

A Practical Introduction to Earth System Modelling

13th-14th July 2016

Life Sciences building (room G08), University of Bristol

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This workshop will give an introduction to and practical hands-on learning in Earth system modelling. It will provide a chance to explore the dynamics of the Earth's climate system as well as of global carbon cycling and the biogeochemical impacts of fossil fuel CO₂ emissions. The workshop will foster a critical appreciation of the nature and limitations of climate and Earth system models in trying to understand and predicting global change. But you will also see how numerical models can be utilized to address scientific questions, test hypotheses, and quantify the past and future relationship between global carbon cycling and climate and associated feedbacks. You will learn new computer skills and gain experience with some data visualization packages.

In summary:

- You will have prescribed fun.
- You will lose all respect for climate (and other complex) models.
- But ... you will also appreciate how essential models are as tools for testing hypotheses, quantifying impacts, and exploring the possible behaviours of climate and carbon cycling to (e.g. human) disruption, and generally: learning how the Earth system 'works'.
- You will get a 'hands-on' appreciation of the nature (in terms of carbonate chemistry) and spatial pattern of anthropogenic ocean acidification.

There are no 'pre-requisites' in terms of computer programming skills or knowledge, and you do not have to bring a laptop.

Food and refreshments will be provided on all days. There will be a vaguely organised outing to the pub on Wednesday evening for beer/food (is there a difference?).

The summer school will take place in the Life Sciences Building which is on 24 Tyndall Avenue, BS8 1TQ (see attached maps). There will be a porter at the entrance to let you in. The practical sessions will take place computer room G08.

Day 1 (Wednesday 13th July) – Earth system modelling for ‘newbies’*

START (9 am)

- **Presentation – Course and methodology overview**
- **Session #0 (am) – Getting started**
Accessing the computing cluster; installing and compiling cGENIE; directory structure (‘where everything is’).
Command-line operation; how to submit jobs to a cluster queue. Use of ‘restart’ experiments and modelling methodologies.
Visualization of model output: time-series and time-slice (2D and 3D) output.
- **COFFEE** (ca. 11 am)
- **Session #0 (am) – Getting started [continued]**
- **LUNCH** (ca. 1-2 pm)
- **Session #1 (pm) – A ‘real’(!) experiment**
Setting up experiments: configuration files and setting parameter values.
Exploring Earth system dynamics: ‘Snowball Earth’ and climate feedback.

END (ca. 5 pm) (+ pub)

Day 2 (Thursday 14th July) – Getting your hands dirty (with carbon)

START (ca. 9 am)

- **Session #2 – ‘Poking the climate beast’**
Applying perturbations and tracing ocean circulation.
- **COFFEE** (ca. 11 am)
- **Session #3 – Poking the carbon cycle**
CO₂ emissions and the spatial patterns of ocean acidification.
- **LUNCH** (ca. 1-2 pm)
- **Session #4 – Engineering the carbon cycle**
Sensitivity of atmospheric $p\text{CO}_2$ and ocean acidification to changes in the ocean’s biological pump and ‘weathering’. Ocean carbon cycle geoengineering.

END (ca. 4 pm)

accommodation (Clifton Hill treehouse)



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Canyng Hall, Coombe
Dingle Sports Centre and
Southmead Hospital 93

M5,
MIDLANDS
AND THE
SOUTH
WEST

OAKFIELD ROAD

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ST PAUL'S ROAD

QUEEN'S ROAD

RICHMOND HILL

Students' Union
Richmond Building

GORDON ROAD

RICHMOND
TERRACE



A38, M5 SOUTH,
BRISTOL AIRPORT

BBC

Victoria
Rooms
81

54
QUEEN'S AVE
108

QUEEN'S ROAD A4018

Wills
Memorial
Building

TRIANGLE SOUTH A4018

BERKELEY
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GREAT GEORGE STREET

ST GEORGE'S ROAD

ABERDEEN ROAD

COTHAM HILL

BELGRAVE RD

TYNDALL'S PARK ROAD

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ELTON ROAD

SENATE HOUSE

Bristol
Grammar
School

UNIVERSITY ROAD

WOODLAND ROAD

PARK STREET A4018

COLSTON STREET

COLSTON AVENUE

CORN STREET

BALDWIN STREET

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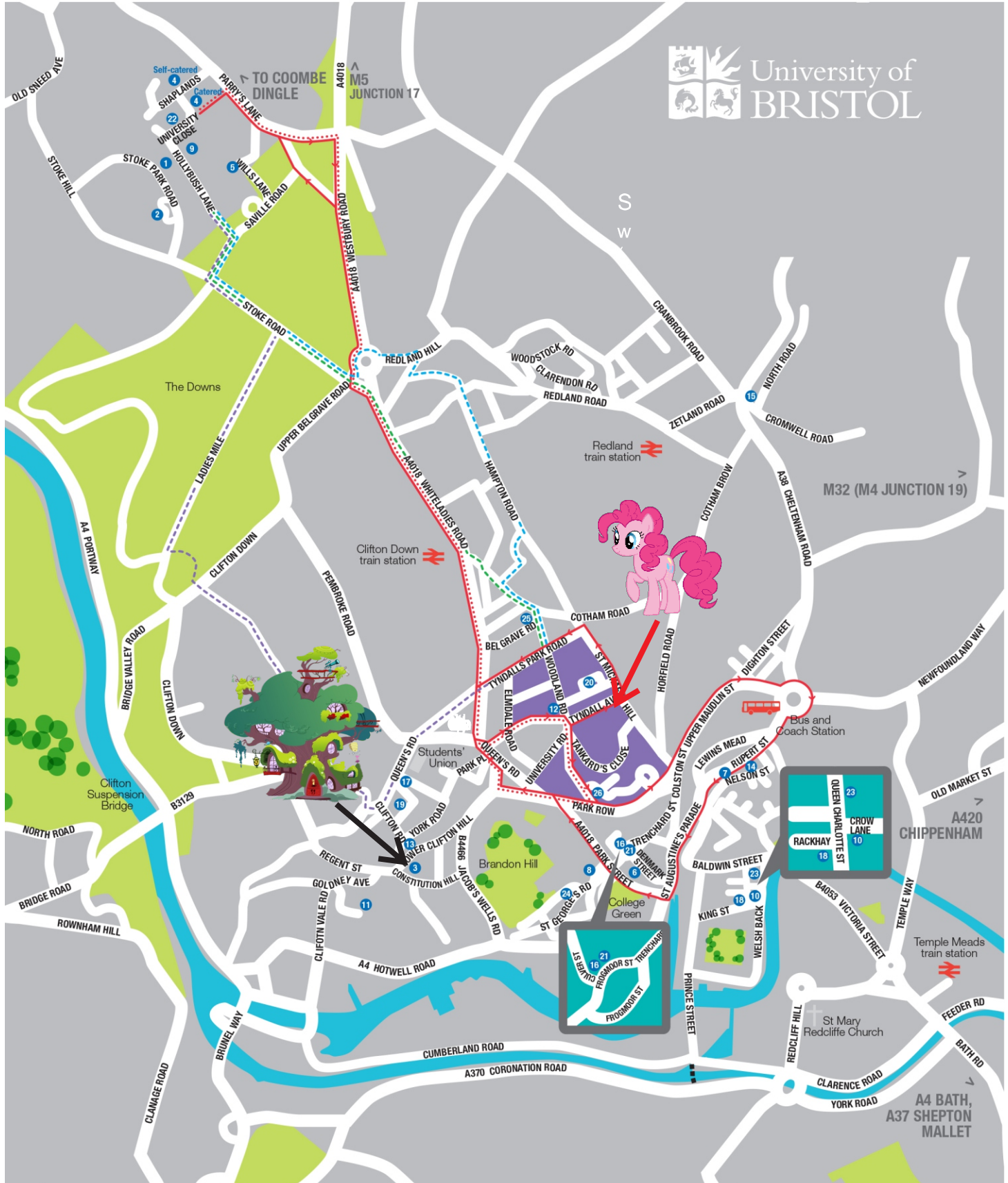
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University of
BRISTOL



Catered

1	Badock Hall	Walking times*
2	Churchill Hall	00:39
3	Clifton Hill House	00:35
4	Hiatt Baker Hall (catered)	00:14
5	Wills Hall	00:42
		00:35

Key

- Cycle route – quiet
- Cycle route – express
- Cycle route – via Students' Union
- Bus route Wessex 16 – off-peak service
- Bus route Wessex 16 – peak service; Mon-Fri 8-10 am, 3-7 pm

Self-catered

4	Hiatt Baker Hall (self-catered)	Walking times*
6	Chantry Court	00:42
7	The Courtrooms	00:15
8	Deans Court	00:12
9	Durham Hall	00:13
10	Favell House	00:38
11	Goldney Hall	00:06
12	The Hawthorns	00:15
13	Manor Hall	00:01
14	New Bridewell	00:14
15	Northwell House	00:12
16	Orchard Heights	00:23
		00:12

17	115 Queen's Road	Walking times*
18	The Rackhay	00:13
19	Richmond Terrace	00:17
20	28/33 St Michael's Park	00:15
21	Unite House	00:03
22	University Hall	00:12
23	Waverley House	00:44
24	Winkworth House	00:19
25	Woodland Court	00:16
26	97 Woodland Road	00:06
		00:00

*Walking times are measured between the halls and the main campus