Construction of climate scenarios for the BKCC integrating framework

CRU, University of East Anglia

WRSRL, University of Newcastle

Hadley Centre

UKCIP02 scenarios

- simulations for 1961-1990/2071-2100 only
- daily timescale output
- 50 km x 50 km resolution
- some present-day features poorly simulated
- limited emissions scenarios/single model
- urbanized portions of land surface neglected

Appropriate approaches

- CRU daily/hourly weather generators

- development & application of the GNSRP model for construction of specialised rainfall scenarios

- exploration of a more-physically based approach to wind scenario development

- new representation of urban areas in GCM simulations

Scenarios of climate change in urban areas

- new mosaic/tiling land surface scheme in HadAM3 (3.75° long. X 2.5° lat.)
- $1xCO_2$ and $2xCO_2$ (with scaling)
- additional inputs of sensible heat in urban areas (current energy consumption)
- mean temperature/extremes & humidity
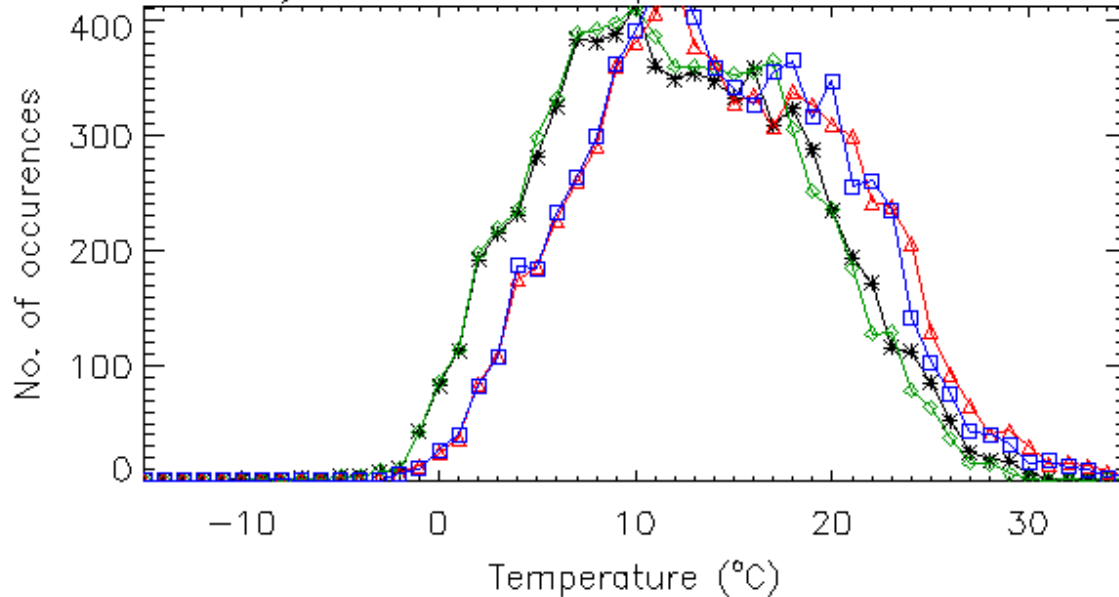- report due April 2004

Issues to be addressed

- UHI effect at present-day and validation
- importance of changes to UHI effect - have urban changes been under or over estimated?
- importance of urban heat sources in the current climate & how this might change

Daily minimum temperature for London
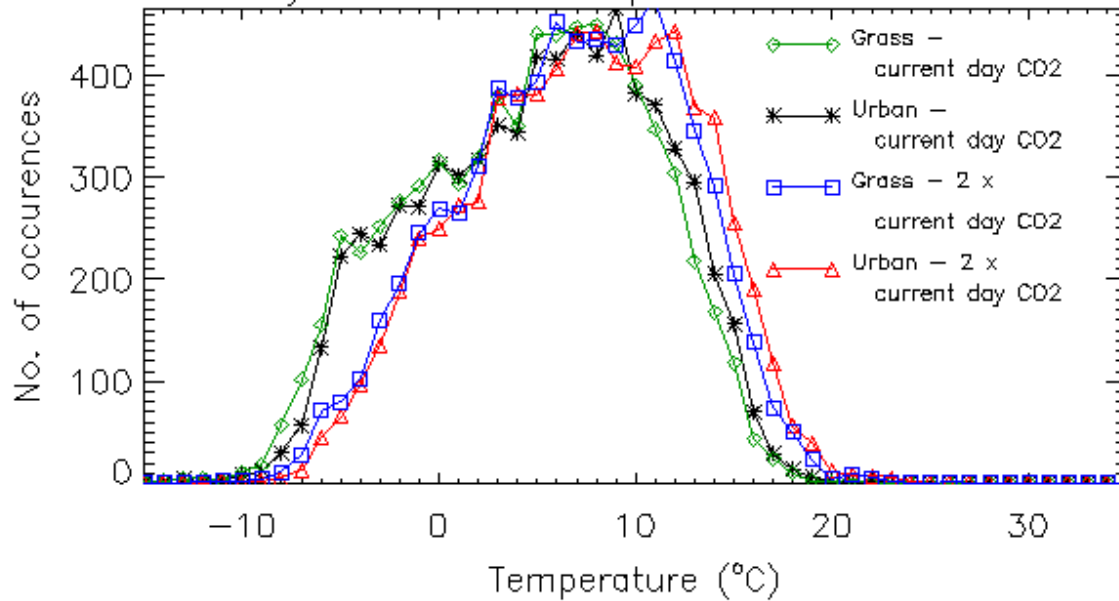
Daily maximum temperature for London

Workshops, dissemination and ongoing support/advice

- two workshops - May 2003 and 2004

- web site

- technical briefing notes

- support/advice on scenario use and availability of information/scenarios for additional variables

- bulletin board?

Deliverables from climate scenarios project

D1: Examples of WG/GNSRP model output for testing impacts models	July/December 2003
D2: Daily/hourly scenarios for 8 variables* for 3-5 representative case-study locations	April 2004
D3: Software package to run the GNSRP precipitation model for any given UK location	April 2004
D4: Report describing the analyses of changes to urban/rural temperature and humidity	April 2004
D5: Technical briefing notes on issues such as the models used and underlying assumptions, uncertainties and confidence limits, and guide to good practice in scenario use	December 2003 and April 2004

Precipitation, min/max temperature, vapour pressure/relative humidity, sunshine duration, wind speed and PET

Climate scenario construction using the CRU daily and hourly weather generators (WG)

Matthew Watts and Clare Goodess

Advantages of the CRU WGs

- daily and hourly time-series for specific point locations

- self-consistent scenarios for a number of variables

Scenario details

- Four UKCIP02 emissions scenarios (low, medium-low, medium-high and high) based on HadRM3 output

- Limited number of additional models?

- *3-5 case-study locations?*

- *2020s, 2050s, 2080s?*

- *time series length, e.g., 30, 100, 1000 yrs?*

- **Task 1:** modification & updating of the daily WG focusing on the development of generic, user-friendly subroutines for perturbing the parameters in climate change studies

- **Task 2:** Development of methodologies for perturbing the WG parameters based on UKCIP02 & to quantify some of the uncertainties

- **Task 3:** Improvements to the daily WG, focusing on secondary variables

- **Task 4:** Development of the hourly WG

Model Description

- Markov Chain Model

- First Order

- Continuous State

- Transfer Function : Gamma distribution

Model Operation

- Create transition matrix
- Calculate parameters for transfer function for each transition
- Derive general relationhip for parameters based on precipitation amount
- Calulate todays preciptation from yesterdays by inverting the transfer function
- Use todays precipitation to derive other variables

Example Model Data

STN	DY	MN	DY	HR	SS	TN	TX	VP	RH	WN	RN	PET
3772	1997	01	01	9999	1.06	-1.7	5.2	6.37	-999.99	0.57	5.00	-999.00
3772	1997	01	02	9999	1.24	3.5	0.5	5.27	-999.99	2.04	7.00	-999.00
3772	1997	01	03	9999	2.87	-0.7	5.8	6.43	-999.99	3.53	23.00	-999.00

Example daily output: end June 2003
Example hourly output: December 2003
Daily/hourly scenarios: April 2004