National Climatic Data Center

DATA DOCUMENTATION

FOR
NOAA Operational Model Archive and Distribution System (NOMADS)

North America Regional Reanalysis (NARR)
"Merge" data set

DATASET DSI-6175

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Prepared for

National Climatic Data Center

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1. Abstract:

These files are from the North America Regional Reanalysis(NARR) Project and contain the analyses and selected quantities from the 0 to 3 hours forecast. The NARR is a reanalysis of historical observations using a 32 km version of the NCEP 1993 operational ETA model and ETA data assimilation system (EDAS). The domain of analyses includes North and Central America as well as small parts of the UK, Eastern Asia and South America and the oceans in between. The period of the reanalyses is from October 1978 to the present and analyses were made 8 times daily. Horizontal boundary conditions were derived from the NCEP/DOE Reanalysis.

The "merged" dataset provides a high spatial (32 km) and temporal (3 hour) analyses of North America and adjacent oceans and land masses from October 1978 to the present. Advantages over the widely used NCEP/NCAR Reanalysis are its higher resolution and a much better treatment of the land surface through a better land-surface model (NOAH), through the assimilation of more surface data (observed precipitation and surface winds) and through a better representation of the terrain (heights, vegetation, soil type).

This data set contains "conventional" atmospheric analyses as well as model-derived fields which contain estimates of subsurface, surface, and radiative properties.

This data set is encoded in WMO format GRIB version 1 using the NCEP GRIB table 131. The data are stored on a Lambert conformal grid (AWIPS grids 221) and efforts have been make to make the data GrADS compatible (http://grads.iges.org/grads).

2. Elements and Definitions:

The files for each analysis time are named

merged_AWIP32.YYYYMMDDHH
and
merged_AWIPS32.YYYYMMDDHH.b

YYYYMMDDHH is the date code which corresponds to the analysis time or the starting time of the forecast for model predicted quantities such as flux or precipitation. The possible HH are
0,03, 06, 09, 12, 15, 18, and 21. All time are in UTC.

The data for each analysis time is split into two files so that the data will be compatible with the software program, GrADS. The ".b" file is much smaller and contains fields that are similar to those in the larger file except they have some differences that GrADS does not recognize. For example, the ".b" file contains 3 hour forecast of the sensible heat flux whereas the larger file contains the average from the 0-3 hour forecast.

These files are in GRIB 1 format using NCEP table 131. A copy of this table can be obtained from

ftp://wesley.ncep.noaa.gov/pub/wgrib/nceptab_131

the GRIB documentation from

http://www.nco.ncep.noaa.gov/pmb/docs/on388/

and a GRIB decoder from

http://wesley.ncep.noaa.gov/wgrib.html

The data is on in a Lambert conformal grid (AWIPS grid 221)
and all vector components are earth relative rather than grids relative which is the convention for operational NCEP model. The list of fields produced by the NARR ETA model differs from the operational ETA model.

Inventory of main file

```
ACPCPsfc          ACC* Convective precipitation [kg/m^2]
ALBDOsfc          ANL* surface Albedo [%]
APCPsfc           ACC* Total precipitation [kg/m^2]
APCPNsfc          ACC* Total precipitation (nearest grid point) [kg/m^2]
BGRUNsfc          ACC* Subsurface runoff (baseflow) [kg/m^2]
BMIXLhlev1        ANL* hybrid level 1 Blackadars mixing length scale [m]
CAPEsfc           ANL* surface Convective available potential energy [J/kg]
CAPE180_0mb       ANL* 180-0 mb above gnd Convective available potential
energy [J/kg]
CCONDsfc          ANL* Canopy conductance [m/s]
CDsfc             ANL* Surface drag coefficient [non-dim]
CDCONclm          AVE* atmos column Convective cloud cover [%]
CDLYRclm          AVE* atmos column Non-convective cloud [%]
CFRZRsfc          3hr* Categorical freezing rain [yes=1;no=0]
CICEPsfc          3hr* Categorical ice pellets [yes=1;no=0]
CINsfc            ANL* Convective inhibition [J/kg]
CIN180_0mb        ANL* 180-0 mb above gnd Convective inhibition [J/kg]
CLWMRprs          ANL* 29* Cloud water [kg/kg]
CNWATsfc          ANL* Plant canopy surface water [kg/m^2]
CRAINsfc          3hr* Categorical rain [yes=1;no=0]
CSNOWsfc          3hr* Categorical snow [yes=1;no=0]
DLWRFsfc          AVE* surface Downward longwave radiation flux [W/m^2]
DPT2m             ANL* 2 m Dew point temp. [K]
DSWRFsfc          AVE* surface Downward shortwave radiation flux [W/m^2]
EVPsfc            ACC* surface Evaporation [kg/m^2]
FRICVsfc          ANL* Surface friction velocity [m/s]
GFLUXsfc          AVE* Ground Heat Flux [W/m^2]
HCDChcl           3hr* high cloud level High level cloud cover [%]
HGTprs            ANL* 29* Geopotential height [gpm]
HGThlev1          ANL* hybrid level 1 Geopotential height [gpm]
HGTclb            ANL* cloud base Geopotential height [gpm]
HGTclt            ANL* cloud top Geopotential height [gpm]
HGT0deg           ANL* 0C isotherm level Geopotential height [gpm]
HGTmwl            ANL* max wind level Geopotential height [gpm]
HGTtrp            ANL* tropopause Geopotential height [gpm]
HLCY0_3000m       ANL* 3000-0 m above ground Storm relative helicity [m^2/s^2]
HPBLsfc           ANL* surface Planetary boundary layer height [m]
ICMRprs           ANL* 29* Ice mixing ratio [kg/kg]
LCDClcl           3hr* low cloud level Low level cloud cover [%]
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LFTX500_1000mb   ANL* 500-1000 mb Surface lifted index [K]
LHTFLsfc         AVE* surface Latent heat flux [W/m^2]
MCDCmcl          3hr* mid-cloud level Mid level cloud cover [%]
MCONVprs         ANL* Horizontal moisture divergence [kg/kg/s]
MCONVhlev1       ANL* hybrid level 1 Horizontal moisture divergence [kg/kg/s]
MCONV30_0mb      ANL* 30-0 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MCONV60_30mb     ANL* 60-30 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MCONV90_60mb     ANL* 90-60 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MCONV120_90mb    ANL* 120-90 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MCONV150_120mb   ANL* 150-120 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MCONV180_150mb   ANL* 180-150 mb above gnd Horizontal moisture divergence
[kg/kg/s]
MSLETmsl         ANL* Mean sea level pressure (ETA model) [Pa]
MSTAV0_100cm     ANL* 0-100 cm undergnd Moisture availability [%]
PEVAPsfc         ACC* surface Potential evaporation [kg/m^2]
POTsfc           ANL* surface Potential temp. [K]
POT10m           ANL* 10 m Potential temp. [K]
POT30m           ANL* 30 m Potential temp. [K]
POThlev1         ANL* hybrid level 1 Potential temp. [K]
PRATEsfc         3hr* Precipitation rate [kg/m^2/s]
PRESsfc          ANL* surface Pressure [Pa]
PRES2m           ANL* 2 m Pressure [Pa]
PRES10m          ANL* 10 m Pressure [Pa]
PRES30m          ANL* 30 m Pressure [Pa]
PREShlev1        ANL* hybrid level 1 Pressure [Pa]
PRESclb          ANL* cloud base Pressure [Pa]
PRESclt          ANL* cloud top Pressure [Pa]
PRESadcl         ANL* adiabatic lifting condensation level Pressure [Pa]
PRESmwl          ANL* max wind level Pressure [Pa]
PREStrp          ANL* tropopause Pressure [Pa]
PRESNsfc         ANL* surface Pressure (nearest grid point) [Pa]
PRMSLmsl         ANL* Pressure reduced to MSL [Pa]
PWATclm          ANL* atmos column Precipitable water [kg/m^2]
RCQsfc           ANL* surface Humidity parameter in canopy conductance
[fraction]
RCSsfc           ANL* surface Solar parameter in canopy conductance
[fraction]
RCSOLsfc         ANL* surface Soil moisture parameter in canopy conductance
[fraction]
RCTsfc           ANL* surface Temperature parameter in canopy conductance
[fraction]
RH2m             ANL* 2 m Relative humidity [%]
RHhlev1          ANL* hybrid level 1 Relative humidity [%]
RH0deg           ANL* 0C isotherm level Relative humidity [%]
SFEXCsfc         ANL* surface Exchange coefficient [(kg/m^3)(m/s)]
SHTFLsfc         AVE* surface Sensible heat flux [W/m^2]
SNODsfc          ANL* Snow depth [m]
SNOHFsfc         AVE* Snow phase-change heat flux [W/m^2]
SNOMsfc          ACC* Snow melt [kg/m^2]
SNOWCsfc         ANL* Snow cover [%]
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SOILL0_10cm ANL* 0-10 cm Liquid volumetric soil moisture (non-frozen) [fraction]
SOILL10_40cm ANL* 10-40 cm Liquid volumetric soil moisture (non-frozen) [fraction]
SOILL40_100cm ANL* 40-100 cm Liquid volumetric soil moisture (non-frozen) [fraction]
SOILL100_200cm ANL* 100-200 cm Liquid volumetric soil moisture (non-frozen) [fraction]
SOILM0_200cm ANL* 0-200 cm Soil moisture content [kg/m^2]
SOILW0_10cm ANL* 0-10 cm Volumetric soil moisture (frozen+liquid) [fraction]
SOILW10_40cm ANL* 10-40 cm Volumetric soil moisture (frozen+liquid) [fraction]
SOILW40_100cm ANL* 40-100 cm Volumetric soil moisture (frozen+liquid) [fraction]
SOILW100_200cm ANL* 100-200 cm Volumetric soil moisture (frozen+liquid) [fraction]
SPFHprs ANL* 29* Specific humidity [kg/kg]
SPFH2m ANL* 2 m Specific humidity [kg/kg]
SPFH10m ANL* 10 m Specific humidity [kg/kg]
SPFH30m ANL* 30 m Specific humidity [kg/kg]
SPFHhlev1 ANL* hybrid level 1 Specific humidity [kg/kg]
SPFH30_0mb ANL* 30-0 mb above gnd Specific humidity [kg/kg]
SPFH60_30mb ANL* 60-30 mb above gnd Specific humidity [kg/kg]
SPFH90_60mb ANL* 90-60 mb above gnd Specific humidity [kg/kg]
SPFH120_90mb ANL* 120-90 mb above gnd Specific humidity [kg/kg]
SPFH150_120mb ANL* 150-120 mb above gnd Specific humidity [kg/kg]
SPFH180_150mb ANL* 180-150 mb above gnd Specific humidity [kg/kg]
SSRUNsfc ACC* Surface runoff (non-infiltrating) [kg/m^2]
TCDCclm 3hr* atmos column Total cloud cover [%]
TKEprs ANL* 15* Turbulent Kinetic Energy [J/kg]
TKEhlev1 ANL* hybrid level 1 Turbulent Kinetic Energy [J/kg]
TMPsfc ANL* surface Temp. [K]
TMPprs ANL* 29* Temp. [K]
TMP2m ANL* 2 m Temp. [K]
TMP10m ANL* 10 m Temp. [K]
TMP30m ANL* 30 m Temp. [K]
TMPhlev1 ANL* hybrid level 1 Temp. [K]
TMP30_0mb ANL* 30-0 mb above gnd Temp. [K]
TMP60_30mb ANL* 60-30 mb above gnd Temp. [K]
TMP90_60mb ANL* 90-60 mb above gnd Temp. [K]
TMP120_90mb ANL* 120-90 mb above gnd Temp. [K]
TMP150_120mb ANL* 150-120 mb above gnd Temp. [K]
TMP180_150mb ANL* 180-150 mb above gnd Temp. [K]
TMPclt ANL* cloud top Temp. [K]
TMPtrp ANL* tropopause Temp. [K]
TSOILdpl ANL* Soil temp. [K]
TSOIL0_10cm ANL* 0-10 cm undergnd Soil temp. [K]
TSOIL10_40cm ANL* 10-40 cm undergnd Soil temp. [K]
TSOIL40_100cm ANL* 40-100 cm undergnd Soil temp. [K]
TSOIL100_200cm ANL* 100-200 cm undergnd Soil temp. [K]
UFLXsfc ANL* surface Zonal momentum flux [N/m^2]
UGRDprs ANL* 29* u wind [m/s]
UGRD10m ANL* 10 m u wind [m/s]
UGRD30m ANL* 30 m u wind [m/s]

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UGRDhlev1        ANL* hybrid level 1 u wind [m/s]
UGRD30_0mb       ANL* 30-0 mb above gnd u wind [m/s]
UGRD60_30mb      ANL* 60-30 mb above gnd u wind [m/s]
UGRD90_60mb      ANL* 90-60 mb above gnd u wind [m/s]
UGRD120_90mb     ANL* 120-90 mb above gnd u wind [m/s]
UGRD150_120mb    ANL* 150-120 mb above gnd u wind [m/s]
UGRD180_150mb    ANL* 180-150 mb above gnd u wind [m/s]
UGRDmwl          ANL* max wind level u wind [m/s]
UGRDtrp          ANL* tropopause u wind [m/s]
ULWRFsfc         AVE* surface Upward long wave radiation flux [W/m^2]
ULWRFtoa         AVE* top of atmos Upward long wave radiation flux [W/m^2]
USTM0_6000m      ANL* 6000-0 m above ground u-component of storm motion [m/s]
USWRFsfc         AVE* surface Upward short wave radiation flux [W/m^2]
USWRFtoa         AVE* top of atmos Upward short wave radiation flux [W/m^2]
VEGsfc           ANL* Vegetation [%]
VFLXsfc          ANL* surface Meridional momentum flux [N/m^2]
VGRDprs          ANL* 29* v wind [m/s]
VGRD10m          ANL* 10 m v wind [m/s]
VGRD30m          ANL* 30 m v wind [m/s]
VGRDhlev1        ANL* hybrid level 1 v wind [m/s]
VGRD30_0mb       ANL* 30-0 mb above gnd v wind [m/s]
VGRD60_30mb      ANL* 60-30 mb above gnd v wind [m/s]
VGRD90_60mb      ANL* 90-60 mb above gnd v wind [m/s]
VGRD120_90mb     ANL* 120-90 mb above gnd v wind [m/s]
VGRD150_120mb    ANL* 150-120 mb above gnd v wind [m/s]
VGRD180_150mb    ANL* 180-150 mb above gnd v wind [m/s]
VGRDmwl          ANL* max wind level v wind [m/s]
VGRDtrp          ANL* tropopause v wind [m/s]
VISsfc           ANL* surface Visibility [m]
VSTM0_6000m      ANL* 6000-0 m above ground v-component of storm motion [m/s]
VVELprs          ANL* 29* Pressure vertical velocity [Pa/s]
VVELhlev1        ANL* hybrid level 1 Pressure vertical velocity [Pa/s]
VVEL30_0mb       ANL* 30-0 mb above gnd Pressure vertical velocity [Pa/s]
VVEL60_30mb      ANL* 60-30 mb above gnd Pressure vertical velocity [Pa/s]
VVEL90_60mb      ANL* 90-60 mb above gnd Pressure vertical velocity [Pa/s]
VVEL120_90mb     ANL* 120-90 mb above gnd Pressure vertical velocity [Pa/s]
VVEL150_120mb    ANL* 150-120 mb above gnd Pressure vertical velocity [Pa/s]
VVEL180_150mb    ANL* 180-150 mb above gnd Pressure vertical velocity [Pa/s]
VWSHtrp          ANL* tropopause Vertical speed shear [1/s]
WCCONVtoa_700mb  ACC* TOA-700 mb Water condensate flux convergence (vert.
int) [kg/m^2]
WCCONVclm        ACC* atmos column Water condensate flux convergence (vert.
int) [kg/m^2]
WCINCtoa_700mb   ACC* TOA-700 mb water condensate added by precip
assimilaition [kg/m^2]
WCINCclm         ACC* atmos column water condensate added by precip
assimilaition [kg/m^2]
WCUFLXtoa_700mb  ACC* TOA-700 mb Water condensate zonal flux (vertical int)
[kg/m]
WCUFLXclm        ACC* atmos column Water condensate zonal flux (vertical int)
[kg/m]
WCVFLXtoa_700mb  ACC* TOA-700 mb Water condensate meridional flux (vertical
int) [kg/m]
WCVFLXclm        ACC* atmos column Water condensate meridional flux (vertical
int) [kg/m]
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WEASDsfc          ANL* surface Accum. snow [kg/m^2]
WVCONVtoa_700mb   ACC* TOA-700 mb Water vapor flux convergence (vertical int)
[kg/m^2]
WVCONVclm         ACC* atmos column Water vapor flux convergence (vertical
int) [kg/m^2]
WVINCtoa_700mb    ACC* TOA-700 mb water vapor added by precip assimilation
[kg/m^2]
WVINCclm          ACC* atmos column water vapor added by precip assimilation
[kg/m^2]
WVUFLXtoa_700mb   ACC* TOA-700 mb Water vapor zonal flux (vertical int)[kg/m]
WVUFLXclm         ACC* atmos column Water vapor zonal flux (vertical
int)[kg/m]
WVVFLXtoa_700mb   ACC* TOA-700 mb Water vapor meridional flux (vertical int)
[kg/m]
WVVFLXclm         ACC* atmos column Water vapor meridional flux (vertical int)
[kg/m]

           Inventory of .b file

DLWRFsfc      3hr* surface Downward longwave radiation flux [W/m^2]
DSWRFsfc      3hr* surface Downward shortwave radiation flux [W/m^2]
GFLUXsfc      3hr* Ground Heat Flux [W/m^2]
LHTFLsfc      3hr* surface Latent heat flux [W/m^2]
PWATclm       3hr* atmos column Precipitable water [kg/m^2]
SHTFLsfc      3hr* surface Sensible heat flux [W/m^2]
ULWRFsfc      3hr* surface Upward long wave radiation flux [W/m^2]
USWRFsfc      3hr* surface Upward short wave radiation flux [W/m^2]
WEASDsfc      3hr* Accum. snow [kg/m^2]

ACC* = accumulation from a 0-3 hour forecast
ANL* = analysis
AVE* = average from a 0-3 hour forecasts
3hr* = 3 hour forecasts
29* = analyses available on the 29 pressure levels (hPA): 1000 975 950 925
900 875 850 825 800 775 750 725 700 650 600 550 500 450 400 350 300 275 250
225 200 175 150 125 100
15* = analyses available on the 15 pressure levels (hPA): 1000 975 950 925
900 875 850 825 800 775 750 725 700 650 600
```

3. Start Date: 1978100100

4. End Date: present

5. Coverage:

a. Southernmost Latitude: 8N
b. Northernmost Latitude: 85N
c. Westernmost Longitude: 150E
d. Easternmost Longitude: 5W

6. How to Order Data:

The cost for this data when accessed through NOMADS system servers or associated ftp web based services is free. For more information contact:

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9. Known Uncorrected Problems:

Gulf of California low level jet is too strong during summer.
Surface wind stress was written with insufficient precision.

10. Quality Statement:

Disclaimer

While every effort has been made to ensure that data are accurate and reliable within the limits of the current state of the art, NOAA cannot assume liability for any damages caused by any errors or omissions in the data, nor as a result of the failure of the data to function on a particular system.

NOAA makes no warranty, expressed or implied, nor does the fact of distribution constitute such a warranty.

The data used to produce these analyses and forecasts has undergone automated quality checks.

11. Essential Companion Data Sets:

NCEP grib table 131,

ftp://wesley.ncep.noaa.gov/pub/wgrib/nceptab_131

12. References:

a. Mesinger, F., et al, 2004: NCEP North American Regional Reanalysis, 15th Symp. On Global Change and Climate Variations, Seattle, WA, 11-15 Jan 2004.

b. Shafran, P., J. Woollen, W. Ebisuzaki, W. Shi, Y. Fan, R. W. Grumbine, M. Fennessy, 2004: Observational Data Used for Assimilation in the NCEP North American Regional Reanalysis, 20th Intl. Conf. On Interactive Information Processing Systems for Meteor. Ocean. And Hydrology. Seattle, WA, 11-15 Jan 2004.

c. Ebisuzaki, W., J. Alpert, J. Wang, D. Jovic, P. Shafran, 2004: North American Regional Reanalysis: end user access to large data sets, 20th Intl. Conf. On Interactive Information Processing Systems for Meteor. Ocean. And Hydrology. Seattle, WA, 11-15 Jan 2004.

d. Mesinger, F., G. DiMego, E. Kalnay, P. Shafran, W. Ebisuzaki, Y. Fan, R. Grumbine, W. Higgins, Y. Lin, K. Mitchell, D. Parrish, E. Rogers, W. Shi, D. Stokes, J. Woolen, 2003: NCEP Regional Reanalysis, Symp. on Observing and Understanding the Variability of Water in Weather and Climate, Long Beach, CA, Feb.9-13, 2003.