Appendix A
List of Symbols

Symbol	description
A_e	Wind direction in natural earth coordinates
$AEXP$	Approximate expansion of the mesoscale grid (km)
B	A humidity variable; $\left(1 - \frac{RH}{100\%}\right)^2$
C_1	Term used in calculations for the lambert-conformal projection
C_2	$R_e \cos\phi_c$
d_{ijk}	Distance of observation k from gridpoint (i, j)
d_m	Effective distance used in ellipse and banana schemes
D	Difference value (Observation - First-guess)
e_s	Saturation vapor pressure
f	Coriolis parameter
g	Acceleration due to gravity (9.8 m s^{-1})
G_1	Current-guess field in Cressman scheme
G_2	Improved field in Cressman scheme
i	Gridpoint index; subscript o indicates the gridpoint nearest an observation point; subscript c indicates the center of curvature of the wind field at an observation point; subscript s indicates position of a station
I_{nex}	Unexpanded grid dimension in the y direction
j	Gridpoint index; subscript o indicates the gridpoint nearest an observation point; subscript c indicates the center of curvature of the wind field at an observation point; subscript s indicates position of a station
J_{nex}	Unexpanded grid dimension in the x direction
k	Observation index
k_m	Coefficient in the weighting factor for Barnes analysis.
ℓ	A level above serious diurnal effects, for calculation of surface pressure
L	Latent heat of condensation (2.5×10^6 J kg^{-1})
m_a	Molecular weight of dry air (28.97 g mol^{-1})
m_v	Molecular weight of water (18.016 g mol^{-1})
n	Number of observations which include a particular gridpoint within their regions of influence; distance along a perpendicular to the left of the flow; cone constant for map projections
O	Observation value
p	Pressure

p_ℓ	Pressure at 1000 or 850 mb for calculation of the geopotential height at new nonmandatory levels (ϕ_n); pressure at a level above diurnal variations for calculation of sea-level pressure or surface pressure
p_n	Pressure at a new nonmandatory level for calculation of the geopotential height at new nonmandatory levels (ϕ_n)
p_o	Sea-level pressure
p_s	Surface pressure
p_s'	Preliminary estimate of surface pressure, used in calculating surface pressure
p_t	Constant pressure of the model top
p^*	$p_s - p_t$
q	Specific humidity
q_s	Saturation specific humidity
r_{ij}	Distance from the center of curvature to the gridpoint (i, j)
r_k	Radius of curvature of the wind field at the kth observation point; conversion factor for m s^{-1} to kts
R	Radius of influence for objective analysis schemes
R_d	Ideal gas constant for dry air (287.04 J kg^{-1} K^{-1})
R_e	Radius of the earth (6370 km)
RH	Relative humidity
t	time
T	Temperature
$\overline{T}$	Mean temperature between the surface and sea-level, for calculating surface or sea-level pressure
T_c	A critical temperature used in defining the fictitious sea-level temperature T_o'
T_g	Ground temperature
T_ℓ	Temperature at the 850 or 1000 mb level for calculation of the geopotential height of a new nonmandatory level (ϕ_n); Temperature of a level above diurnal variations for the calculation of surface pressure and sea-level pressure
T_n	Temperature at a new nonmandatory level for calculation of the geopotential height of a new nonmandatory level (ϕ_n)
T_o	A preliminary fictitious sea-level temperature used in calculating surface pressure
T_o'	Fictitious sea-level temperature for calculating surface or sea-level pressure
T_s	Surface temperature
T_s'	Approximate surface temperature without serious diurnal effects, for calculating surface or sea-level pressure
T_v	Virtual temperature
T_1	Current-guess temperature used in iterative procedure for converting T_v to T

T_2	New approximation of temperature, based on T_1, calculated in the iterative procedure for converting T_v to T
u	x-component of the wind
u_e	x-component of the wind in natural earth coordinates
u_g	x-component of the geostrophic wind
v	y-component of the wind
v_c	Critical wind speed for determining analysis scheme
v_e	y-component of the wind in natural earth coordinates
v_g	y-component of the geostrophic wind
$\mathbf{V}$	Two-dimensional wind vector
V_e	Wind speed in natural earth coordinates
w	mixing ratio
W_{ijk}	Weighting coefficient due to the kth observation's influence on the gridpoint (i, j)
x	Horizontal grid coordinate, increasing from left to right
x_D	Distance in the x direction from the lower left corner to the center of the mesoscale grid
y	Horizontal grid coordinate, increasing from bottom to top
y_D	Distance in the y direction from the lower left corner to the center of the mesoscale grid
z_s	Surface height
α	Correction coefficient
$\alpha_{i,j}$	Unsmoothed meteorological variable defined at gridpoints
$\hat{\alpha}_{i,j}$	Partially smoothed value of $\alpha_{i,j}$
$\alpha^*_{i,j}$	Smoothed value of $\alpha_{i,j}$
α_m	Angle between the direction in earth coordinates and the direction in the mesoscale grid coordinates
β	Elongation of ellipses and curved ellipses for Ellipse and Banana schemes
γ	Lapse rate
γ_s	Standard atmospheric lapse rate (6.5×10^{-3} K m^{-1})
γ_{57}	Lapse rate between 500 and 700 mb
γ_{78}	Lapse rate between 700 and 850 mb
δ	Maximum difference allowed between an observations difference value and the average of difference values at nearby stations
ϵ	Ratio of molecular weights of water and dry air (0.622)
ζ_r	Relative vorticity; $\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}$
θ_{ij}	Angle from the positive x-direction to the line between the center of curvature of the wind field and the gridpoint (i, j)
θ_k	Angle from the positive x-direction to the line between the center of curvature of the wind field at the kth observation point and the kth observation point
λ	Convergence coefficient for weight factor in Barnes analysis

λ_c	Longitude of the center of the mesoscale grid
λ_o	Longitude of an observation
λ_1	$n(\lambda_o - \lambda_c)$, where n is the cone constant
ν	y-coordinate of interpolation point
ξ	x-coordinate of interpolation point
ρ_s	Surface density
σ	Vertical coordinate of the model (Eq. 2.1)
$\dot{\sigma}$	Vertical velocity in σ coordinates: $\frac{d\sigma}{dt}$
ϕ	Geopotential
ϕ_c	Latitude at which the map projections are exact
ϕ_ℓ	Geopotential at the 1000 or 850 mb level
ϕ_n	Geopotential of a new pressure level
ϕ_o	Latitude of observation