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tsplot

a tool to plot time series data
Documentation

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NAME

tsplot - To plot time series

SYNOPSIS

tsplot [OPTIONS] [FILE(S)]

DESCRIPTION

tsplot generates xy-plots in PostScript from MPIOM data by using GMT tools.

```
OPTIONS
-help,  -h Print this text.
-codes, -c CODES Codes: Commas for lists and hyphens for ranges.
                 No overlap. (Default: '1')
-resol, -r RESOL Time resolution: 0 for yearly, 1 for monthly
                 and 2 for daily. (Default: '1')
                 It is dependent on what the FILE(S) allow(s) for.
-nplots,-n NPLOTS Number of plots per page (Default: '2')
-xticks,-x XTICKS Tickmarks on the x-axis (Default: '10')
-yticks,-y YTICKS Tickmarks on the y-axis (Default: '10')
-suppr, -s Suppress plotting variable names.
-gaps,  -g Look for gaps.
-vfile, -v FILE File of variable names
                 (Default: 'TSVAR' is created from zeitser.partab)
-dfile, -d FILE File of description texts
                 (Default: 'TSDESC' is created from zeitser.partab)
-ufile, -u FILE File of physical units
                 (Default: 'TSUNIT' is created from zeitser.partab)
FILE(S)         Up to ten file(s) of time series data written in the
                EXTRA format. Names must include just one '_'.
                (Default: 'ZEITSER.ext_').
                Characters after '_' are interpreted as experiment names.
                Experiment names may not contain '_0', '_1' or '_2'.
```

```
If OPTIONS are not given, tsplot inquires them interactively
and shows the information extracted from the files.
At least one OPTION is necessary to run non-interactively.
```

CODES may be given by a list of numbers separated by commas. The list entries may be single numbers or ranges of numbers indicated by hyphens. e.g. `1-4,6,9-11`. The numbers specified that way must occur just once and may not overlap.
RESOL may be 0 for yearly, 1 for monthly, and 2 for daily resolution. **tsplot** examines the FILE(S) for their resolutions. If they have daily resolution, RESOL may be 0, 1, or 2. If they have monthly resolution, RESOL may only be 0 or 1, and if they have yearly resolution, RESOL may only be 0. If more than one file is given, that one with the most coarse resolution determines the range allowed for RESOL. Dependent on this structure, **tsplot** decides whether files have to be averaged or not. If the file resolution is equal to RESOL, a symbolic link is created.
NPLOTS may be any number greater than or equal to 1. It determines the number of time series plots on one page. On such a page the plots are arranged bottom-up.
XTICKS and YTICKS determine the number of tickmarks on the x- and y-axis, respectively. However, these numbers are only approximations of those really plotted, because they are adjusted to match reasonable intervals.
The −−`suppr` or −`s` option allows to suppress plotting variable names that might be interesting for publication purposes. Default is no.
The −−`gaps` or −`g` option allows to search through the time series files for gaps on a yearly base. If gaps are found, the time series are decomposed into several subseries. They are plotted independently of each other so that disturbing connection lines between those subseries are not plotted. Default is no.
The −−`vfile` or −`v`, −−`dfile` or −`d`, −−`ufile` or −`d` options allow to specify three files containing texts needed to label the time series plots. For all options which were described defaults are given.
tsplot distinguishes an interactive and a non-interactive mode. If OPTIONS are not given, the script runs interactively. If at least one option is supplied, it runs non- interactively. This should be preferred when the content of the file or the files is not known. However, the script extracts information about the files which

is shown only in the interactive mode. These informations include the first and the last year and if a year is not complete, the number of codes and the temporal resolution. If more than one file of time series data is given, the script determines the minimum of those numbers to account for future changes in the number of codes. Furthermore, in the interactive mode the script informs about what it is doing at the moment - similar to a verbose mode.

If FILE(S) are not given, the script looks in the current directory by default for files whose names begin with `ZEITSER.ext_`. If FILE(S) are given, their names must include just one underscore sign (_), because the character string which follows this sign is interpreted as experiment name.

While **tsplot** is running some intermediate files are created which are removed again when the script finishes properly. The names of those files consist of the original file name extended by a _ and a number denoting the resolution, followed by another _ and a number denoting the code. In addition, files are created whose names are furthermore extended by _info, _info2, _info3, and _output. The files whose names end on _info3 can further on be extended by another _ and the subseries number, if gaps were encountered.

In order not to confuse those file names in regard to the temporal resolution, the names of the FILE(S) may not include _0, _1, or _2. Therefore, also the experiment names may not include these three character strings.

Up to ten files are allowed. This somewhat arbitrary limit is linked to the way colors are defined. Ten names for colors are used in this order: black, red, gold, green, cyan, blue, purple, brown, grey, pink.

In **tsplot** five GMT tools are used,

gmtset	to set GMT variables
minmax	to determine minima and maxima of the data to be plotted
psbasemap	to draw axis' and labels
psxy	to plot the data
pstext	to plot MPIOM variables, physical units, experiment names.

These commands produce the file `plot.ps` containing PostScript code. This file is controlled by the GMT options `-O` and `-K` which are available for all these commands. Option `-O` denotes the overlay mode, and option `-K` refers to as the append mode. That GMT command which is invoked first, may use only the option `-K`, that one which is invoked last, may use only the option `-O`, and all those invoked in between must use both options.
tsplot has been tested on a Linux machine ('cross') and on a SunOS machine ('yang'). Although the Bourne Again Shell (bash) was available on both computers, this shell showed different behaviour in regard to reading options and the `tr` command. Under Linux the `getopt` command is applied for reading options but under SunOS the `getopts` command is used instead. The `tr` command is applied in a multiple way to achieve similar behaviour on both machines. Also, the GNU `awk` (`gawk`) command is used instead of `awk` to provide similar behaviour. `gawk` is needed to calculate real numbers, whereas calculating integers is done by the `expr` command. On the Linux machine the GMT version 4.1.4 is applied, whereas on the SunOS machine GMT version 4.2 is used instead of version 4.1.3 which showed a different behaviour. If **tsplot** is ported to a machine other than Linux or SunOS, the paths for CDO and GMT have to be changed accordingly and the shell commands controlled by the `uname` shell variable should be traced carefully.

1 Timeseries in MPIOM

The time series data from MPIOM consist of 151 codes (Summer 2007). These are written `formatted` (TIMESER.asc) and/or `unformatted` (TIMESER.ext) by using the EXTRA format. A record written in EXTRA format can be read in a FORTRAN program by

```
READ(10) IDATE,ICODE,ILEVEL,NSIZE
READ(10) (FIELD(ISIZE),ISIZE=1,NSIZE)
```

whereas `IDATE` denotes the date, `ICODE` the code, `ILEVEL` the level, and `NSIZE` the size of the record (http://www.mad.zmaw.de/Pingo/downloads.html).

PSEUDO EXTRA : If the user wishes all 151 codes can be written at once in one record. This however violates the principle of the EXTRA format, because one record should be assigned to just one code (see `ICODE`). Therefore, this format is called PSEUDO EXTRA format. For **tsplot** to be able to plot time series, the data have to be transposed. Unfortunately, CDO does not support a transpose function. The `OCECTL` Namelist from MPIOM includes a variable `ltstranspose` of type `logical`. If it is `.false.` the PSEUDO EXTRA format is applied and if it is `.true.`, the EXTRA format is applied so that only one code is written in one record, i.e. `NSIZE=1`.

The namelist variable `itsdiag` controls the output. Eight settings are possible.

0	no output
1	one snapshot per day
2	monthly averaged snapshot
3	yearly averaged snapshot
4	output every timestep
5	daily average
6	monthly mean of daily averages
7	yearly mean of daily averages

In `mpiom.f90` the variable `itsdiag` controls how often the subroutine `diagnosis` is called. This subroutine is called each time step, if `itsdiag` is greater than are equal to 4. Otherwise `diagnosis` is called once per day as in the former version. In `mo_diagnosis.f90` the new subroutine `write_timeseries` is called, if `itsdiag` is greater than or equal to 1. In `write_timeseries` the variable `itsdiag` controls the accumulating and averaging of time series data as described above. In addition, three new files are generated by `write_timeseries` containing texts used by **tsplot** to label the time series plots. File `TSVAR` contains the variable names as used in MPIOM. File `TSDESC` includes the scientific expressions of these variables to be used as titles for the plots. File `TSUNIT` provides the physical units to label the y-axis of the plots (see Appendix). These files are written only when `diagnosis` is called the first time.

Appendix

Examples:

`As first step the user needs to cat the individual time series in to one file.`

```
cat $WRKSHR//TIMESER.????0101_????1231.ext » TIMESER_hel9994
```

`As second step make the plot, e.g. for codes 1-16 and 32-151`

```
tsplot -c1-16,32-151 -r 0 -n 2 TIMESER_hel9994
```

1	PSIGULF	max_of_barotropic_streamfunction_in_subtropical_atlantic	m3 s-1
2	PSIKURO	max_of_barotropic_streamfunction_in_subtropical_pacific	m3 s-1
3	PSIBANDA	barotropic_transport_through_indonesian_archipelago	m3 s-1
4	PSIDRAKE	barotropic_transport_through_drake_passage	m3 s-1
5	PSIBERING	barotropic_transport_through_bering_strait	m3 s-1
6	PSISPG	max_of_barotropic_streamfunction_in_subpolar_atlantic	m3 s-1
7	CO2	mass_fraction_of_carbon_dioxide_in_air	ppm
8	CO2FLUX	downward_carbon_flux_at_surface	mole m-2
9	AABW2	mass_transport_below_1000m_in_atlantic_around_60N	m3 s-1
10	NADW2	mass_transport_below_1000m_in_atlantic_around_60N	m3 s-1
11	AABW3	mass_transport_below_1000m_in_atlantic_around_50N	m3 s-1
12	NADW3	mass_transport_below_1000m_in_atlantic_around_50N	m3 s-1
13	AABW4	mass_transport_below_1000m_in_atlantic_around_30N	m3 s-1
14	NADW4	mass_transport_below_1000m_in_atlantic_around_30N	m3 s-1
15	AABW5	mass_transport_below_1000m_in_atlantic_around_30S	m3 s-1
16	NADW5	mass_transport_below_1000m_in_atlantic_around_30S	m3 s-1
17	TVQUER1	heat_transport_by_advection_in_pacific_at_65N	W
18	SVQUER1	salt_transport_by_advection_in_pacific_at_65N	g s-1
19	TMERCI1	mass_transport_in_pacific_at_65N	m3 s-1
20	TVQUER2	heat_transport_by_advection_in_atlantic_at_60N	W
21	SVQUER2	salt_transport_by_advection_in_atlantic_at_60N	g s-1
22	TMERCI2	mass_transport_in_atlantic_at_60N	m3 s-1
23	TVQUER3	heat_transport_by_advection_in_atlantic_at_50N	W
24	SVQUER3	salt_transport_by_advection_in_atlantic_at_50N	g s-1
25	TMERCI3	mass_transport_in_atlantic_at_50N	m3 s-1
26	TVQUER4	heat_transport_by_advection_in_atlantic_at_30N	W
27	SVQUER4	salt_transport_by_advection_in_atlantic_at_30N	g s-1
28	TMERCI4	mass_transport_in_atlantic_at_30N	m3 s-1
29	TVQUER5	heat_transport_by_advection_in_atlantic_at_30S	W
30	SVQUER5	salt_transport_by_advection_in_atlantic_at_30S	g s-1
31	TMERCI5	mass_transport_in_atlantic_at_30S	m3 s-1
32	TVNET2	net_heat_transport_by_advection_in_atlantic_at_60N	W
33	SVNET2	net_salt_transport_by_advection_in_atlantic_at_60N	g s-1
34	TVNET3	net_heat_transport_by_advection_in_atlantic_at_50N	W
35	SVNET3	net_salt_transport_by_advection_in_atlantic_at_50N	g s-1
36	TVNET4	net_heat_transport_by_advection_in_atlantic_at_30N	W
37	SVNET4	net_salt_transport_by_advection_in_atlantic_at_30N	g s-1
38	TVNET5	net_heat_transport_by_advection_in_atlantic_at_30S	W
39	SVNET5	net_salt_transport_by_advection_in_atlantic_at_30S	g s-1
40	TRBERING	mass_transport_through_bering_strait	m3 s-1

41	TRDENMARK	overflow_transport_through_denmark_strait	m3 s-1
42	TRFAROER	overflow_transport_through_faroer_bank_channel	m3 s-1
43	SFRAM	seaice_transport_through_fram_strait	m3 s-1
44	ICEARE_ARC	seaice_area	m2
45	ICEVOL_ARC	seaice_volume	m3
46	HFL_ARC	downward_heatflux_into_ocean	W
47	WFL_ARC	downward_waterflux_into_ocean	m3 s-1
48	SST_ARC	sea_surface_temperature	deg C
49	SSS_ARC	sea_surface_salinity	psu
50	T200_ARC	potential_temperature	deg C
51	S200_ARC	salinity	psu
52	T700_ARC	potential_temperature	deg C
53	S700_ARC	salinity	psu
54	T2200_ARC	potential_temperature	deg C
55	S2200_ARC	salinity	psu
56	ICEARE_GIN	seaice_area	m2
57	ICEVOL_GIN	seaice_volume	m3
58	HFL_GIN	downward_heatflux_into_ocean	W
59	WFL_GIN	downward_waterflux_into_ocean	m3 s-1
60	SST_GIN	sea_surface_temperature	deg C
61	SSS_GIN	sea_surface_salinity	psu
62	T200_GIN	potential_temperature	deg C
63	S200_GIN	salinity	psu
64	T700_GIN	potential_temperature	deg C
65	S700_GIN	salinity	psu
66	T2200_GIN	potential_temperature	deg C
67	S2200_GIN	salinity	psu
68	ICEARE_LAB	seaice_area	m2
69	ICEVOL_LAB	seaice_volume	m3
70	HFL_LAB	downward_heatflux_into_ocean	W
71	WFL_LAB	downward_waterflux_into_ocean	m3 s-1
72	SST_LAB	sea_surface_temperature	deg C
73	SSS_LAB	sea_surface_salinity	psu
74	T200_LAB	potential_temperature	deg C
75	S200_LAB	salinity	psu
76	T700_LAB	potential_temperature	deg C
77	S700_LAB	salinity	psu
78	T2200_LAB	potential_temperature	deg C
79	S2200_LAB	salinity	psu
80	ICEARE_NAT	seaice_area	m2

81	ICEVOL_NAT	seaice_volume	m3
82	HFL_NAT	downward_heatflux_into_ocean	W
83	WFL_NAT	downward_waterflux_into_ocean	m3 s-1
84	SST_NAT	sea_surface_temperature	deg C
85	SSS_NAT	sea_surface_salinity	psu
86	T200_NAT	potential_temperature	deg C
87	S200_NAT	salinity_at_200m	psu
88	T700_NAT	potential_temperature	deg C
89	S700_NAT	salinity	psu
90	T2200_NAT	potential_temperature	deg C
91	S2200_NAT	salinity	psu
92	ICEARE_ATL	seaice_area	m2
93	ICEVOL_ATL	seaice_volume	m3
94	HFL_ATL	downward_heatflux_into_ocean	W
95	WFL_ATL	downward_waterflux_into_ocean	m3 s-1
96	SST_ATL	sea_surface_temperature	deg C
97	SSS_ATL	sea_surface_salinity	psu
98	T200_ATL	potential_temperature	deg C
99	S200_ATL	salinity	psu
100	T700_ATL	potential_temperature	deg C
101	S700_ATL	salinity	psu
102	T2200_ATL	potential_temperature	deg C
103	S2200_ATL	salinity	psu
104	ICEARE_SO	seaice_area	m2
105	ICEVOL_SO	seaice_volume	m3
106	HFL_SO	downward_heatflux_into_ocean	W
107	WFL_SO	downward_waterflux_into_ocean	m3 s-1
108	SST_SO	sea_surface_temperature	deg C
109	SSS_SO	sea_surface_salinity	psu
110	T200_SO	potential_temperature	deg C
111	S200_SO	salinity	psu
112	T700_SO	potential_temperature	deg C
113	S700_SO	salinity	psu
114	T2200_SO	potential_temperature	deg C
115	S2200_SO	salinity	psu
116	ICEARE_PAC	seaice_area	m2
117	ICEVOL_PAC	seaice_volume	m3
118	HFL_PAC	downward_heatflux_into_ocean	W
119	WFL_PAC	downward_waterflux_into_ocean	m3 s-1
120	SST_PAC	sea_surface_temperature	deg C

121	SSS_PAC	sea_surface_salinity	psu
122	T200_PAC	potential_temperature	deg C
123	S200_PAC	salinity	psu
124	T700_PAC	potential_temperature	deg C
125	S700_PAC	salinity	psu
126	T2200_PAC	potential_temperature	deg C
127	S2200_PAC	salinity	psu
128	ICEARE_NI3	seaice_area	m2
129	ICEVOL_NI3	seaice_volume	m3
130	HFL_NI3	downward_heatflux_into_ocean	W
131	WFL_NI3	downward_waterflux_into_ocean	m3 s-1
132	SST_NI3	sea_surface_temperature	deg C
133	SSS_NI3	sea_surface_salinity	psu
134	T200_NI3	potential_temperature	deg C
135	S200_NI3	salinity	psu
136	T700_NI3	potential_temperature	deg C
137	S700_NI3	salinity	psu
138	T2200_NI3	potential_temperature	deg C
139	S2200_NI3	salinity	psu
140	ICEARE_GLO	seaice_area	m2
141	ICEVOL_GLO	seaice_volume	m3
142	HFL_GLO	downward_heatflux_into_ocean	W
143	WFL_GLO	downward_waterflux_into_ocean	m3 s-1
144	SST_GLO	sea_surface_temperature	deg C
145	SSS_GLO	sea_surface_salinity	psu
146	T200_GLO	potential_temperature	deg C
147	S200_GLO	salinity	psu
148	T700_GLO	potential_temperature	deg C
149	S700_GLO	salinity	psu
150	T2200_GLO	potential_temperature	deg C
151	S2200_GLO	salinity	psu