

# CDO reference card

Climate Data Operators

Version 0.9.6

April 2005

Uwe Schulzweida

Max-Planck-Institute for Meteorology

## Syntax

cdo	[Options]	Operators
-----	-----------	-----------

## Options

-a	Absolute time axis
-d	Print debugging information
-f <format>	Format of the output file (grb, nc, nc2, srv or ext)
-g <grid>	Grid name or file Available grids: t<RES>grid, r<LON>x<LAT>
-h	Help information for the operators
-m <missval>	Default missing value
-p <prec>	Precision of the output data in bytes (4/8 for nc, nc2, srv, ext; 1/2/3 for grb)
-R	Convert reduced to regular grid
-r	Relative time axis
-t <table>	Parameter table name or file Predefined tables: echam4 echam5 mpiom1
-V	Print version number
-v	Print extra details for some operators

## Operators

### Information

info	File information <b>info ifiles</b>
infov	File information <b>infov ifiles</b>
map	Print simple map <b>map ifiles</b>
sinfo	Short file information <b>sinfo ifile</b>
sinfov	Short file information <b>sinfov ifile</b>
diff	Differences of two files <b>diff ifile1 ifile2</b>
diffv	Differences of two files <b>diffv ifile1 ifile2</b>

nyear	Number of years <b>nyear ifile</b>
nmon	Number of months <b>nmon ifile</b>
ndate	Number of dates <b>ndate ifile</b>
ntime	Number of timesteps <b>ntime ifile</b>
ncode	Number of codes <b>ncode ifile</b>
nvar	Number of variables <b>nvar ifile</b>
nlevel	Number of levels <b>nlevel ifile</b>

showyear	Show years <b>showyear ifile</b>
showmon	Show months <b>showmon ifile</b>
showdate	Show dates <b>showdate ifile</b>
showtime	Show timesteps <b>showtime ifile</b>
showcode	Show codes <b>showcode ifile</b>
showvar	Show variable names <b>showvar ifile</b>
showlevel	Show levels <b>showlevel ifile</b>

vardes	Variable description <b>vardes ifile</b>
griddes	Grid description <b>griddes ifile</b>
vct	Vertical coordinate table <b>vct ifile</b>

### File operations

copy	Copy files <b>copy ifiles ofile</b>
cat	Concatenate files <b>cat ifiles ofile</b>
merge	Merge files <b>merge ifiles ofile</b>
splitcode	Split codes <b>splitcode ifile oprefix</b>
splitvar	Split variables <b>splitvar ifile oprefix</b>
splitlevel	Split levels <b>splitlevel ifile oprefix</b>
splitgrid	Split grids <b>splitgrid ifile oprefix</b>
splitzaxis	Split zaxis <b>splitzaxis ifile oprefix</b>

splithour	Split hours <b>splithour ifile oprefix</b>
splitday	Split days <b>splitday ifile oprefix</b>
splitmon	Split months <b>splitmon ifile oprefix</b>
splitseas	Split seasons <b>splitseas ifile oprefix</b>

splityear	Split years <b>splityear ifile oprefix</b>
-----------	---

splitrec	Split records <b>splitrec ifile oprefix</b>
----------	--

## Formatted I/O

output	ASCII output <b>output ifiles</b>
outputint	Integer output <b>outputint ifiles</b>
outputsrv	SERVICE output <b>outputsrv ifiles</b>
outputtext	EXTRA output <b>outputtext ifiles</b>

## Generation of variables

const	Constant variable <b>const,const,grid ofile</b>
random	Variable with random values <b>random,grid ofile</b>
vardup	Duplicate variables <b>vardup ifile ofile</b>
varmul	Multiply variables <b>varmul,nmul ifile ofile</b>

## Manipulating the header/field

setpartab	Set parameter table <b>setpartab,table ifile ofile</b>
setcode	Set code <b>setcode,code ifile ofile</b>
setvar	Set variable name <b>setvar,name ifile ofile</b>

setdate	Set date <b>setdate</b> , <i>date</i> ifile ofile
settime	Set time <b>settime</b> , <i>time</i> ifile ofile
setday	Set day <b>setday</b> , <i>day</i> ifile ofile
setmon	Set month <b>setmon</b> , <i>month</i> ifile ofile
setyear	Set year <b>setyear</b> , <i>year</i> ifile ofile
settunits	Set time units <b>settunits</b> , <i>units</i> ifile ofile
settaxis	Set time axis <b>settaxis</b> , <i>date,time,[inc]</i> ifile ofile
setreftime	Set reference time <b>setreftime</b> , <i>date,time</i> ifile ofile
shifttime	Shift time steps <b>shifttime</b> , <i>sval</i> ifile ofile

chcode	Change code <b>chcode</b> , <i>ocode,ncode,...</i> ifile ofile
--------	---

setgrid	Set grid <b>setgrid</b> , <i>grid</i> ifile ofile
setgridtype	Set grid type <b>setgridtype</b> , <i>gridtype</i> ifile ofile

setgatt	Set global attribute <b>setgatt</b> , <i>attname,attstring</i> ifile ofile
setgatts	Set global attributes <b>setgatts</b> , <i>attfile</i> ifile ofile

invertlat	Invert latitude <b>invertlat</b> ifile ofile
invertlon	Invert longitude <b>invertlon</b> ifile ofile
invertlatdes	Invert latitude decription <b>invertlatdes</b> ifile ofile
invertlondes	Invert longitude decription <b>invertlondes</b> ifile ofile
invertlatdata	Invert latitude data <b>invertlatdata</b> ifile ofile
invertlondata	Invert longitude data <b>invertlondata</b> ifile ofile

#### Selection

selcode	Select codes <b>selcode</b> , <i>codes</i> ifile ofile
delcode	Delete codes <b>delcode</b> , <i>codes</i> ifile ofile
selvar	Select variables <b>selvar</b> , <i>vars</i> ifile ofile
delvar	Delete variables <b>delvar</b> , <i>vars</i> ifile ofile
sellevel	Select levels <b>sellevel</b> , <i>levels</i> ifile ofile
selgrid	Select grids <b>selgrid</b> , <i>grids</i> ifile ofile
selzaxis	Select zaxis <b>selzaxis</b> , <i>zaxis</i> ifile ofile

selrec	Select records <b>selrec</b> , <i>records</i> ifile ofile
--------	--

sel timestep	Select timesteps <b>sel timestep</b> , <i>timesteps</i> ifile ofile
seltime	Select times <b>seltime</b> , <i>times</i> ifile ofile
selhour	Select hours <b>selhour</b> , <i>hours</i> ifile ofile
selday	Select days <b>selday</b> , <i>days</i> ifile ofile
selmon	Select months <b>selmon</b> , <i>months</i> ifile ofile
selseas	Select seasons <b>selseas</b> , <i>seasons</i> ifile ofile
selyear	Select years <b>selyear</b> , <i>years</i> ifile ofile
seldate	Select dates <b>seldate</b> , <i>date1,[date2]</i> ifile ofile

sellonlatbox	Select lon/lat box <b>sellonlatbox</b> , <i>lon1,lon2,lat1,lat2</i> ifile ofile
selindexbox	Select index box <b>selindexbox</b> , <i>ilon1,ilon2,ilat1,ilat2</i> ifile ofile

#### Missing values

setmissval	Set a new missing value <b>setmissval</b> , <i>miss</i> ifile ofile
setctomiss	Set constant to missing value <b>setctomiss</b> , <i>c</i> ifile ofile
setmisstoc	Set missing value to constant <b>setmisstoc</b> , <i>c</i> ifile ofile
setrtomiss	Set range to missing value <b>setrtomiss</b> , <i>rmin,rmax</i> ifile ofile

#### Sorting

sortcode	Sort by code number <b>sortcode</b> ifile ofile
sortvar	Sort by variable name <b>sortvar</b> ifile ofile
sortlevel	Sort by level <b>sortlevel</b> ifile ofile

timsort	Sort over the time <b>timsort</b> ifile ofile
---------	--

#### Arithmetic processor

expr	Evaluate expressions <b>expr</b> , <i>instr</i> ifile ofile
exprf	Evaluate expressions from script file <b>exprf</b> , <i>filename</i> ifile ofile

#### Arithmetic

addc	Add by constant <b>addc</b> , <i>c</i> ifile ofile
subc	Subtract by constant <b>subc</b> , <i>c</i> ifile ofile
mulc	Multiply by constant <b>mulc</b> , <i>c</i> ifile ofile
divc	Divide by constant <b>divc</b> , <i>c</i> ifile ofile

add	Add two fields <b>add</b> ifile1 ifile2 ofile
sub	Subtract two fields <b>sub</b> ifile1 ifile2 ofile
mul	Multiply two fields <b>mul</b> ifile1 ifile2 ofile
div	Divide two fields <b>div</b> ifile1 ifile2 ofile
min	Minimum of two fields <b>min</b> ifile1 ifile2 ofile
max	Maximum of two fields <b>max</b> ifile1 ifile2 ofile

ymonadd	Add multi-year monthly time averages <b>ymonadd</b> ifile1 ifile2 ofile
ymonsub	Subtract multi-year monthly time averages <b>ymonsub</b> ifile1 ifile2 ofile
ymonmul	Multiply multi-year monthly time averages <b>ymonmul</b> ifile1 ifile2 ofile
ymonddiv	Divide multi-year monthly time averages <b>ymonddiv</b> ifile1 ifile2 ofile

Mathematical functions

<b>sqr</b>	Square <b>sqr</b> ifile ofile
<b>sqrt</b>	Square root <b>sqrt</b> ifile ofile
<b>exp</b>	Exp <b>exp</b> ifile ofile
<b>log</b>	Logarithm <b>log</b> ifile ofile
<b>log10</b>	Logarithm base 10 <b>log10</b> ifile ofile
<b>sin</b>	Sine <b>sin</b> ifile ofile
<b>cos</b>	Cosine <b>cos</b> ifile ofile
<b>tan</b>	Tangent <b>tan</b> ifile ofile
<b>asin</b>	Arcus sine <b>asin</b> ifile ofile
<b>acos</b>	Arcus cosine <b>acos</b> ifile ofile
<b>atan</b>	Arcus tangent <b>atan</b> ifile ofile

Comparisons

<b>eq</b>	Equal <b>eq</b> ifile1 ifile2 ofile
<b>ne</b>	Not equal <b>ne</b> ifile1 ifile2 ofile
<b>le</b>	Less equal <b>le</b> ifile1 ifile2 ofile
<b>lt</b>	Less then <b>lt</b> ifile1 ifile2 ofile
<b>ge</b>	Greater equal <b>ge</b> ifile1 ifile2 ofile
<b>gt</b>	Greater then <b>gt</b> ifile1 ifile2 ofile
<b>eqc</b>	Equal constant <b>eqc,c</b> ifile ofile
<b>nec</b>	Not equal constant <b>nec,c</b> ifile ofile
<b>lec</b>	Less equal constant <b>lec,c</b> ifile ofile
<b>ltc</b>	Less then constant <b>ltc,c</b> ifile ofile
<b>gec</b>	Greater equal constant <b>gec,c</b> ifile ofile
<b>gtc</b>	Greater then constant <b>gtc,c</b> ifile ofile

Conditions

<b>ifthen</b>	If then <b>ifthen</b> ifile1 ifile2 ofile
<b>ifnotthen</b>	If not then <b>ifnotthen</b> ifile1 ifile2 ofile
<b>ifthenc</b>	If then constant <b>ifthenc,c</b> ifile ofile
<b>ifnotthenc</b>	If not then constant <b>ifnotthenc,c</b> ifile ofile

Statistical description of the data

<b>fldmin</b>	Field minimum <b>fldmin</b> ifile ofile
<b>fldmax</b>	Field maximum <b>fldmax</b> ifile ofile
<b>fldsum</b>	Field sum <b>fldsum</b> ifile ofile
<b>fldmean</b>	Field mean <b>fldmean</b> ifile ofile
<b>fldavg</b>	Field average <b>fldavg</b> ifile ofile
<b>fldstd</b>	Field standard deviation <b>fldstd</b> ifile ofile
<b>fldvar</b>	Field variance <b>fldvar</b> ifile ofile
<b>zonmin</b>	Zonal minimum <b>zonmin</b> ifile ofile
<b>zonmax</b>	Zonal maximum <b>zonmax</b> ifile ofile
<b>zonsum</b>	Zonal sum <b>zonsum</b> ifile ofile
<b>zonmean</b>	Zonal mean <b>zonmean</b> ifile ofile
<b>zonavg</b>	Zonal average <b>zonavg</b> ifile ofile
<b>zonstd</b>	Zonal standard deviation <b>zonstd</b> ifile ofile
<b>zonvar</b>	Zonal variance <b>zonvar</b> ifile ofile
<b>mermin</b>	Meridional minimum <b>mermin</b> ifile ofile
<b>mermax</b>	Meridional maximum <b>mermax</b> ifile ofile
<b>mersum</b>	Meridional sum <b>mersum</b> ifile ofile
<b>mermean</b>	Meridional mean <b>mermean</b> ifile ofile
<b>meravg</b>	Meridional average <b>meravg</b> ifile ofile
<b>merstd</b>	Meridional standard deviation <b>merstd</b> ifile ofile
<b>mervar</b>	Meridional variance <b>mervar</b> ifile ofile

<b>vertmin</b>	Vertical minimum <b>vertmin</b> ifile ofile
<b>vertmax</b>	Vertical maximum <b>vertmax</b> ifile ofile
<b>vertsum</b>	Vertical sum <b>vertsum</b> ifile ofile
<b>vertmean</b>	Vertical mean <b>vertmean</b> ifile ofile
<b>vertavg</b>	Vertical average <b>vertavg</b> ifile ofile
<b>vertstd</b>	Vertical standard deviation <b>vertstd</b> ifile ofile
<b>timmin</b>	Time minimum <b>timmin</b> ifile ofile
<b>timmax</b>	Time maximum <b>timmax</b> ifile ofile
<b>timsum</b>	Time sum <b>timsum</b> ifile ofile
<b>timmean</b>	Time mean <b>timmean</b> ifile ofile
<b>timavg</b>	Time average <b>timavg</b> ifile ofile
<b>timstd</b>	Time standard deviation <b>timstd</b> ifile ofile
<b>hourmin</b>	Hourly minimum <b>hourmin</b> ifile ofile
<b>hourmax</b>	Hourly maximum <b>hourmax</b> ifile ofile
<b>hoursum</b>	Hourly sum <b>hoursum</b> ifile ofile
<b>hourmean</b>	Hourly mean <b>hourmean</b> ifile ofile
<b>houravg</b>	Hourly average <b>houravg</b> ifile ofile
<b>hourstd</b>	Hourly standard deviation <b>hourstd</b> ifile ofile
<b>daymin</b>	Daily minimum <b>daymin</b> ifile ofile
<b>daymax</b>	Daily maximum <b>daymax</b> ifile ofile
<b>daysum</b>	Daily sum <b>daysum</b> ifile ofile
<b>daymean</b>	Daily mean <b>daymean</b> ifile ofile
<b>dayavg</b>	Daily average <b>dayavg</b> ifile ofile
<b>daystd</b>	Daily standard deviation <b>daystd</b> ifile ofile

<b>monmin</b>	Monthly minimum <b>monmin</b> ifile ofile
<b>monmax</b>	Monthly maximum <b>monmax</b> ifile ofile
<b>monsum</b>	Monthly sum <b>monsum</b> ifile ofile
<b>monmean</b>	Monthly mean <b>monmean</b> ifile ofile
<b>monavg</b>	Monthly average <b>monavg</b> ifile ofile
<b>monstd</b>	Monthly standard deviation <b>monstd</b> ifile ofile

<b>yearmin</b>	Yearly minimum <b>yearmin</b> ifile ofile
<b>yearmax</b>	Yearly maximum <b>yearmax</b> ifile ofile
<b>yearsum</b>	Yearly sum <b>yearsum</b> ifile ofile
<b>yearmean</b>	Yearly mean <b>yearmean</b> ifile ofile
<b>yearavg</b>	Yearly average <b>yearavg</b> ifile ofile
<b>yearstd</b>	Yearly standard deviation <b>yearstd</b> ifile ofile

<b>seasmin</b>	Seasonally minimum <b>seasmin</b> ifile ofile
<b>seasmax</b>	Seasonally maximum <b>seasmax</b> ifile ofile
<b>seassum</b>	Seasonally sum <b>seassum</b> ifile ofile
<b>seasmean</b>	Seasonally mean <b>seasmean</b> ifile ofile
<b>seasavg</b>	Seasonally average <b>seasavg</b> ifile ofile
<b>seasstd</b>	Seasonally standard deviation <b>seasstd</b> ifile ofile

<b>ydaymin</b>	Multi-year daily minimum <b>ydaymin</b> ifile ofile
<b>ydaymax</b>	Multi-year daily maximum <b>ydaymax</b> ifile ofile
<b>ydaymean</b>	Multi-year daily mean <b>ydaymean</b> ifile ofile
<b>ydayavg</b>	Multi-year daily average <b>ydayavg</b> ifile ofile
<b>ydaystd</b>	Multi-year daily standard deviation <b>ydaystd</b> ifile ofile

<b>ymonmin</b>	Multi-year monthly minimum <b>ymonmin</b> ifile ofile
<b>ymonmax</b>	Multi-year monthly maximum <b>ymonmax</b> ifile ofile
<b>ymonmean</b>	Multi-year monthly mean <b>ymonmean</b> ifile ofile
<b>ymonavg</b>	Multi-year monthly average <b>ymonavg</b> ifile ofile
<b>ymonstd</b>	Multi-year monthly standard deviation <b>ymonstd</b> ifile ofile

<b>yseasmin</b>	Multi-year seasonally minimum <b>yseasmin</b> ifile ofile
<b>yseasmax</b>	Multi-year seasonally maximum <b>yseasmax</b> ifile ofile
<b>yseasmean</b>	Multi-year seasonally mean <b>yseasmean</b> ifile ofile
<b>yseasavg</b>	Multi-year seasonally average <b>yseasavg</b> ifile ofile
<b>yseasstd</b>	Multi-year seasonally standard deviation <b>yseasstd</b> ifile ofile

<b>runmin</b>	Running minimum <b>runmin</b> , <i>nts</i> ifile ofile
<b>runmax</b>	Running maximum <b>runmax</b> , <i>nts</i> ifile ofile
<b>runsum</b>	Running sum <b>runsum</b> , <i>nts</i> ifile ofile
<b>runmean</b>	Running mean <b>runmean</b> , <i>nts</i> ifile ofile
<b>runavg</b>	Running average <b>runavg</b> , <i>nts</i> ifile ofile
<b>runstd</b>	Running standard deviation <b>runstd</b> , <i>nts</i> ifile ofile

### Regression

<b>detrend</b>	Detrend <b>detrend</b> ifile ofile
----------------	---------------------------------------

<b>trend</b>	Trend <b>trend</b> ifile ofile1 ofile2
--------------	---

<b>subtrend</b>	Subtract trend <b>subtrend</b> ifile1 ifile2 ifile3 ofile
-----------------	--

### Interpolation

<b>remapcon</b>	Conservative remapping <b>remapcon</b> , <i>grid</i> ifile ofile
<b>remapbil</b>	Bilinear interpolation <b>remapbil</b> , <i>grid</i> ifile ofile
<b>remapbic</b>	Bicubic interpolation <b>remapbic</b> , <i>grid</i> ifile ofile
<b>remapdis</b>	Distance-weighted averaging <b>remapdis</b> , <i>grid</i> ifile ofile

<b>interpolate</b>	Interpolate <b>interpolate</b> , <i>grid</i> ifile ofile
<b>intgrid</b>	Grid interpolation <b>intgrid</b> , <i>grid</i> ifile ofile
<b>intpoint</b>	Point interpolation <b>intpoint</b> , <i>long,lat</i> ifile ofile

<b>ml2pl</b>	Model to pressure level interpolation <b>ml2pl</b> , <i>levels</i> ifile ofile
<b>ml2hl</b>	Model to height level interpolation <b>ml2hl</b> , <i>levels</i> ifile ofile

<b>inttime</b>	Time interpolation <b>inttime</b> , <i>date,time,[inc]</i> ifile ofile
----------------	---

<b>intyear</b>	Year interpolation <b>intyear</b> , <i>years</i> ifile1 ifile2 ofile
----------------	---

### Spectral transformation

<b>sp2gp</b>	Spectral to gridpoint <b>sp2gp</b> ifile ofile
<b>gp2sp</b>	Gridpoint to spectral <b>gp2sp</b> ifile ofile
<b>sp2sp</b>	Spectral to spectral <b>sp2sp</b> , <i>trunc</i> ifile ofile
<b>spcut</b>	Cut spectral wave number <b>spcut</b> , <i>wnums</i> ifile ofile

### Other

<b>gradsdes</b>	GrADS data descriptor file <b>gradsdes</b> ifile
-----------------	---

<b>mastrfu</b>	Mass stream function <b>mastrfu</b> ifile ofile
----------------	--