'gu23trp7494.dat', Version 1.0, February 1998

1. The Dataset

A monthly blended precipitation data set for land and ocean for the extended tropical region of 30°N to 30°S from 1974 to 1994, gridded at 2.5° latitude by 3.75° longitude resolution, has been constructed and is available for use in scientific research. The land component of this data set is the gridded data set of Hulme (gu23wld0094.dat; as it was in 1996), constructed from historical station time-series. The ocean component is derived from satellite Outgoing Longwave Radiation (OLR) measurements and employs a linear thresholding algorithm to convert cloud-top temperatures to precipitation rates. The two data sets have been combined using a Poisson blending technique to produce a continuous merged climatology for the extended tropics. This work has been supported by the UK Department of the Environment, Transport and the Regions (Contract EPG 1/1/14) and the Hadley Centre (Contract MET 2A/0651). The following credit and paper should be cited in reports or publications, etc.:

'gu23trp7494.dat', Doherty, R.M., Hulme,M. and Jones,C.G., (1999). A gridded reconstruction of land and ocean precipitation for the extended tropics from 1974 to 1994 **Int. J.Climatol**., 19, 119-142.

2. Obtaining the Gridded Dataset

'gu23trp7494.dat' is about 3.8MB (1.3MB zipped) in size and can be obtained via FTP. The gzipped (binary) version of the file may be found in the following location and unzipped using 'gunzip' under UNIX:

ftp	ftp.cru.uea.ac.uk
login	'anonymous'
password	your email address
cd	people/mikehulme/outgoing/griddedprecip/gu23trp7494.dat.gz

Once transferred by FTP please email <m.hulme@uea.ac.uk> to say that you have received the data set.

3. Oceanic Climatology Construction and Blending Method

Linear regression was performed between monthly time series of gridded OLR flux measurements (Janowiack *et al*., 1985) and co-located atoll or island precipitation observations over the extended Tropics (30°N - 30°S). This amounted to 105 monthly time series which were utilised to construct a predictive thresholding equation between OLR fluxes to precipitation rates, for the extended Tropics (see Jones 1994). The main assumption in relating OLR to precipitation, is that rainfall occurs predominately from deep convective systems, hence this algorithm is confined to the extended tropical area and performs least well in subtropical locations within this domain. There are a number of other uncertainties inherent in this approach including: relating grid-cell OLR averages to site observations, the application of a single equation for the entire Tropical region, the use of a thresholding on-off relationship, and the presence of low-level precipitating and high-level cirrus non-preciptitating clouds, (see Doherty *et al*., 1999).

The Poisson blending technique, based on Reynolds (1988), uses the complete land and ocean OLR-derived precipitation measurements (derived from the method described above) to define the relative distribution (shape or smoothness) of the blended tropical field, and the land observational climatology (Hulme 1992, 1994, 1998) to define the amplitude of the blended tropical field. This assumes the land observational-based tropical fields to be reliable but incomplete (i.e. no oceanic values), and the OLR-derived tropical fields to be complete over land and ocean, but less reliable. This technique by default will infill missing land grid-cells with OLR values, however, missing land-cells were re-inserted into the final product as the relation between OLR and precipitation is less appropriate for land areas with more complicated topography. The land climatology remains unchanged in the blending process. The merging of the land and OLR-derived climatology was performed for 12 mean- monthly and then 252 monthly anomaly fields for 1974-1994. These were then recombined into a single climatology. For further details and a comparison with other satellite-derived climatologies see Doherty *et al*. (1999).

References:

Doherty, R.M., Hulme,M. and Jones,C.G., (1999). A gridded reconstruction of land and ocean precipitation for the extended tropics from 1974 to 1994 **Int. J.Climatol**., 19, 119-142.

Hulme, M. (1992) A 1951-80 global land precipitation climatology for the evaluation of General Circulation Models **Climate Dynamics**, 7, 57-72.

Hulme, M. (1994) Validation of large-scale precipitation fields in General Circulation Models pp.387-406 in, **Global precipitations and climate change** (eds.) Desbois,M. and Desalmand,F., NATO ASI Series, Springer-Verlag, Berlin, 466pp.

Hulme, M., Osborn,T.J. and T.C.Johns (1998) Precipitation sensitivity to global warming: Comparison of observations with HadCM2 simulations **Geophys. Res. Letts**., 25, 3379-3382.

Janowiack, J.E., Kreuger, A.F., Arkin, P.A. and Gruber, A. (1985) **Atlas of outgoing longwave radiation derived from NOAA satellite data**. NOAA Atlas No. 6 NOAA/NWS/NESDIS, US Department of Commerce, Silver Spring, MD 20907, 44 pp.

Jones, C.G. (1994) **Development of a precipitation climatology for the tropical oceans fron outgoing longwave radiation measurements**, Internal Report, Climatic Research Unit, Norwich, UK 54 pp (unpublished).

Reynolds, R.W. (1998) A real-time global sea-surface temperature analysis **J. Climate** 1, 75-86.

DATA file format:

The data file is organised by gridbox with each gridbox entry consisting of a header line followed by n lines of monthly precipitation totals, one line per year.

HEADER line: the FORTRAN format for this line is: (I7,I5,I6,I5,A15,I4,A14,2I4,I7,I9). The information contained is as follows:

FIELD 1. Seven digit number: this is the global gridbox number which at a 2.5° by 3.75° resolution varies between 1 and 6816. The gridbox numbering starts at 87.5° S, 180°W (centre of box number 1), proceeds first eastward, then northward and ends at 87.5°N, 176.25°E (centre of

box number 6816). This gridding geography follows that of the Hadley Centre's current Unified Model (post-1992 version). 2400 tropical gridboxes exist in gu23trp7494.dat.

FIELD 2. Five digit number: this is the latitude of the centre of the gridbox to the nearest 0.01. Latitude has been decimalised and multiplied by 100 (e.g. -8750 means 87°30'S). North is positive and south is negative.

FIELD 3. Five digit number: this is the longitude of the centre of the gridbox to the nearest 0.01. Longitude has been decimalised and multiplied by 100 (e.g. -17625 means 176°15'W). West is negative and east is positive.

FIELD 4. Five digit number: this is the mean altitude, in metres above sea level, of the stations which have contributed to the gridbox estimate. Where altitude is not known '-999' is entered. This is not the `true' elevation of the gridbox.

FIELD 5. Fifteen character country name: this is the dominant country among the stations which have contributed to the gridbox estimate. It is not necessarily the country in which the largest portion of the gridbox falls. A full list of countries worldwide is available on a separate sheet.

FIELD 6. Four digit integer: this is the number of stations which have contributed to the gridbox estimate.

FIELD 7. Fourteen character string which contains diagnostic information about the gridding technique. Can be ignored.

FIELD 8. Two four digit numbers: these represent the start and end years respectively of the data held for that gridbox in the data file. These years do not necessarily imply that all monthly totals for these years are present.

FIELD 9. Same as FIELD 1.

DATA lines: each line contains 14 numbers in format (I4,12I5,I6). Number 1: is the year; Numbers 2-13: are the twelve monthly precipitation totals in mms*10 (e.g. 246 is 24.6mm). Where a monthly total is missing '-10' is entered. Trace rainfalls are entered as '0'; Number 14: is the annual precipitation total in mms*10 (e.g. 15467 is 1546.7mm). This annual total will be the sum of the 12 monthly totals. Where one or more monthly totals are missing, no annual total is entered and the missing code '-10' is used.

***** No liability is accepted for errors in the data set *****

For further information about these gridded data sets contact:

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