

Digital rocks

The lessons learned in making
geoscience data work are
generic

Ian Jackson





The take-aways

Competent, shareable, accessible data are essential to robust environmental/science evidence, but you still need a use-case

The biggest challenges relate to people, not data or technology

Be transparent and communicate...a lot

Engage - consult - decide - do – reviewand keep engaging

Shout about your achievements externally - it will bring others on board (and counter internal dissonance)

Sustaining the effort/resource: data stewardship is for the long term

What you're doing is vital - you are not alone, you're not the first and you won't be the last





What you're thinking....?

Who is this old guy?

..... and what have rocks got to do with biodiversity data?





The old guy?

Field geologist with British Geological Survey (BGS)

Experimented with databases and GIS thru 1980s

Director of BGS digital transformation programme

Ran a global geoscience spatial data project

EU Environmental Information Directive (INSPIRE) team

D i g i t a l r o c k s
ianjackson2011@gmail.com





Why is a digital rock story relevant to you?

Almost all environmental data & people share common characteristics.....

Data – spatially related, analogue and digital, interpretive, inconsistent/variable, collected for other purposes, poorly managed, low priority

People – clever, passionate, independent, driven by science/nature (not data), rarely data-tech trained

Leaders/managers – focused on “bigger” priorities, think data management is simple/already done/ and doesn't need maintaining





The next 10 minutes

Two stories

Lessons learned





BGS story

Been around since 1835

Part of Natural Environment Research Council (NERC)

~650 staff, ~£55 million budget, 50:50 gov/contracts

Mission: provide geoscience expertise & data for UK

Lots of data – analogue, digital, samples.....

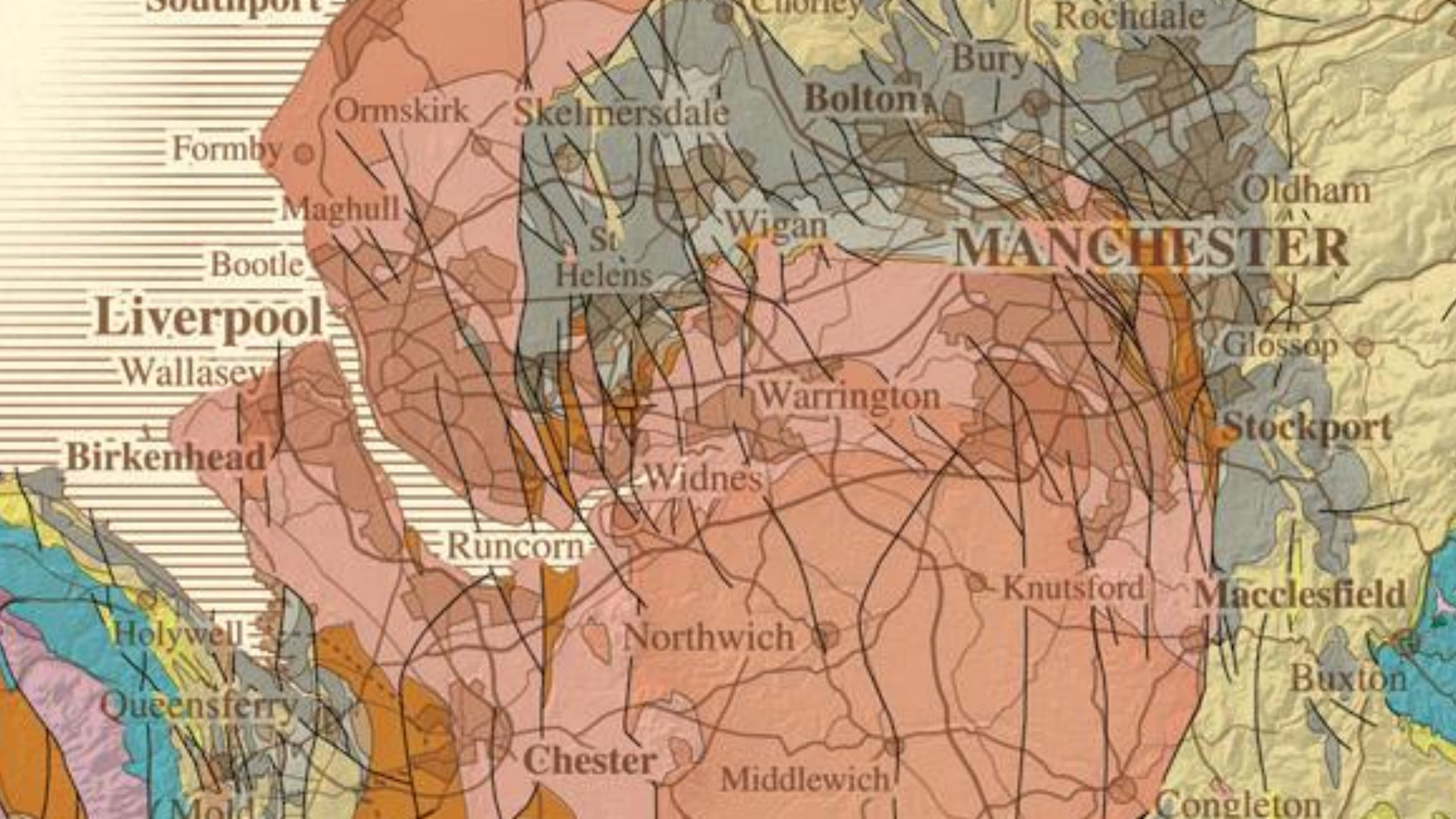




BGS data – a flavour

100,000s of geoscience maps at large and small scale





MANCHESTER

Liverpool

Birkenhead

Stockport

Macclesfield

Chester

Holywell

Queensferry

Mold

Formby

Maghull

Bootle

Wallasey

Ormskirk

Skelmersdale

St Helens

Wigan

Bolton

Bury

Rochdale

Oldham

Warrington

Widnes

Runcorn

Knutsford

Northwich

Middlewich

Congleton

Buxton

Short line
Northumberland

LAT 54° 59'

LAT 54° 58'

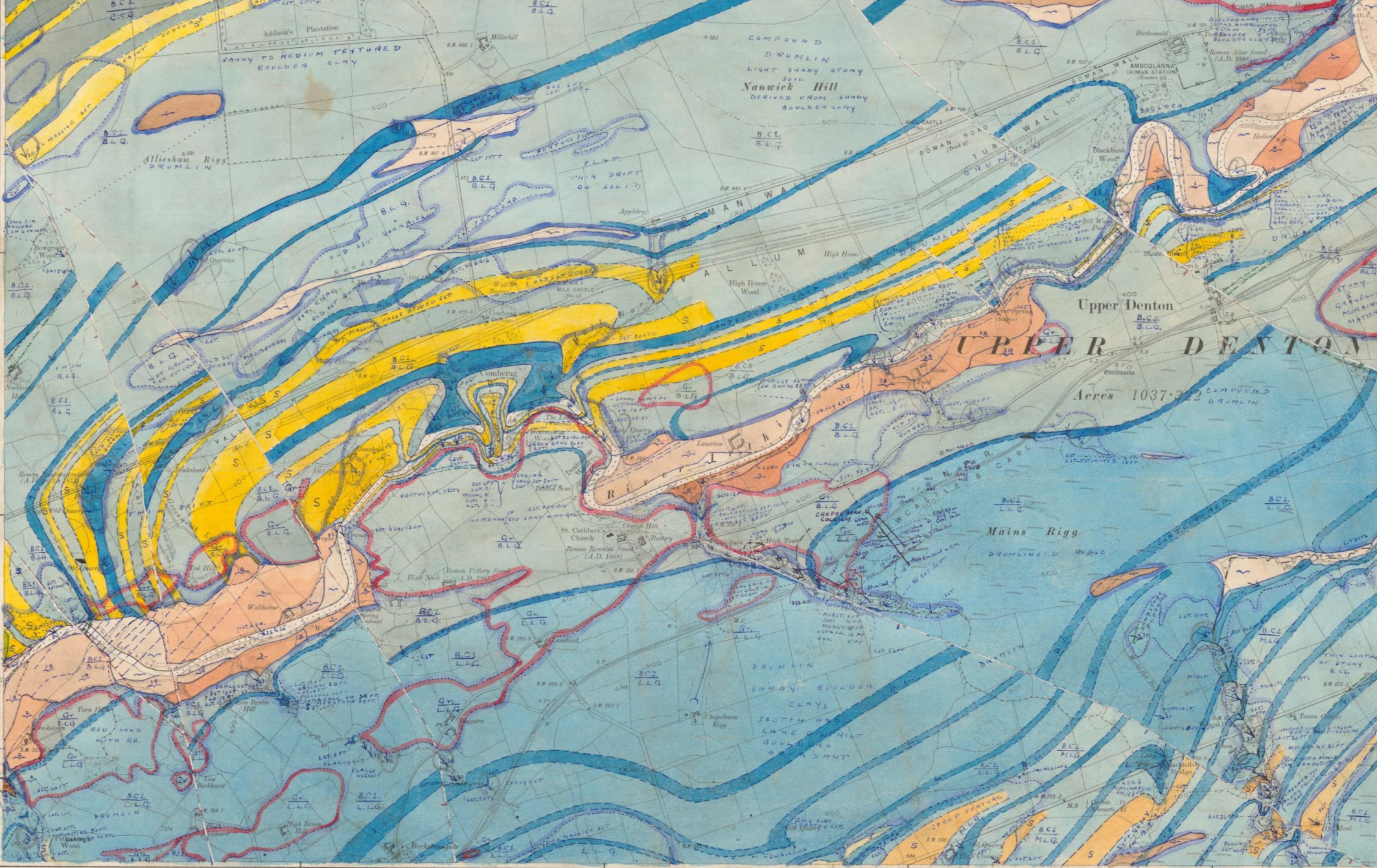
BIRTHOLME PH.

W. MOORE PARK

CUMB. XII. S.W.

CUMB. XVIII. N.E.

NORTHUM. XCI. N.W.



RECENT

- 1st Terrace (Sand & loam)
- 2nd Terrace (Gravel)
- 3rd Terrace (Gravel)
- Alluvial Cone

MOR Moraine

Gr Sand & Gravel

B.C.L. Boulder Clay

LAYERS

- ML.G. Undivided
- S Sandstone
- LL.G. Undivided
- S Sandstone
- AL.G. Undivided
- S Sandstone
- L Limestone on above groups
- C.S.G. Undivided (see above)

Geological symbols:

- Horizontal strata dip observed at surface in degrees
- Highly inclined strata
- Whitened lines show position of faults on the surface, the character of the fault is given by the downthrow
- Geological boundary
- Coal Crops
- Boundaries, Coal and faults where uncertain are by broken lines
- Drift boundaries
- Mine shaft, abandoned
- Fossil localities
- Glacial drainage channel
- Abbreviations

Abbreviations:

- SH = SHALE
- LS = LIMESTONE
- SST = SANDSTONE
- MUDST = MUDSTONE
- SL = SCAR LIMESTONE
- S.P.L. = SINGLE POST-TENSILE
- T.B.L. = TONGUE BOTTOM
- D. = DENTON
- N.L. = NORTH
- L.L. = LEA
- T.L. = TILLY
- A.L. = APPLE TREE

Scale: Six Inches to One Statute Mile or 800 Feet to One Inch = 10800

Map Title: NETHER DENTON PH.

Author: Clean copied by F.M. Trotter in 1927

Printer: D.L. BANKHOUSES LTD

Cumberland. Surveyed in 1862. Revised in 1899.
Northumberland. Surveyed in 1861. Revised in 1895.
Reprint 50/1905.

CHARACTERISTICS AND SYMBOLS

SPECIALY PRINTED ON HARD PAPER

Scale - Six Inches to One Statute Mile or 800 Feet to One Inch = 10800



D i g i t a l r o c k s
ianjackson2011@gmail.com

18 linear kilometres of paper records - field note books,
scientific papers, etc





The Quartz Porphyry reaches its maximum thickness on the north side of the hill at point between contours 1330 + 1290 on foregoing sketch section. It is at this point well seen

as a row of well

defined columns whose appearance is denoted in the above sketch. Beds of schist + gneiss dip below the felsite as sketched



British Geological Survey

TECHNICAL REPORT

Onshore Geology Series

REPORT

on the

GEOLOGICAL SURVEY OF THE
AT INCHCOONANS CLAYPIE

by

M A E Brown, I B Paterson and I

Technical Report WA/95/



British Geological Survey

TECHNICAL REPORT

Onshore Geology Series

TECHNICAL REPORT WA/00/09

The Quaternary Landscape
surrounding the Calen Gorm Funicular
site, central Highlands, Scotland: a brief
appraisal of sediments and landforms.

N R Gollidge
October 2000



British Geological Survey

TECHNICAL REPORT

Onshore Geology Series

TECHNICAL REPORT WA/95/18
Onshore Geology Series

EXPLANATION FOR 1:10 000 SHEET NS71NW
(AUCHTITENCH)

Part of 1:50 000 Sheet 15W (New Cumnock)

Richard A. Smith

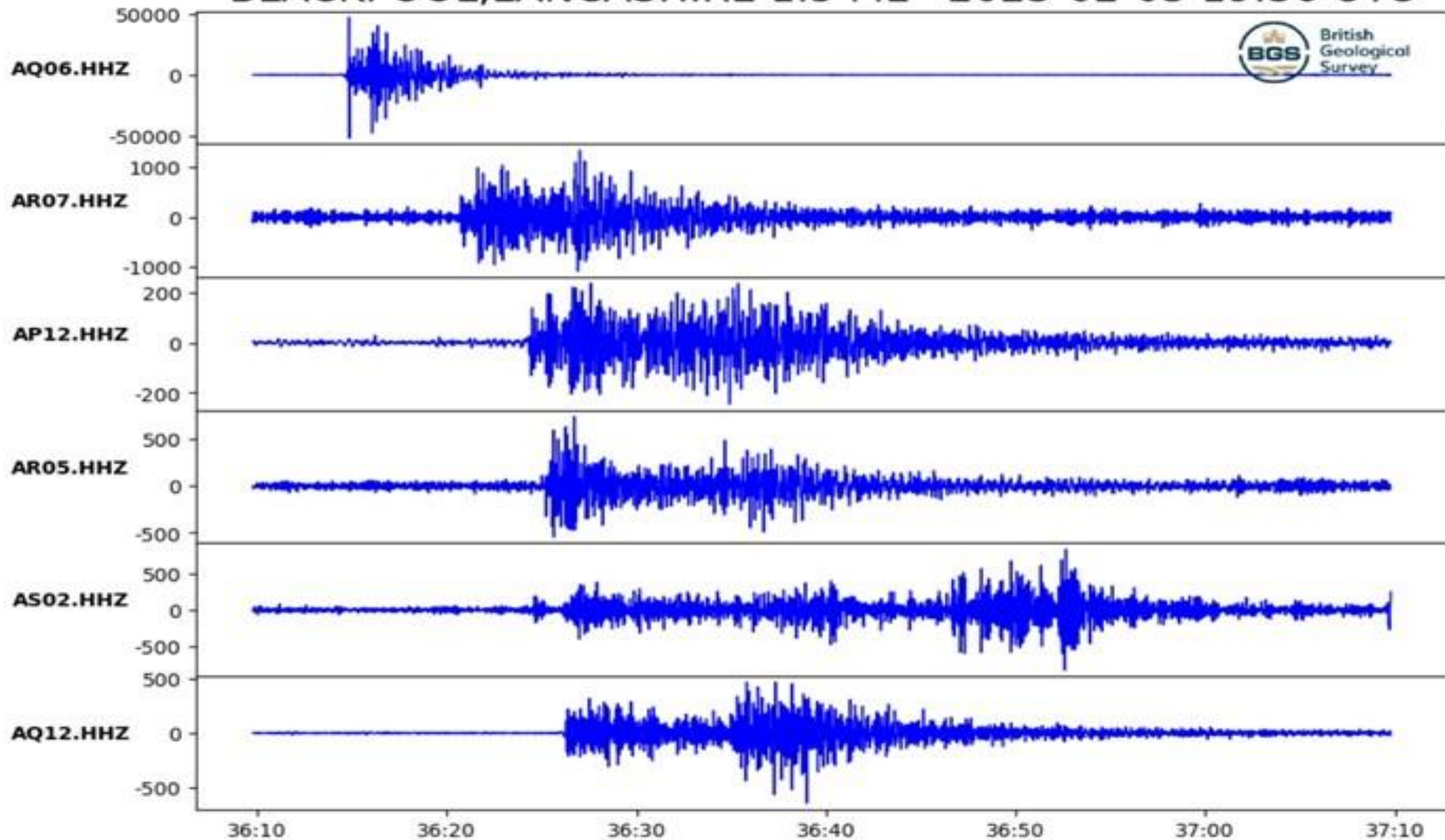


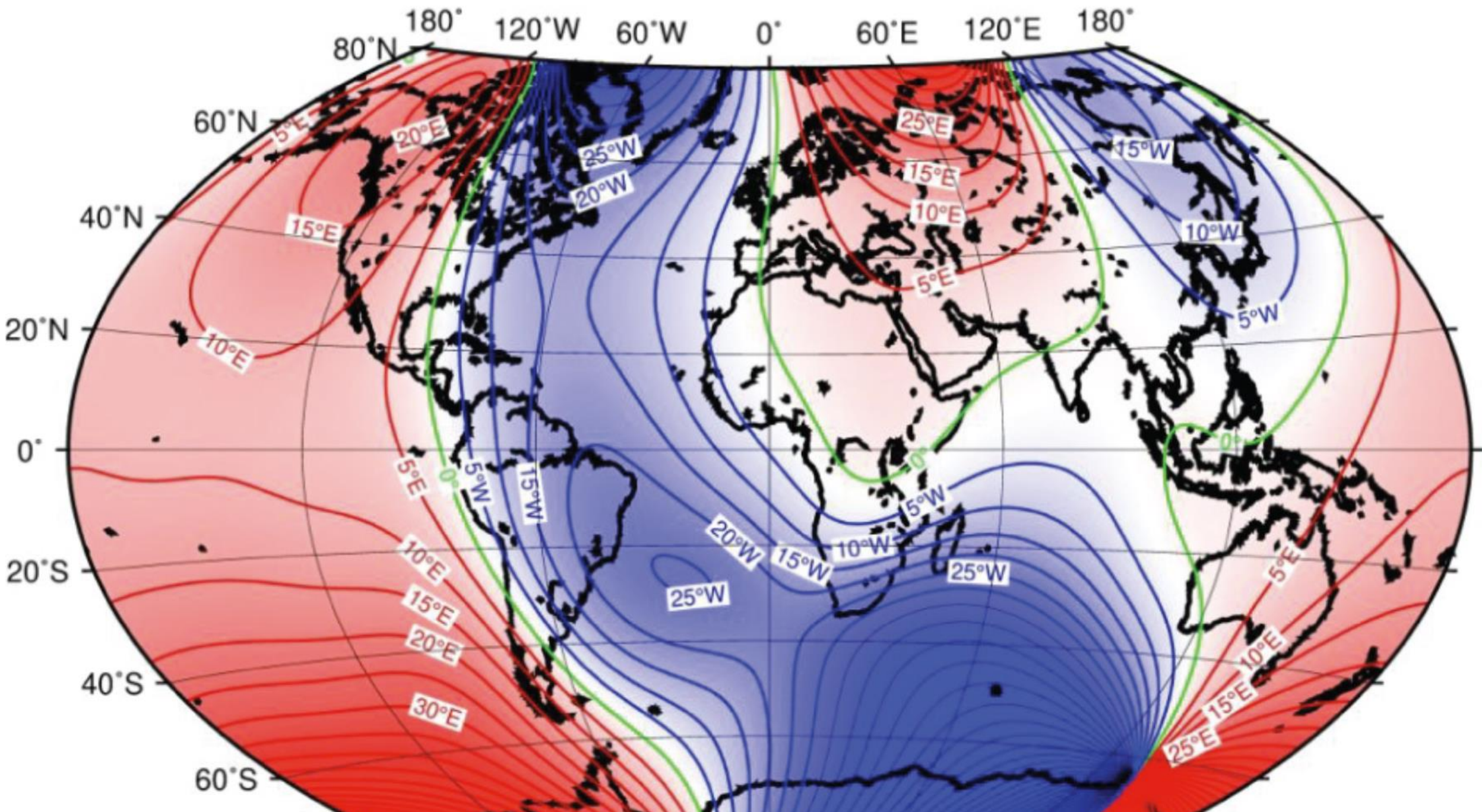
D i g i t a l r o c k s
ianjackson2011@gmail.com

Terabytes of geophysical data



BLACKPOOL, LANCASHIRE 1.5 ML 2023-02-03 19:36 UTC



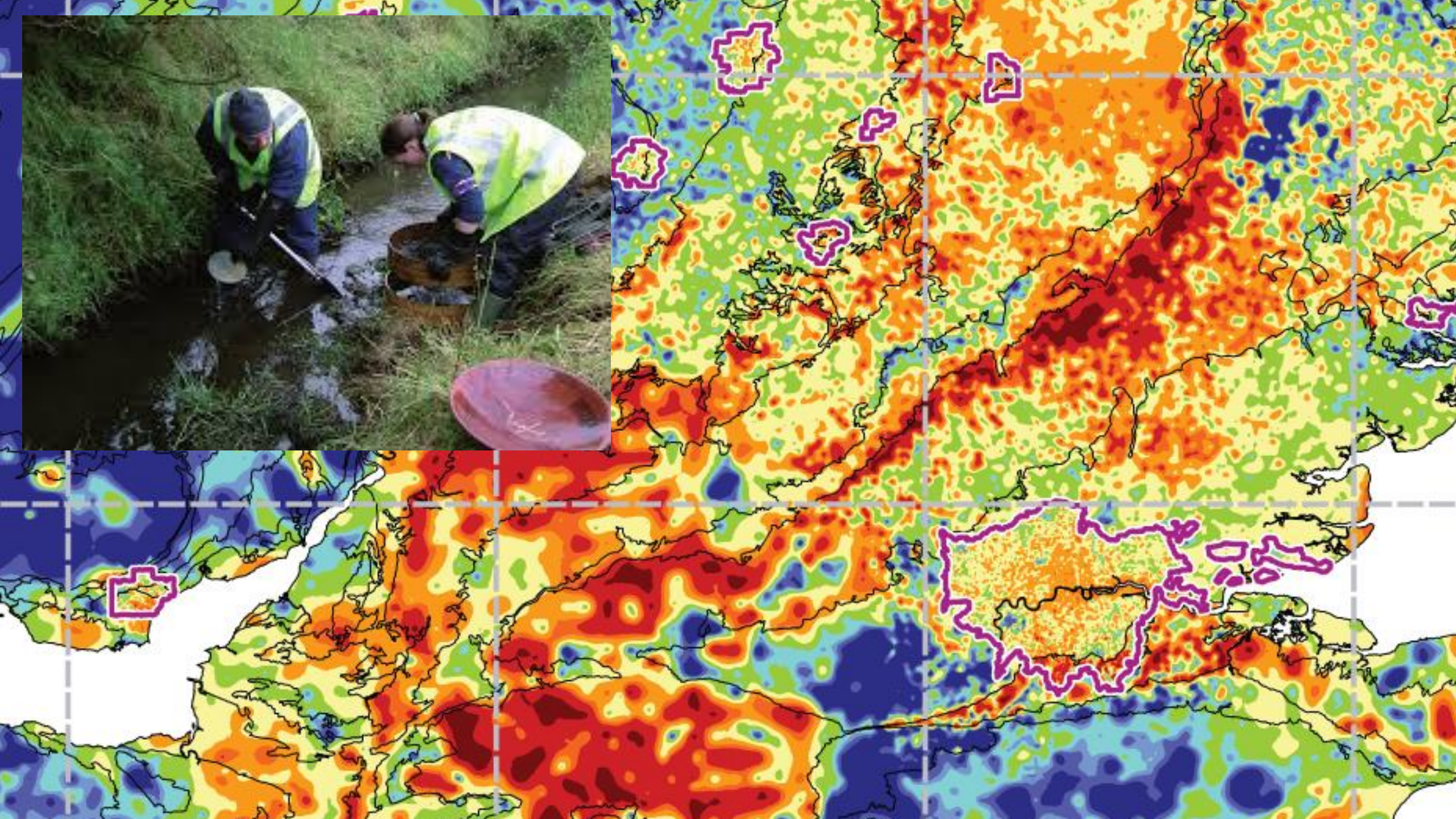




D i g i t a l r o c k s
ianjackson2011@gmail.com

Terabytes of geochemical data







D i g i t a l r o c k s
ianjackson2011@gmail.com

100,000s water well records





Wates Manor - SU01/5B

— RWL — Telemetry — Max — Min — Avg



Levels average in January 2022

Dropping faster than they did in 2021

But not yet at record low levels

Last RWL Today



D i g i t a l r o c k s
ianjackson2011@gmail.com

2 million+ borehole records



Type of boring
No. of borings
Diameter

RECORD OF BORING 1-T-1
LEG. 1079-1041
1-1-57

Depth (ft)	Soils	Remarks	Borehole Diameter		Remarks
			Top	Bottom	
0.0			12.00	12.00	Surface
1.0			12.00	12.00	
2.0			12.00	12.00	
3.0			12.00	12.00	
4.0			12.00	12.00	
5.0			12.00	12.00	
6.0			12.00	12.00	
7.0			12.00	12.00	
8.0			12.00	12.00	
9.0			12.00	12.00	
10.0			12.00	12.00	
11.0			12.00	12.00	
12.0			12.00	12.00	
13.0			12.00	12.00	
14.0			12.00	12.00	
15.0			12.00	12.00	
16.0			12.00	12.00	
17.0			12.00	12.00	
18.0			12.00	12.00	
19.0			12.00	12.00	
20.0			12.00	12.00	
21.0			12.00	12.00	
22.0			12.00	12.00	
23.0			12.00	12.00	
24.0			12.00	12.00	
25.0			12.00	12.00	
26.0			12.00	12.00	
27.0			12.00	12.00	
28.0			12.00	12.00	
29.0			12.00	12.00	
30.0			12.00	12.00	
31.0			12.00	12.00	
32.0			12.00	12.00	
33.0			12.00	12.00	
34.0			12.00	12.00	
35.0			12.00	12.00	
36.0			12.00	12.00	
37.0			12.00	12.00	
38.0			12.00	12.00	
39.0			12.00	12.00	
40.0			12.00	12.00	
41.0			12.00	12.00	
42.0			12.00	12.00	
43.0			12.00	12.00	
44.0			12.00	12.00	
45.0			12.00	12.00	
46.0			12.00	12.00	
47.0			12.00	12.00	
48.0			12.00	12.00	
49.0			12.00	12.00	
50.0			12.00	12.00	



SDA ~~CONFIDENTIAL~~ ~~SECRET~~ ~~TOP SECRET~~

Exploratory Boring E-5
for salt
Barnes Farm

County Lane
Sta No 43100

BORE - DRIFT

Stagnell
FLEETWOOD

In actual site is located Barnes Farm along the bank of the
river at +33.5ft. 00 - - - - -
Crossed to the bridge to (C.I. (Alkali) Limited). Within
the distance about 1900 am. S.C. (Alkali) Fleetwood
at Barnes Farm

Description	ELEVATION	
	Top	Bottom
Silt, better clay, gravel and sand Red and blue sand with gypsum grey sand and gypsum Red and grey sand, gypsum and salt hard and gritty	155	0
	6	0
<u>ROCKHEAD</u>	45	6
Silt, blue sand, grey sand 4 in lumps gypsum	211	0
<u>BOTTOM OF BORE</u>		
Red and blue sand, red plate with gypsum and salt veins	264	6

Full details on attached sheet.



D i g i t a l r o c k s
ianjackson2011@gmail.com

13 million rock, fossil and mineral samples
550 kilometres of onshore/offshore borehole core







BGS data

Until 1990s most data was analogue

BGS data management reviewed by UK Treasury in 1992 – damning

Data practices inadequate to deliver mission

Corporate priorities and budget changed.....

all BGS processes and culture had to change too





Move from analogue to digital

D i g i t a l r o c k s
ianjackson2011@gmail.com





Establish national taxonomies and data standards

D i g i t a l r o c k s
ianjackson2011@gmail.com





Work and share as teams not as independent individuals

D i g i t a l r o c k s
ianjackson2011@gmail.com





A complete change in work practices

D i g i t a l r o c k s
ianjackson2011@gmail.com





The outcomes

A competent national digital geoscience database

Data was an asset not a liability

At last we (and the UK) knew what data we held

...and we had a security/backup copy

We could search and interrogate

Support our work and conclusions with hard evidence – the data

Share and integrate – within BGS and with others

Exploit new technologies (eg mobile apps & 3D models)

Fully digital workflows

Deliver what our users and clients wanted

A much more coherent professional organisation

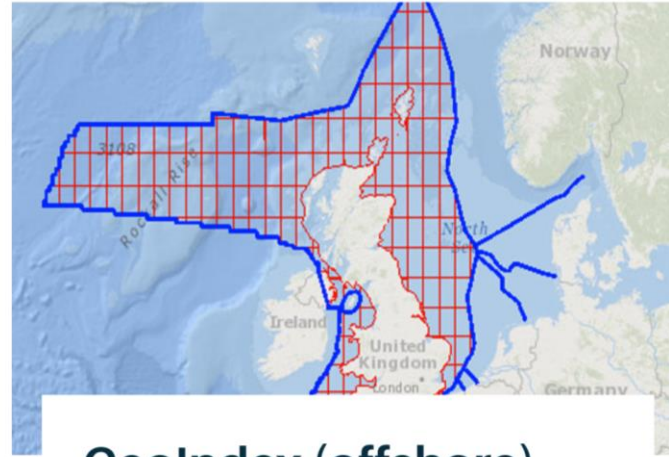




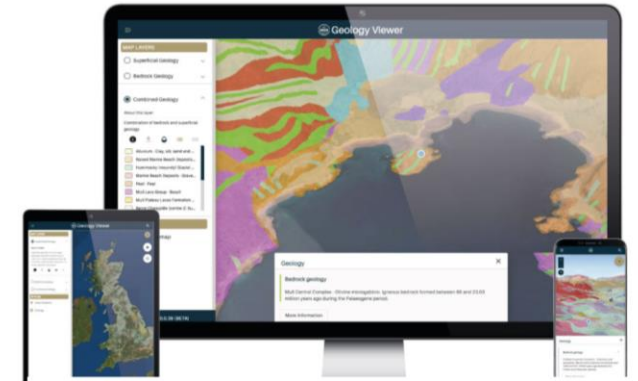
Public web access to all BGS data



GeoIndex (onshore)



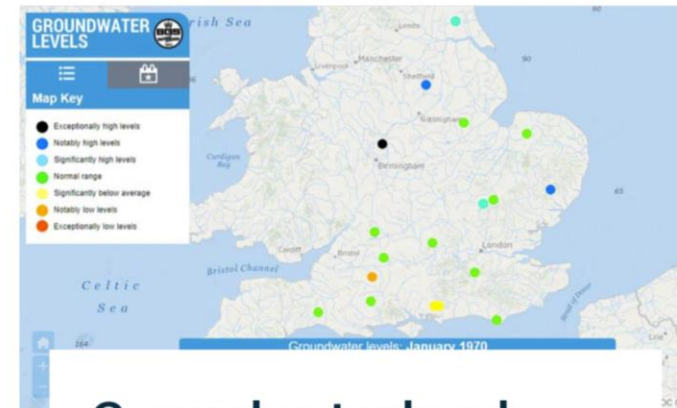
GeoIndex (offshore)



BGS Geology Viewer



UK Soil Observatory



Groundwater levels timeline

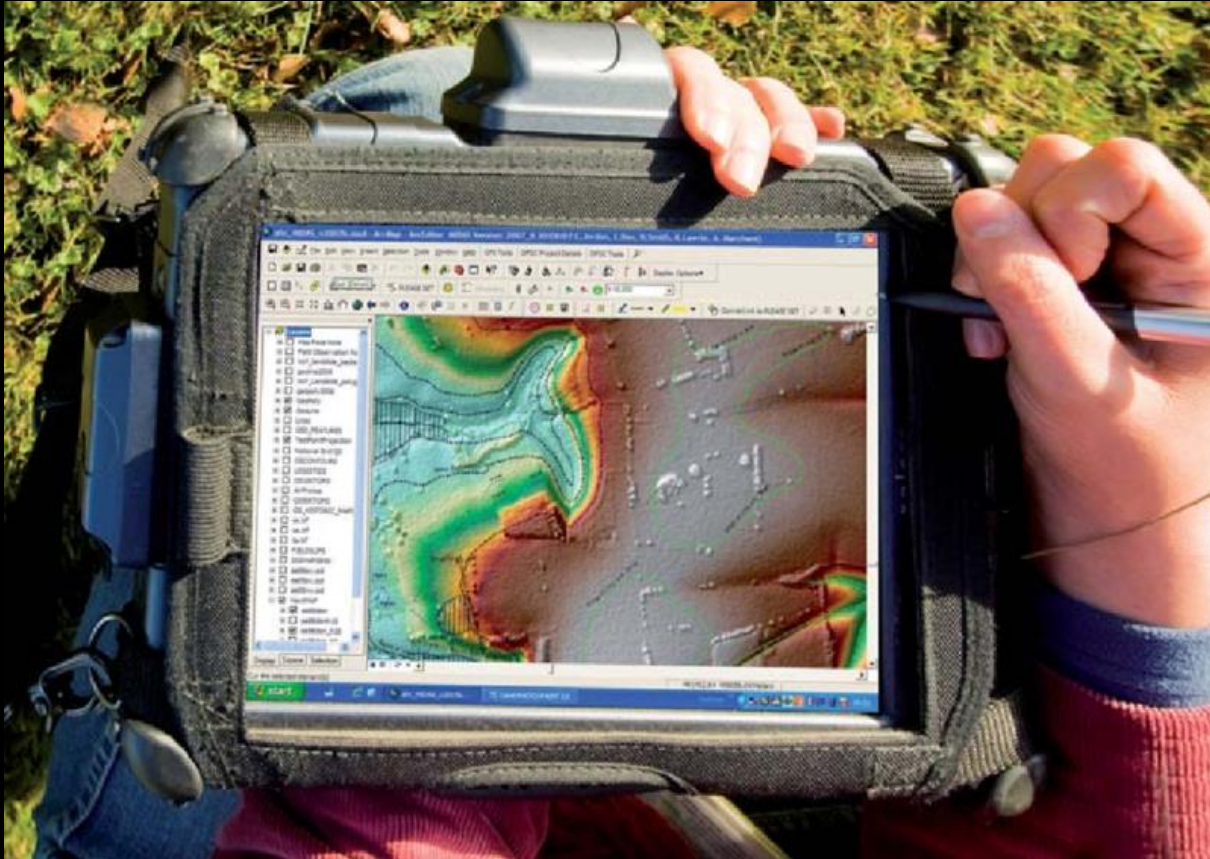
Digital rocks
ianjackson2011@gmail.com





Born-digital workflows

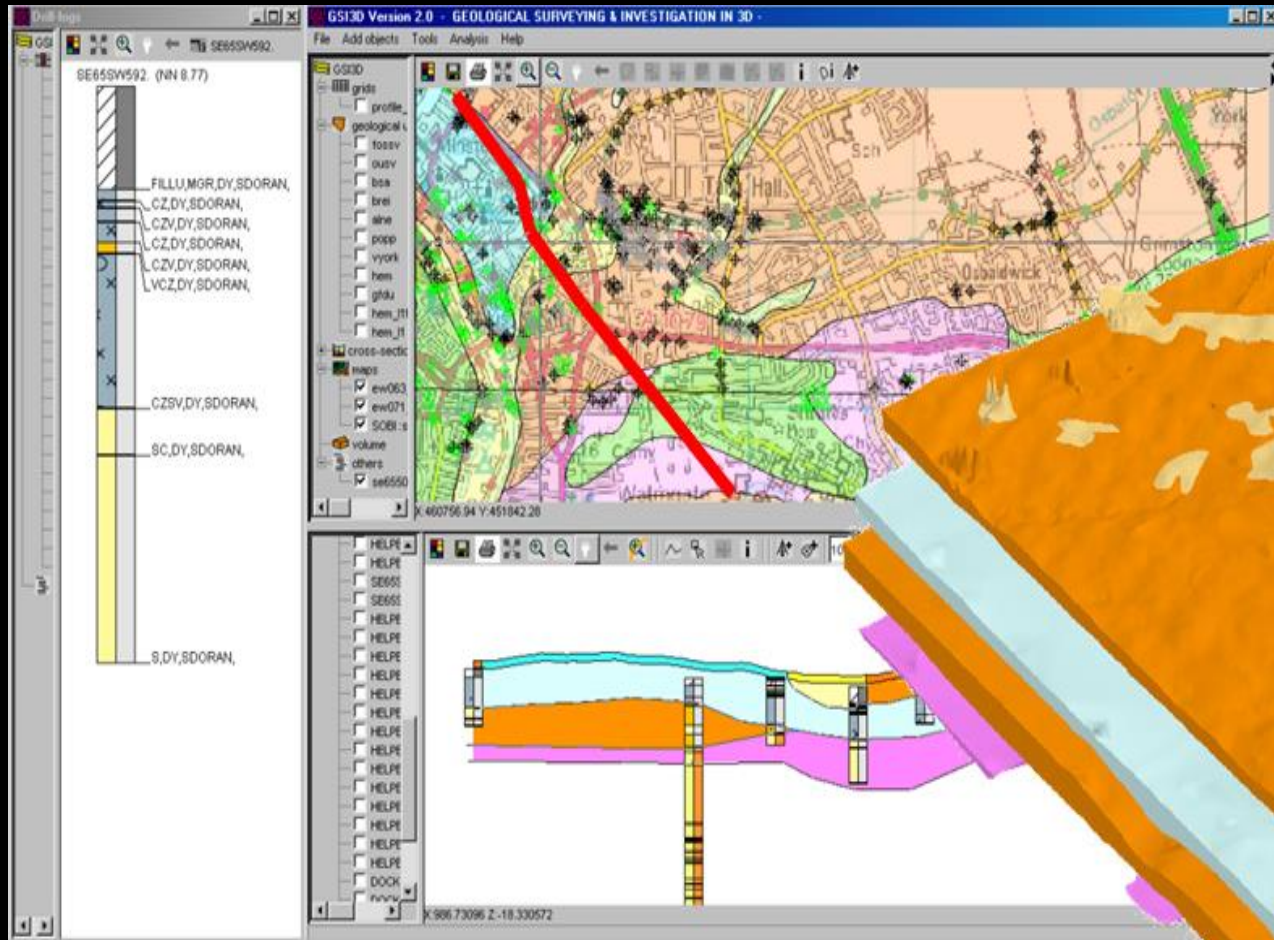
Digital rocks
ianjackson2011@gmail.com





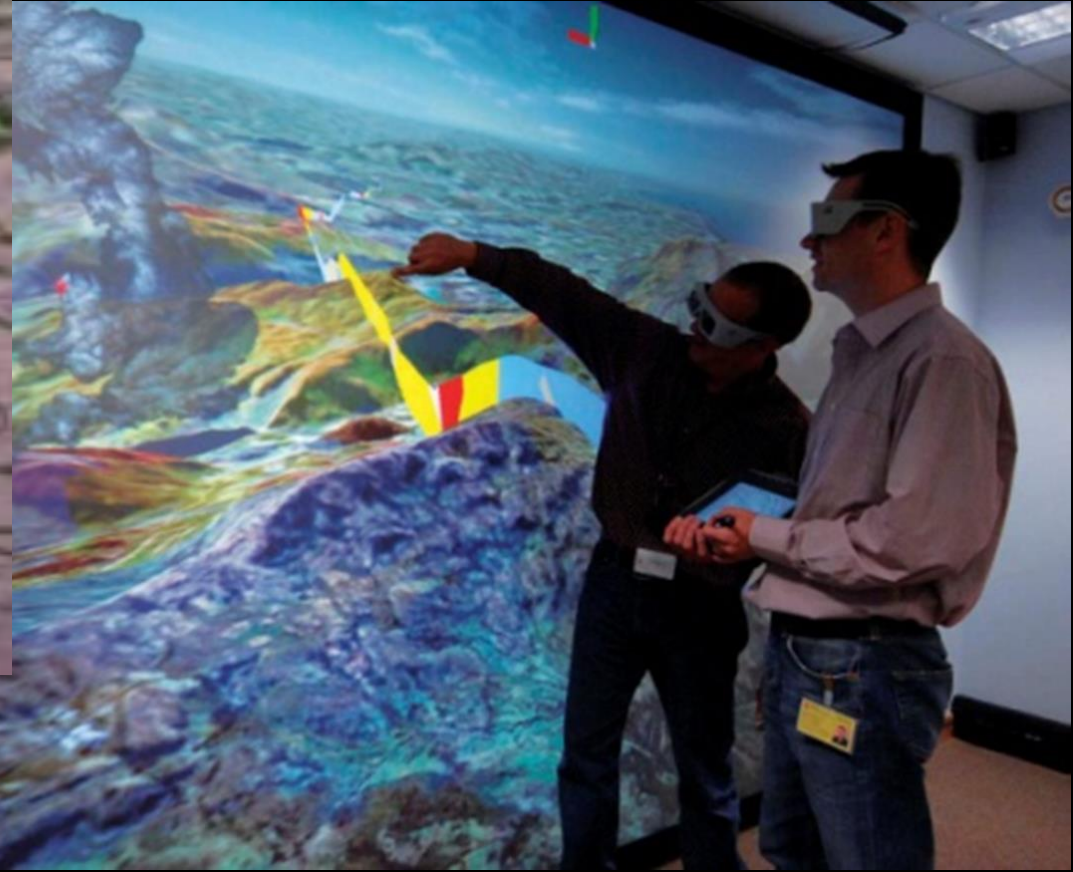
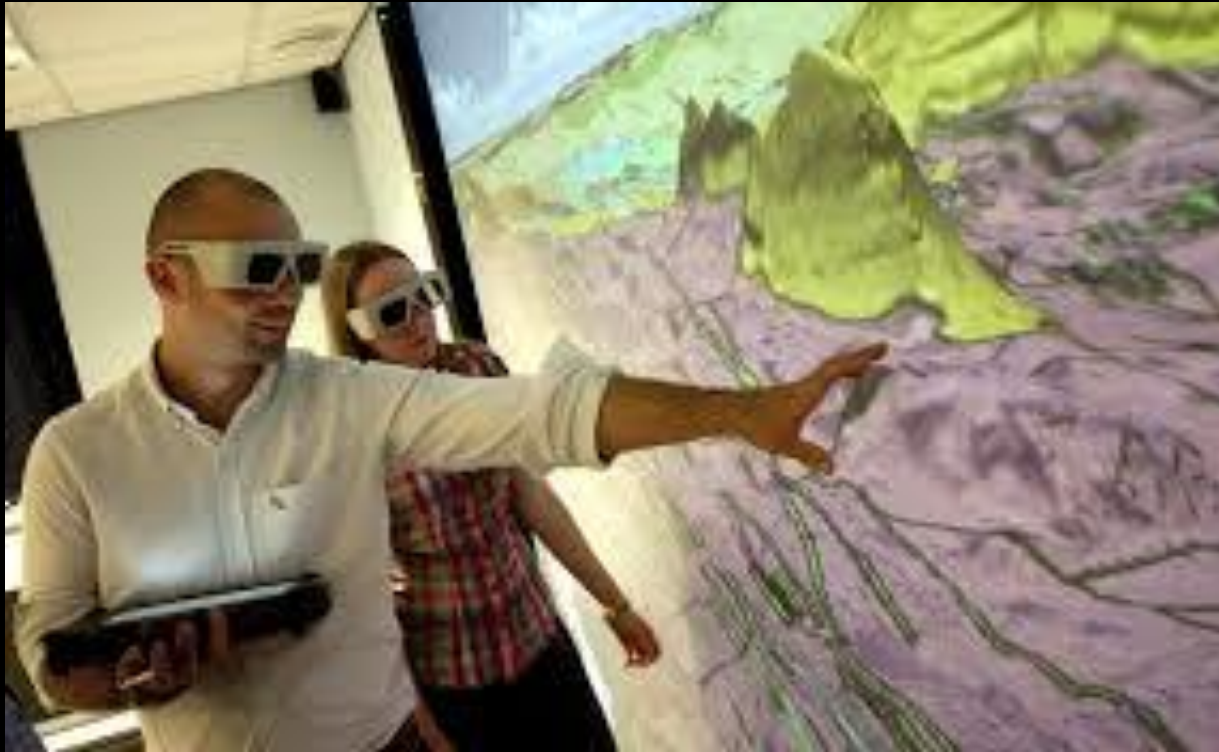
Exploit tech fully, eg GIS & 3D modelling

Digital Rocks
ianjackson2011@gmail.com





Communicate our science to all



...and provide the
evidence – the data





Integrate and share data inside and out



eg Radon gas and rock data with UKHSA





Are you thinking.....?

Impressive..... but we are not BGS

We haven't got their budget & information skills

Nor the corporate/national mission and control

At best we are a loose federation – a militia not an army

All true..... so here's another story





The OneGeology story

An international project to make geological map data available on the web

Launched 2007, delivered portal in 2008 ...still going

No project budget, just in-kind input from members

140 national/state geological survey organisations

From the richest to the poorest in the world

D
i
g
i
t
a
l
r
o
c
k
s

ianjackson2011@gmail.com





A diverse team



culture, language, ability, budget





5 simple objectives

Show what data is held

Make the data available

Make the data shareable

Exchange the know-how

Increase the profile of geology and data





Same 5 simple objectives (put another way)

Get the member nations to:

Conduct data audits

Make their data visible and accessible

Accelerate interoperability and consistency

Transfer technology and skills

Market externally to encourage internal take-up





Outcome – a web-GIS portal by 2008

Digital rocks
ianjackson2011@gmail.com

OneGeology Portal

portal.onegeology.org/OnegeologyGlobal/

ONE Geology Providing geoscience data globally

Search engine (location, layer, lithology)

Base map OneGeology

NORTH ATLANTIC OCEAN

SOUTH PACIFIC OCEAN

SOUTH ATLANTIC OCEAN

INDIAN OCEAN

2000 km X: 0 Y: 0 SRS 2D LATITUDE / LONGITUDE (WGS84)

DATASETS

LEGENDS

MEASURE

SAVE VIEW

GENERATE URL

CATALOG

HELP



Why did it succeed?

Short simple mission and vision: 5 simple objectives

Uncomplicated plan, start with simple dataset everyone shares and build up

Inclusivity: all geological surveys welcome – different nations have differing abilities to participate

Minimal intrusion into local systems

Pragmatic approach to coordination and governance

“Let’s do it” ethos, not excessively strategise about it

“Buddy” system to help those who need it

Putting significant effort into outreach and media profile

Pre-existence of international network of geoscientists and geological surveys, several with practical experience

A very small core of passionate and hard-working people who shared a vision and approach





Lessons learned from BGS and OneGeology

Competent, shareable and accessible data are essential to robust environmental/science evidence ... but you still need a use-case

The biggest challenges relate to people, not data or technology

Be transparent and communicate...a lot

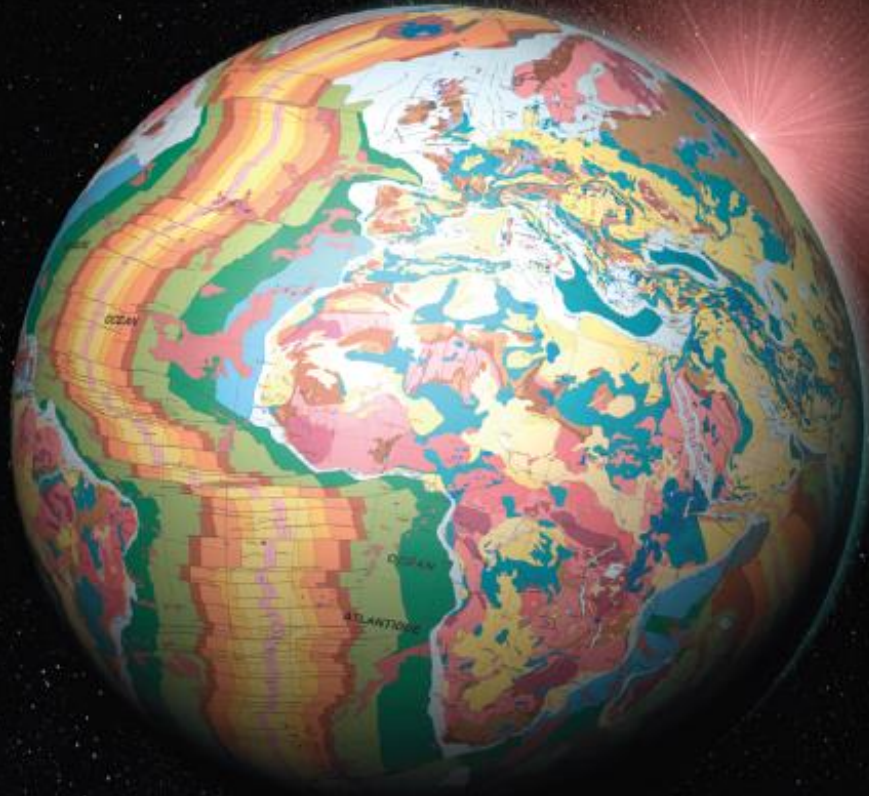
Engage - consult - decide - do – reviewand keep engaging

Shout about your achievements externally - it will bring others on board (and counter internal dissonance)

Sustaining the effort/resource: data stewardship is for the long term

What you're doing is vital - you are not alone, you're not the first and you won't be the last





Thank you to the BGS and
OneGeology teams
and thank you to you!



ianjackson2011@gmail.com