GrADS reference card version 1.0

(GrADS Version 1.5.1.12) compiled by *Karin Meier, DKRZ Hamburg*

General settings

help	gives a summary list of operations essential to do anything in GrADS	
set grads on|off	enable/disable display of the GrADS logo	
set display grey|greyscale|color <black|white>	sets the mode of the display. By default, the mode is color, where shading and contouring is done with a rainbow of colors	
set frame on|off|circle	control the frame on a plot. where:	
	on	- plots a rectangular frame around the clipped region
	off	- plots no frame
	circle	- plots a rectangular frame for lat-lon projections, plots a circular frame for a polar plot at the outermost latitude. Used for whole hemisphere plots only.
set background <color | index>	set background color to color or color index	
display expression	display data via the graphics output window;	
d expression	the simplest expression is a variable abbreviation	
open filename	open descriptor file	
set dfile number	change to descriptor file number for current file	
define var = expression	create new variable, which then can be used in subsequent expressions	
undefine var	free the resources used by the defined variable var	
modify varname <seasonal> <diurnal>	define variable, which is climatological. varname is the defined grid.	
	seasonal - monthly or multi-monthly means	
	diurnal - over some time period less than a day	
query <option>	query options are:	
q <option>	q files	lists open files
	q file n	gives info on particular file
	q define	lists currently defined variables
	q dims	gives current dimension environm.
	q gxinfo	gives graphics environment info
	q shades	gives colors and levels of shaded contours
	q pos	waits for mouse click, returns the position
	query time	gives info about time settings
	query fwrite	print name of fwrite ouput file
	query string s	gives the width of string s
	q defval v1 i j	gives the value of a defined variable v1 at point i,j
	query udft	list the user defined function table
query transform val1 val2	where transform is one of:	
	xy2w	XY coords to world coords
	xy2gr	XY coords to grid coords
	w2xy	world coords to XY coords
	w2gr	world coords to grid coords
	gr2w	grid coords to world coords
	gr2xy	grid coords to XY coords
	ll2xy lon lat	LON/LAT coords to XY coords
	pp2xy ppx ppy	page coords to XY coords
set imprun script-name	automatically executes script script-name before every display command	
run file-name <options>	load and run a GrADS script	
exec fname <arg0,arg1,..,arg9>	executes a sequence of GrADS commands from file fname. If a clear command is encountered, GrADS waits until enter is pressed before clearing and continuing with command processing	
clear <option>	clear the display; where option is one of:	
c <option>	events	flush event buffer
	graphics	clear graphic, not widgets
	hbuff	clear display buffer, when in double buffer mode
reset <option>	initializes GrADS to its initial state with following exceptions: 1) No files are closed 2) No defined objects are released 3) The 'set display' settings are not modified where option is one of: events; graphics ; hbuff; norset	
reinit	same as reset, and in addition closes all open files and releases all defined objects	
quit	quit - to leave GrADS	

!shell-command	runs a shell command on GrADS command line. The output will appear on the console, but will not be returned to the script

Dimension environments

set lon	val1 <val2>	sets longitude to vary from val1 to val2
set lat	val1 <val2>	sets latitude to vary from val1 to val2
set lev	val	sets the level to val - fixed dimension
set t	val1 <val2>	sets time to the "val" time in the data set
set x	val1 <val2>	set x values or fix it to one value
set y	val1 <val2>	set y values or fix it to one value
set z	val1 <val2>	set z values or fix it to one value

Page control

set vpage off	real page is equal to "virtual page"; default state
set vpage xmn xmx ymn ymx	defining one "virtual" page
set parea xmn xmx ymn ymx	control the area within the virutal page

Graphic types

set gxout graphic-type	where graphic-type could be:	
	bar	Bar chart
	barb	Plot wind barb at station
	contour	Contour plot
	errbar	Error bar
	fgrid	specific value grid fill plot
	findstn	Find closest station to x,y point
	fwrite	Write data to file instead of displaying
	grfill	Filled grid boxes
	grid	Grid boxes with values
	line	Line graph
	linefill	Color fill between two lines
	model	Plot station model
	scatter	Scatter graph plot
	shaded	Shaded contour plot
	stat	Display information about data
	stream	Streamline plot
	tserwx	Plot time series of weather symbols at a point (1-D station graphics)
	tserbarb	Plot time series of wind barbs at a point (1-D)
	value	Plot station values
	vector	Vector wind arrows
	wxsym	Plot weather symbols at station

Graphics options

set clip xlo xhi ylo yhi	clipping area for drawing graphics primitives
set ccolor index	sets the contour color to index: 0 - black, 1 - white, 2 - red, 3 - green, 4 - blue, 5 - cyan, 6 - magenta, 7 - yellow, 8 - orange, 9 - purple, 10 - yellow/green, 11 - med. blue, 12 - dark yellow, 13 - aqua, 14 - dark purple, 15 - grey. You can also issue: rainbow - rainbow color sequence; revrain - reversed rainbow color sequence
set cstyle style	sets the contour or line style to "style": 1 - solid, 2 - long dash, 3 - short dash, 4 - long short dash, 5 - dots, 6 - dot dash, 7 - dot dot dash (gxout = contour, only style 1,2,3and 5 available)
set cmark marker	sets line marker: 0 - none, 1 - cross, 2 - open circle, 3 - closed circle, 4 - open square, 5 - closed square, 6 - X, 7 - diamond, 8 - triangle, 9 - none, 10 - open circle with vertical line, 11 - open oval
set cterp on|off	turns spline smoothing on or off
set clab on|off|forced|string|auto	controls contour labeling
set clopts color <thickness <size>>	contour line options
set clskip val	skip val contour lines when labelling
set cthick thckns	sets the line thickness for the contours [1-10]
set csmooth on|off|linear	interpolate to a finer grid using cubic or linear interpolation
set cint value	sets the contour interval to the specified "value"
set cmax value	contours not drawn above this value
set cmin value	contours not drawn below this value
set clevs lev1 lev2 ...	sets specified contour levels
set ccols col1 col2 ...	sets specified color for clev levels
set line color <style> <thickness>	sets current line attributes. thickness range 1 - 6. colors are: 0 - black, 1 - white, 2 - red, 3 - green, 4 - blue, 5 - cyan, 6 - magenta, 7 - yellow, 8 - orange, 9 - purple, 10 - yellow/green, 11 - med. blue, 12 - dark yellow, 13 - aqua, 14 - dark purple, 15 - grey. styles are: 1 - solid, 2 - long dash, 3 - short dash, 4 - long, short dashed, 5 - dotted, 6 - dot dash, 7 - dot dot dash
set lfcols col1 col2	set color below and above lines (gxout linefill)
set black off|val1 val2	contours not drawn within this interval
set rbcols col1 col2 <col3> ..	specifies a new 'rainbow' color sequence
set rbcols <auto>	built in rainbow sequence is used
set rbrange low high	range of values used to determine which values acquire which rainbow color
set grid on|off|<style> <color>|horizontal|vertical	draw grid lines using the specified options or not
set bargap val	sets the gap between bars in percent
set barbase val|bottom|top	bar rises from or falls from value
set baropts filled|outline	bar outlined or filled; default: filled
set dignum number	number of digits after the decimal place
set digsize size	size (in inches, or plotter units) of the numbers
set arrlab on|off	set arrow labeling on or off
set arrscl size <magnitude>	specifies arrow length scaling
set arrowhead size	specifies arrow head size
set fgvals val col <val col>...	fgrid output type treats the grid values as rounded integers, and will shade a specified integer valued grid with the specified color.
set zlog on|off	sets log scaling of the Z dimension on or off
set strmden value	specifies the streamline density, where value is from 1 to 10. Default: 5
set stnopts <dig3> <nodig3>	plot the number in the slp location as a three digit number, with only the LAST three digits of the whole number plotted
set mdlopts noblank|blank|dig3|nodig3	plot the number of the model data as a three digit
set stid on|off	controls wether the station id is displayed next to the values or not
set wxcols c1 c2 c3 c4 c5 c6	set colors for weather symbols c1 - c6

Axis labeling/Annotation/labeling

set xaxis start end <incr>	specifies the axis is to be labeled
set yaxis start end <incr>	specifies the axis is to be labeled
set xlevs lab1 lab2 ...	specifies the label levels to plot for the X axis
set ylevs lab1 lab2 ...	specifies the label levels to plot for the Y axis
set xlint interval	specifies the label interval of the X axis
set ylint interval	specifies the label interval of the Y axis
set xyrev on	reverses the axes on a plot
set xflip on	flips the order of the horizontal axis
set yflip on	flips the order of the vertical axis
set xlab on|off|auto|string	controls and/or draws X axis label
set ylab on|off|auto|string	controls and/or draws Y axis label
set xlopts color <thickness <size>>	controls X axis
set ylopts color <thickness <size>>	controls Y axis
set xlpos offset side	controls position of x axis labels. Where offset - in inches; side - b or t (bottom or top)
set ylpos offset side	controls position of y axis labels. Where offset - in inches; side - r or l (right or left)
set zlog on|off|swap|undefine	sets log scaling of the Z axis
set annot color <thickness>	sets color and line thicknesses for the above 3 draw commands
set vrange vlo vhi	Set range for plotting 1-D or scatter plots; range of the variable values for y-axis scaling
set vrange2 vlo vhi	Set range for plotting 1-D or scatter plots; range of the variable values for x-axis scaling
set missconn on|off	lines will be connected across missing data
draw title string	draw title at top of graph

Map projections/drawing

set mproj proj	sets current map projection. Keywords are: latlon- the default. Lat/lon projection with aspect ratio maintained. scaled- latlon projection where aspect ratio is not maintained.The plot fills the plotting area.

nps- north polar stereographic
sps- south polar stereographic
robinson- Robinson projection
off- same as scaled, but no map is drawn and lables are not interpreted as lat/lon labels

set mpvals off|lnmn lnmx ltmn ltmx sets reference longitudes and latitudes for polar stereographic plots

set mpdset lowres|mres|hires|nmap mres and hires have state and country outlines. nmap covers only North America. lowres is the default

set map auto|color <style <thickness>> draws the map background using the requested line attributes or auto mode

set mpdraw on|off if off, does not draw the map background

set grid on|off <style <color>> draw or do not draw lat/lon lines on polar plots using the specified color and linestyle

set poli on|off selects whether you want political boundries drawn for the mres or hires map data sets. Default is on

Graphic primitives

draw line x1 y1 x2 y2 draws a line from x1, y1 to x2, y2 using current line drawing attributes

draw rec xlo ylo xhi yhi draws an unfilled rectangle from xlo, ylo to xhi, ylo to xhi, yhi to xlo, yhi to xlo, ylo

draw recf xlo ylo xhi yhi draws a filled rectangle in the area described by xlo, ylo, xhi,yhi

draw mark marktype x y size draws a marker of type marktype at position x, y at the requested size. Marker types are:
1 - crosshair; 2 - open circle; 3 - closed circle;
4 - open square; 5 - closed square

darw polyf x1 y1 x2 y2 ... xn yn draw a filled polyline, where xn=x1 and yn=y1

draw wxsym symbol x y size <color <thickness>>
Draws the specified wx symbol at the specified location. To see what symbols are available, run grads, then: run /usr/local/dkrz/grads/wxsym.gs

String primitives

set string color <justification> <thickness>
sets string drawing attributes. Justification:
l - left; c - center; r - right;
tl - top left;; tc - center top; tr - right top
bl - bottom left; tc - center bottom; tr - right bott.

set strsiz hsiz <vsiz> sets the string character size
hsiz - width; vsiz - height

draw string x y string draws the character string at the x,y position

draw title string draw a title ‘string’ on top of the graph

Color settings

set rgb num red green blue defines new colors within GrADS, and assigns them to a new color number.color-number *num* must be a value between 16 and 99 (0 to 15 are predefined)

Font settings

set font number change to font number [0-5]

Widgets

set button 1 bcol1 bcol2 bcol3 0 fcol1 fcol2 fcol3 thckn
set button colors. 1 - “on” state; 0 - “off” state
thckn - thickness of the shadow outline

draw button number x y width height string
draws a button on position x,y with the attributes

redraw button number 0|1 redraws button number; 1 - “on”; 0 - “off”

set rband nn mode x1 y1 x2 y2 rubber banding
nn = widget number; mode = box or line
x1, y1 = lowest point in x/y page units
x2, y2 = highest point in x/y page units

Double buffering

set dbuff on|off sets double buffer mode on or off

swap swaps buffers, when double buffer mode is on

Animation

set looping on|off control animation; set animation on or off

set loopdim x|y|z|t animate through x,y,z or t; default: t

set loopincr incr set looping increment

Hardcopy output

enable print fname enables the print command and directs print command output to the given file fname

print copy the contents of current display into the output file in a metacode format

disable print close print output file

Create PostScript files

Program: gxps [-c][-r][-i fname][-o fname][-d]
converts the GrADS meta file into a PostScript file. Command line options:
-c color on a white background (=old gxpscw)
-r color on a black background (=old gxpsc)
-d add ctrl-d to the end of the file, useful if printing on a HP 1200C/PS printer
-i fname where fname is the name of the input GrADS meta file
-o fname where fname is the name of the output PostScript file

Create/Write a grid file

set fwrite fname output grid fname; if not set, fname=grads.fwrite

set gxout fwrite enables grid file output

disable fwrite close output grid file

Variables

complete specification for a variable name
abbrev.file#(dimexpr,dimexpr,...)
abbrev is the abbreviation for the variable as specified in the data descriptor file file# is the file number that contains this variable. The default initially is 1. (“set dfile” changes the default). dimexpr is a dimension expression that locally modifies the current dimension environment.

scripting language supports compound variables, which can be used to construct arrays in scripts. varname.i.j

global scripting variables. Varibale name starts with an underscore(_).
_variable

continued variable lines var1 = set clevs -15 -10 -5 0 5 10 15
var1 = var1%20 25 30 40 45 50 55 60 65

Mathematical Functions

abs(expr) absolute value of result of expr. Operates on both gridded and station data

acos(expr) applies the $\cos^{-1}$ function to the result of expr

asin(expr) applies the $\sin^{-1}$ function to the result of expr

atan2(expr1,expr2) applies the tan-1 function to the result of the two expressions, using $\tan\theta = y/x$

cos(expr) takes the cosine of the expr

exp(expr) performs the e^x operation, where expr is x. Works on both gridded and station data

gint(expr) general integral, same as ave except do not devide by the total area

log(expr) takes the natural logarithm of expr

log10(expr) takes the logarithm base 10 of the expr

pow(expr1,expr2) raises the values of expr1 to the power of expr2

sin(expr) takes the sine of the provided expr. Argument in radians

sqrt(expr) takes the square root of the result of the expr

tan(expr) applies the trigonometric tangent function to the expr

Averaging Functions

ave(expr,dexpr1,dexpr2<,tinc<,flags>>)
generalized averaging function. expr is averaged through the dimension range specified by dim1 and dim2

aave(expr,xdim1,xdim2,ydim1,ydim2)
does area average. xdim1 and xdim2 must be for longitude or x, ydim1 and ydim2 must be for latitude or y

mean(expr,dexpr1,dexpr2<,tinc<,flags>>) same as ave, except that area weighting is disabled

amean(expr,xdim1,xdim2,ydim1,ydim2) same as aave, except that area weighting is disabled

vint(expr,psexpr,top) performs a mass-weighted vertical integral in mb pressure coordinates, where:
expr expression for quantity to be integrated
psexpr expression yielding the surface pressure, in mb, which will be used to bound the integration on the bottom
top constant, giving the bounding top pressure, in mb. This cannot be provided as an expression

Grid Functions

const(expr,const<,flag>) function allows you to set various parts of a grid to a constant

maskout(expr,mask) whenever the mask values are less than zero, the values in expr are set to the missing data value

skip(expr,skipx,skipy) sets alternating values of the expr to the missing data value.This function is used while displaying wind arrows or barbs to thin the number of arrows or barbs

Filtering Functions

smth9(expr) performs a 9 point smoothing to the gridded result of expr

Finite Difference Functions

cdiff(expr,dim) performs a centered difference operation on expr in the direction specified by dim

Meteorological Functions

tvrh2q(tvexpr,rhexpr) given virtual temperature and relative humidity, tvrh2q returns specific humidity, q, in g/g

tvrh2t(tvexpr,rhexpr) given virtual temperature and relative humidity, tvrh2t returns the temperature in degrees Kelvin

Special Purpose Functions

tloop(expr) when time is varying dimension in the dimension environment, tloop function evaluates the expr at fixed times, then constructs the time series to obtain a final result that is the time varying

Vector Functions

hcurl(uexpr,vexpr) calculates the vertical component of the curl (i.e.vorticity) at each grid pointusing finite differencing on the grids provided

hdivg(expr1,expr2) calculates the horizontal divergence using the finite differencing

mag(uexpr,vexpr) performs the calculation:
sqrt(uexpr*uexpr+vexpr*vexpr)

Station Data Functions

gr2stn(grid_expr,stn_expr) performs an interpolation from grid space back to station locations

oacres(grid_expr,stn_expr<,radii<first guess>>)
a Cressman objective analysis is performed on the station data to yield a gridded result representing the station data

stnave(expr,dexpr1,dexpr2<,-m cnt>)
takes an average of station data over time

stnmin(expr,dexpr1,dexpr2<,-m cnt>)
examines a time series of station data and returns the minimum value encountered for each station

stnmax(expr,dexpr1,dexpr2<,-m cnt>)
examines a time series of station data and returns the maximum value encountered for each station