

# Datasets: from creation to publication or "A tale of two datasets"

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\* and a lot of others, including, but not limited to: the Chilbolton Group, the NERC data citation and publication project team, the PREPARDE project team and the CEDA team







# Are you sitting comfortably?





Science & Technology Facilities Council









# Creating data: a radio propagation dataset

The problem: rain and cloud mess up your satellite radio signal. How can we fix this?

Italsat F1: Owned and operated by Italian Space Agency (ASI). Launched January 1991, ended operational life January 2001.



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The receive cabin at Sparsholt in Hampshire



Inside the receive cabin – the instruments my data came from



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## Creating/processing data



Figure 2.3 : 49.49 GHz Signal and Zero dB reference level relative to Vacuum and Clear sky.( Red : Fourier series , Blue :Linear interpolation , **\*** : Signal level values at clear sky time points).

One day's worth of raw data from one of the receivers My job was to take this...



#### ....turn it into this ....



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# Analysing data

...a process which involved 4 major steps, 4 different computer programmes, and 16 intermediate files for each day of measurements.

Each month of preproccessed data represented somewhere between a couple of days and a week's worth of effort.

It was a job where attention to detail was important, and you really had to know what you were looking at from a scientific perspective.

#### ...with the final result being this.



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### **Example documentation**



Note the software filenames in the documentation.

I still have the IDL files on disk somewhere, but I'd be very surprised if they' re still compatible with the current version of IDL











www.phdcomics.com

I started work on this project in 1999. In 2006 (five years after the dataset was finished) we finally got a journal publication out of it:

Ventouras, S., S. A. Callaghan, and C. L. Wrench (2006), Long-term statistics of tropospheric attenuation from the Ka/U band ITALSAT satellite experiment in the United Kingdom, *Radio Sci.*, *41*, RS2007, doi:10.1029/2005RS003252.

It's been cited twice, both times by me.











#### Publications – grey literature













#### Publications – journal paper

RADIO SCIENCE, VOL. 41, RS2007, doi:10.1029/2005RS003252, 2006

#### Where's the data?

# Long-term statistics of tropospheric attenuation from the Ka/U band ITALSAT satellite experiment in the United Kingdom

S. Ventouras,1 S. A. Callaghan,1 and C. L. Wranch1

Received 9 February 2005; revised 9 December 2005; ac

[1] Long-term statistics of tropospheric attenu measurements made in the south of England u 49.5, 39.6, and 18.7 GHz; coincident rainfall r the receiving ground station. A method to rem beacon signals and to establish the reference le total attenuation has been presented in detail. estimated to be  $\sim \pm 0.5$  dB. A new method for statistics has been proposed and validated aga 18.7, 39.6, and 49.5 GHz. For both locations, tl predictions compared with the established Inte recommendation method. A significant monthl the attenuation and rainfall statistics and should the design and use of future slant path systems. are subject to diurnal variations; however, for t seem to follow a particular pattern.

Citation: Ventouras, S., and C. L. Wrench (2006), Lo ITALSAT satellite experiment in the United Kingdom,



RS2007

VENTOURAS AND WRENCH: TROPOSPHERIC ATTENUATION

RS2007

Table 4. Annual Measured and Predicted Total Attenuation Statistics for Sparsholt, UKa

				Т	otal Attenua	tion, dB				
Outage, %	49.5 GHz				39.6 GI	Hz	18.7 GHz			
	Measured	ITU-R, 0.01%	New Method, All Distribution	Measured	ITU-R, 0.01%	New Method, All Distribution	Measured	ITU-R, 0.01%	New Method, All Distribution	
30	3.05	3.09	2.96	0.99	1.06	0.94	0.46	0.42	0.38	
20	3.40	3.67	3.50	1.31	1.46	1.29	0.61	0.54	0.46	
10	4.38	4.89	4.42	1.96	2.33	1.93	0.84	0.78	0.61	
5	5.87	6.30	5.48	3.00	3.34	2.64	0.96	1.05	0.76	
3	7.11	7.38	6.47	3.84	4.14	3.30	1.10	1.26	0.89	
2	8.14	8.48	7.86	4.54	4.95	4.30	1.36	1.46	1.01	
1	10.34	10.53	10.58	6.03	6.50	6.38	1.85	1.85	1.50	
0.50	13.28	12.86	13.45	7.98	8.33	8.66	2.45	2.30	2.09	
0.30	15.99	15.16	15.78	9.83	10.15	10.54	2.91	2.77	2.59	
0.20	18.50	17.39	17.80	11.47	11.92	12.20	3.25	3.25	3.06	
0.10	23.45	22.17	21.69	14.95	15.73	15.49	3.91	4.30	4.02	
0.050				19.23	20.63	19.49	5.21	5.72	5.28	
0.030				23.04	24.98	23.00	6.46	7.04	6.42	
0.020							7.50	8.26	7.51	
0.010							9.91	10.71	9.75	
0.005							12.91	13.59	12.42	
0.003							15.04	15.95	14.58	
0.002							16.62	17.93	16.34	
0.001							17.87	21,42	17.52	

<sup>a</sup>For measured statistics, 49.5 and 39.6 GHz were averaged over 4 years, and 18.7 GHz was averaged over 3 years. For predicted statistics, ITU-R, 0.01% refers to Recommendation P.618-8, and New Method, All Distribution is a proposed combination method, whole rain distribution for rain attenuation statistics.



### Preserving data (the wrong way!)



Part of the Italsat data archive – on CDs in a shelf in my office









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For Help, press F1





# What it all came down to:



<u>Composite image from Flickr user bnilsen</u> and Matt Stempeck (NOI), shared under <u>Creative Commons license</u>

#### And I wasn't even preserving my data properly!









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Summary						
Measurements of tropo	shperic attenuation (excess and to	otal) made at Sparsholt in Hampshir	e, UK using the ITALSAT satellite F1 beacon s	ignal at 50 GHz.		
Tropospheric attenuati Agency) was in geosta sampled once a second nonatmospheric change tropospheric attenuati estimated to be ~+/-0 Author	on measurements made at Sparshol tionary orbit at 13 degrees east, ar J. North-south tracking of the satell so of the beacon signal and to esta on from the Ka/U band ITALSAT sat J.5dB	It in Hampshire, UK using the ITALS nd it could be seen from the receiv llite with the beacon receiver main ablish the reference level from whic tellite experiment in the United King	SAT satellite F1 beacon signal at 49.5 GHz. ITA ing station at an elevation angle of 30 degrees tained -2040 of dynamic range thought of the h to measure the excess and total attenuation dom, Radio Sci.,41,RS2007,doi:10.1029/2005R	LSAT F1 (owned and operated by the Itali s. The received signal was vertically polaris measurement period. The method applied t is described in [Ventouras et.al, Long-tex S003252]. The accuracy of fade level retri	an Space ed and was to remove the mr statistics of eval is	
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### Good news: the data is all on the BADC now

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# Data creation and management is hard work. But not everyone understands.



"Piled Higher and Deeper" by Jorge Cham www.phdcomics.com

WWW. PHDCOMICS. COM











### Why bother linking the data to the publication? Surely the important stuff is in the journal paper?





Data don't make any sense, we will have to resort to statistics.

If you can't see/use the data, then you can't test the conclusions or reproduce the results! It's not science!











Opportunities for Data Exchange



Opportunities for Data Exchange

# The Ideal Pyramid



Opportunities for Data Exchange



#### Compare and contrast 2 datasets





# What is a data journal?



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# What is a data article?

A data article describes a dataset, giving details of its collection, processing, software, file formats, etc., without the requirement of novel analyses or ground breaking conclusions.

• the when, how and why data was collected and what the data-product is.













### Why bother publishing the dataset in a data journal? Why not just publish a normal journal paper citing the data?

#### Data Journals:



- •Peer-review the data
- Publish negative results

•Make it quicker to publish the data as they don't require analysis or novelty – the dataset is published "as-is"

•Provide attribution and credit for the data collectors who might not be involved with the analysis

•Make it easier to find datasets, understand them and be sure of their quality and provenance.



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## Live Data Paper in Geoscience Data Journal!

Dataset citation is first thing in the paper (after abstract) and is also included in reference list (to take advantage of citation count systems)

DOI: 10.1002/gdj3.2





# Linking between data and publications = Citing Data

• We already have a working method for linking between publications which is:

- commonly used
- understood by the research community
- used to create metrics to show how much of an impact something has (citation counts)
- applied to digital objects (digital versions of journal articles)
- We can extend citation to other things like:
  - data
  - code
  - multimedia

And the best bit is, researchers don't need to learn a new method of linking – they cite like they normally would!



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http://www.naa.gov.au/records-management/ capability-development/keep-the-knowledge/ index.aspx





# Out of Cite, Out of Mind: Report of the CODATA Task Group on Data Citation

The report was published by the CODATA Data Science Journal on 13 September 2013



#### https://www.jstage.jst.go.jp/article/dsj/12/0/12\_OSOM13-043/\_article









# **First Principles for Data Citation**

**1. Status of Data:** Data citations should be accorded the same importance in the scholarly record as the citation of other objects.

**2. Attribution:** A citation to data should facilitate giving scholarly credit and legal attribution to all parties responsible for those data.

**3. Persistence:** Citations should refer to objects that persist.

**4. Access:** Citations should facilitate access to data by humans and by machines.

**5. Discovery:** Citations should support the discovery of data and their documentation.





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# First Principles for Data Citation

**6. Provenance:** Citations should facilitate the establishment of provenance of data.

- **7. Granularity:** Citations should support the finest-grained description necessary to identify the data.
- **8. Verifiability:** Citations should contain information sufficient to identify the data unambiguously.

**9. Metadata Standards:** Citations should employ existing metadata standards.

**10. Flexibility:** Citation methods should be sufficiently flexible to accommodate the variant practices among communities but should not differ so much that they compromise interoperability of data across communities..











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PREPARDE: Peer REview for Publication & Accreditation of Research Data in the Earth sciences

Example steps/workflow required for a researcher to publish a data paper

3 main areas of interest (in orange)

- 1. Workflows and cross-linking between journal and repository
- 2. Repository accreditation
- 3. Scientific peer-review of data
- Division of area of responsibilities between
  - repository controlled processes
  - *journal controlled* processes





# Other types of publication and data linking

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- 1. Data repository banner ads
- 2. Geographical maps

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Data Centre

- 3. Pulling metadata from the data repository into journal workflows
- 4. "Data behind the graph"



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#### Data Description

Citation: Volbers, ANA; Henrich, R (2004): Dissolution index of Globigerina bulloides in recent and Last Glacial Maximum sediments. doi:10.1594/PANGAEA.735719, Supplement to: Volbers, Andrea N A; Henrich, Rüdiger (2004): Calcium carbonate corrosiveness in the South Atlantic during the Last Glacial Maximum as inferred from changes in the preservation of Globigerina bulloides: A proxy to determine deep-water circulation patterns?. Marine Geology, 204(1-2), 43-57, doi:10.1016/S0025-3227(03)00372-4

Abstract: The modern Atlantic Ocean, dominated by the interactions of North Atlantic Deep Water (NADW) and Antarctic Bottom Water (AABW), plays a key role in redistributing heat from the Southern to the Northern Hemisphere. In order to reconstruct the evolution of the relative importance of these two water masses, the NADW/AABW transition, reflected by the calcite lysocline, was investigated by the Globigerina bulloides dissolution index (BDX?). The depth level of the Late Glacial Maximum (ICM) calcite lysocline was elevated by several hundred metres, indicating a more corrosive water masse present at modern NADW level. Overall, the small range of BDX? data and the gradual decrease in preservation below the calcite lysocline point to a less stratified Atlantic Ocean during the LGM. Similar preservation patterns in the West and East Atlantic demonstrate that the modern west-east asymmetry did not exist due to an expansion of southern deep waters compensating for the decrease in NADW formation. Show Map Google Earth RIS Bartx

2013 NASA, Map data @2013 MapLink

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# Geographical maps

Related to: Volbers, Andrea N A (2001): Planktic foraminifera as paleoceangraphic indicators: Production, preservation, and reconstruction of upwelling intensity. Implications from

#### Example mapping of geolocation metadata in the Pangaea data repository landing page. (<u>http://doi.pangaea.de/10.1594/PANGAEA.735719</u>)



Example Elsevier article on ScienceDirect displaying geolocation metadata on a map for the dataset referred to in the article.



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Always quote citation when using data!



Journal of Molecular Biology Volume 400, Issue 3, 16 July 2010, Pages 295-308

#### Identification of a New Motif in Family B DNA Polymerases by Mutational Analyses of the Bacteriophage T4 DNA Polymerase

Vincent Li<sup>1</sup>, Matthew Hogg<sup>2</sup>, Linda J. Reha-Krantz<sup>1,</sup> Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2E9 <sup>2</sup> Department of Microbiology and Molecular Genetics, University of Vermont, Burlington, VT 05405, USA

http://dx.doi.org/10.1016/j.jmb.2010.05.030, How to Cite or Link Using DOI Permissions & Reprints

#### Abstract

Structure-based protein sequence alignments of family B DNA polymerases revealed a conserved motif that is formed from interacting residues between loops from the N-terminal and palm domains and between the Nterminal loop and a conserved proline residue. The importance of the motif for function of the bacteriophage T4 DNA polymerase was revealed by suppressor analysis. T4 DNA polymerases that form weak replicating complexes cannot replicate DNA when the dGTP pool is reduced. The conditional lethality provides the means to identify amino acid substitutions that restore replication activity under low-dGTP conditions either by correcting the defect produced by the first amino acid substitution or by generally increasing the stability of polymerase complexes; the second type are global suppressors that can effectively counter the reduced stability caused by a variety of amino acid substitutions. Some amino acid substitutions that increase the stability of polymerase complexes produce a new phenotype-sensitivity to the antiviral drug phosphonoacetic acid. Amino acid substitutions that confer decreased ability to replicate DNA under lowdGTP conditions or drug sensitivity were identified in the new motif, which suggests that the motif functions in regulating the stability of polymerase complexes. Additional suppressor analyses revealed an apparent network of interactions that link the new motif to the fingers domain and to two patches of conserved

#### Example article with interactive viewer for proteins referred to in the article. (

http://www.sciencedirect.com/science/article/pii/S002228361000522>

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Example of data in a repository linked to and from the table in its parent publication. (

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Enlarge Download





- Data is important, and becoming more so for a far wider range of the population
- Conclusions and knowledge given in publications are only as good as the data they' re based on
- Science is supposed to be reproducible and verifiable
- It's up to us as scientists to care for the data we've got and ensure that the story of what we did to the data is transparent
  - •So we can use the data again
  - •And so people will trust our results



http://scienceblogs.com/clock/2007/04/ framing\_politics\_based\_on\_scie\_1.php

#### The data and publications resulting from it must be linked!











### Cost Action: Publishing Academic and Research Data (PARD)

COST is a mechanism in the EU to fund networking activities on topics in science and technology – meetings, workshops, short term scientific missions...bringing people together

>50 people interested

12 countries including: UK, USA, Austria, Australia, the Netherlands, Germany, South Africa, Spain, Norway, Greece, Italy and Poland.

#### For more information – or to join!

Sarah Callaghan [sarah.callaghan@stfc.ac.uk] @sorcha\_ni

A **Pard** is an animal from Medieval bestiaries. They were felines with spotted coats, and were extremely fast.



http://en.wikipedia.org/wiki/ File:AberdeenBestiaryFolio008vLeopardDet



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### "Publishing research without data is simply advertising, not science" - Graham Steel

http://blog.okfn.org/2013/09/03/publishing-research-without-data-is-simply-advertising-not-science/

Thanks!

#### Any questions?

sarah.callaghan@stfc.ac.uk @sorcha\_ni <u>http://</u> citingbytes.blogspot.co.uk/



Image credit: Borepatch http://borepatch.blogspot.com/2010/06/its-not-what-you-dont-know-that-hurts.html







