TYN SC 2.0: Introduction

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1 Introduction

This document provides a summary of the climate data-set labelled TYN SC 2.0. Any use of this data-set should be duly acknowledged by referring to the published paper (Mitchell et al, 2003).

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Table 1: Climate variables supplied as part of TYN SC 2.0. Where limits were placed on the values that a variable could take, the limits are indicated.

[var]	variable	units	minimum	maximum
cld	cloud cover	percentage	0	100
dtr	diurnal temperature range	degrees Celsius	0.1	
pre	precipitation	mm	0	
tmp	temperature	degrees Celsius		
vap	vapour pressure	hecta-Pascals	0	

Table 2: UEA gridded data-sets of climate observations previously developed.

data-set	space	time	variety	reference
CRU CL 1.0	0.5^o	1961-90	climatology	New et al, 1999
CRU CL 2.0	10'	1961-90	climatology	New et al, 2002
CRU CL 2.1	10'	1961-90	climatology	Mitchell et al, 2003
CRU TS 1.0	0.5^o	1901-1995	time-series	New et al, 2000
CRU TS 1.1	0.5^o	1996-1998	time-series	Mark New, pers. comm.
CRU TS 1.2	0.5^o Europe	1995-2000	time-series	Mitchell et al, 2003
TYN SC 1.0	10' Europe	2001-2100	time-series	Mitchell et al, 2003
TYN SC 2.0	0.5^o	2001-2100	time-series	Mitchell et al, 2003

2 Variables

There are five variables supplied in this data-set, each constrained to lie within the range of the possible (Table 1).

3 Resolution

The data is supplied on a 0.5 degree grid, covering the global land surface. The data grid is envisaged as a rectangle with boundaries at the poles and the international date line. Data is only supplied for land boxes on the grid, which total 67420. The data is supplied at a monthly time-step for 2001-2100.

4 Construction

The data-set builds upon a number of prior data-sets, summarised in Table 2. Wherever possible, all scenarios should be employed on an equal basis.

4.1 Control scenario

There is one control scenario.[1] This represents the evolution of surface climate over the 21st century under the assumption that mean climate remains fixed at 1961–90 levels. The same 'scenario' may be imposed on the 20th century, to represent the assumption that there has not been any climate change over the 20th century.

4.2 Climate change scenarios

There are 16 climate change scenarios. The climate change scenarios are made up of:

- Inter-annual variations constructed from the 20th century observations.[2] The method of construction was to take the observed grids for 1951–2000,[3] anomalise them compared to 1961–90, remove the global warming trend, duplicate the 50-year period, and impose the full length on the period 2001–2100.

- The climate change patterns[4] for all 16 permutations of four GCMs (HadCM3, CSIRO2, CGCM2, PCM)[5] with four SRES[6] scenarios (A1FI, A2, B1, B2).[7]

- The time-series of global temperature anomalies for each of the 16 permutations noted above.[8]

[1] The data files are named `iavar.1901--2000.[var]`

[2] The data files are named `iavar.1901--2000.[var]`

[3] Observant users of TYN SC 1.0 (the ATEAM scenarios) may notice that this differs from the ATEAM scenarios, for which the period 1901-2000 was used. The reason for the change is that the data coverage for 1901–1950 is much better for Europe than for most other parts of the world, where the anomalies are often 'relaxed' to zero through a lack of data. Therefore for TYN SC 2.0, with its global coverage, it was better to provide interannual variability from the 1951–2000 period and duplicate it.

[4] In the 2080s (2070–99), relative to 1961–90.

[5] These are state-of-the-art coupled climate models. A summary of their features may be found in Working Group One's contribution to the IPCC's Third Assessment Report; see tables 8.1 and 9.1: these four models are numbers 23, 10, 7, 30 respectively.

[6] For details of SRES, see the IPCC's Special Report on Emissions Scenarios.

[7] The data files are named `[SRES].[GCM].2001--2100.[var]`

[8] The data files have `.ann` suffixes.

- The observed 0.5 degree gridded climatology for 1961–90 (CRU CL 1.0). [9]

The climate change scenarios were constructed as described below. For any particular variable (v), GCM (g), and SRES scenario (s), the value (x) at a particular grid-box (i) in a particular year (y) and month (m) is:

$$x_{vgsiym} = c_{vim} + r_{viym} + (p_{vgsim} * t_{gsy})$$

where (c) is the observed climatological mean from 1961–90, (r) is the residual from the observations after anomalising relative to 1961–90 and detrending against global temperature, (p) is the pattern of response to radiative forcing (expressed as anomalies relative to 1961–90, per degree of global temperature change), and (t) is the global temperature change (relative to 1961–90).

5 References

Mitchell, T. D., et al., 2003: A comprehensive set of climate scenarios for Europe and the globe. *In preparation*

New, M., Hulme, M., and Jones, P., 1999: Representing Twentieth-Century Space-Time Climate Variability. Part I: Development of a 1961–90 mean monthly terrestrial climatology. Journal of Climate 12:829–856.[10]

New, M., Hulme, M., and Jones, P., 2000: Representing Twentieth-Century Space-Time Climate Variability. Part II: development of 1901–96[11] monthly grids of terrestrial surface climate. Journal of Climate 13: 2217–2238.[12]

New, M., Lister, D., Hulme, M., and Makin, I., 2002: A high-resolution data set of surface climate over global land areas. Climate Research 21:1–25.[13]

[9] The data files have names beginning with `obs`

[10] This data-set is known as CRU CL 1.0

[11] In fact, only 1901–1995 were developed.

[12] This data-set is known as CRU TS 1.0

[13] This data-set is known as CRU CL 2.0