing locally outwards (i.e. 'upwards')
k_H horizontal viscosity coefficient for second order friction
k_R viscosity coefficient for Rayleigh friction
k_z vertical viscosity coefficient for second order friction
L latent heat of vaporization, = 2.5×10^6 J kg^{-1} at 0 C.
M angular momentum per unit mass, =R_c (R_c Ω + u)
MSE moist static energy, = $C_pT+\Phi+Lq$
N^2 Brunt-Väisälä frequency, = $\frac{g}{\theta_s}\left(\frac{\partial\theta_s}{\partial z}\right)$ in height coordinates for an ideal gas
NCEP (U.S.) National Centers for Environmental Prediction
NDRA2 NCEP-DOE (AMIP-II) reanalysis datasets
P_w precipitation of any solid or liquid form of water
P_{QG} quasi-geostrophic potential vorticity
P_{SWE} shallow water equations potential vorticity, = $\frac{\tilde{\zeta}_g + f}{\tilde{h}}$

p	pressure
p_{oo}	reference pressure, typically set to 10^5 Pa
Q	total diabatic heating rate per unit mass, = Q_J / C_p (units K/s)
Q_J	total diabatic heating rate per unit mass (units J s^{-1} kg^{-1})
Q_{NM}	diabatic heating rate from processes other than net changes of water state (K/s units)
Q_{QGy}	meridional gradient of quasi-geostrophic potential vorticity
QG	quasi-geostrophic
q	specific humidity
R	gas constant for dry air, = 287 J K^{-1} kg^{-1}
R_v	gas constant for water vapor, = 461 J K^{-1} kg^{-1}
R_c	r cos(φ)
R_o	Rossby number, =U/f_oL_s, where U and L_s are speed and horizontal length scales.
r	mean radius of the solid earth, 6370 km
S_a	enthalpy, = C_p T
S_o	entropy, $dS_o = C_p\, d\ln(\theta)$
SLP	sea level pressure
SWE	shallow water equations
T	temperature
t	time
U_{amc}	a zonal wind component conserving angular momentum
u	zonal component of the wind
u_{ag}	zonal component of the ageostrophic wind, = u - u_g
u_g	zonal component of the geostrophic wind, = $-\frac{1}{f}\frac{\partial Z}{\partial y}$ in pressure coordinates
v	meridional component of the wind
v_{ag}	meridional component of the ageostrophic wind, = v - v_g
v_g	meridional component of the geostrophic wind, = $\frac{1}{f}\frac{\partial Z}{\partial x}$ in pressure coordinates
$[v_R]$	meridional component of the zonal average residual circulation
w	vertical velocity in height coordinates
w_d	mixing ratio, equivalent to saturation mixing ratio at dewpoint temperature
Z	geopotential height
z	elevation
α	specific volume, = 1/ρ
α_v	specific volume for water vapor, = 1/e
λ	longitude
μ	=sin(φ)
Ω	angular rotation rate of the earth, 7.292 x 10^{-5} rad/sec
$\mathbf{\Omega}$, $\vec{\Omega}$	(bold or with arrow) angular rotation vector for the earth, = (0 **i**, Ω cos(φ) **j**, Ω sin(φ) **k**)
ω	(vertical) pressure velocity. ω = dP/dt
$[\omega_R]$	(vertical) pressure component of the zonal average residual circulation
Φ	geopotential, $d\Phi = g\, dz = -RTdp/p$ (for hydrostatic balance)
φ	latitude
ρ	density
ρ_w	density of fresh water. = 10^3 kg/m^3

Ψ streamfunction

τ surface stress by wind

θ potential temperature

θ_e equivalent potential temperature

ζ vertical component of relative vorticity, $= \vec{k} \bullet \vec{\nabla} \times \vec{V} = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}$

ζ_a vertical component of absolute vorticity, $= \zeta + f$

ζ_{ay} meridional gradient of vertical component of absolute vorticity

$\vec{\zeta}$ three dimensional vorticity, $= \vec{\nabla} \times \vec{V}$