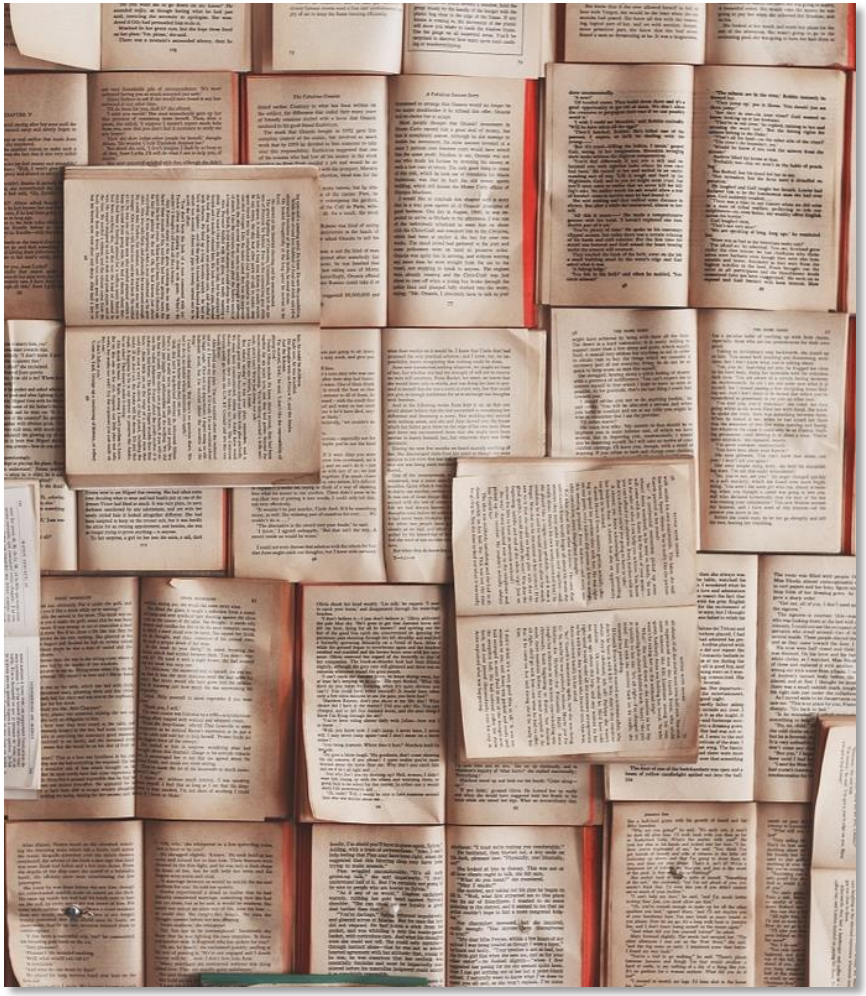
SOARS 2019 WORKSHOPS

COMPUTATIONAL THINKING AND DATA SCIENCE

5/25/2019

Keith E. Maull, PhD

Workshop Motivation



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> The publication of research papers is slowly changing to adapt to the digital age. We envision that in the near future (5–10 years), scientists will use **radically new tools to author papers and disseminate information** about the process and products of their research. These tools will **document** and **publish** the **computational workflow** as well as all the associated **digital objects** (data, software, etc.) that **form the basis of a paper**.

Gil, Y., et al. (2016), Toward the Geoscience Paper of the Future: Best practices for documenting and sharing research from data to software to provenance, Earth and Space Science, 3, 388–415, doi:10.1002/2015EA000136.

2019 Computational Thinking and Data Science Workshops

SECTION A(M)

- **Introduction** to computational thinking
- Use **algorithms** solve problems (GCD, search, etc.)
- Develop intermediate solutions with **pseudocode** and converting that pseudocode to **running Python code**
- Apply basic knowledge of tools (Jupyter) and resources

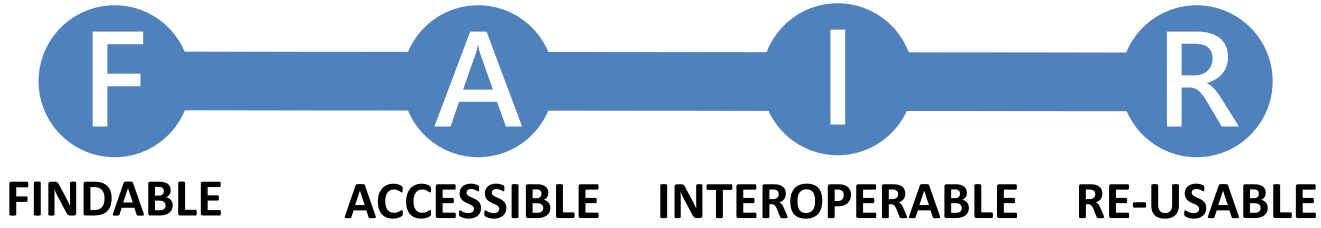
SECTION P(M)

- **Deeper dive** into Python and the data science stack
- Implement **working solutions** to common tasks (data manipulation, graphing, etc.)
- Develop **advanced strategies** and working knowledge of **platforms, tools and workflows** (Jupyter, Python libraries, etc.)

Tools we will use …

SECTIONS A(M)+P(M)

We want our work to be …

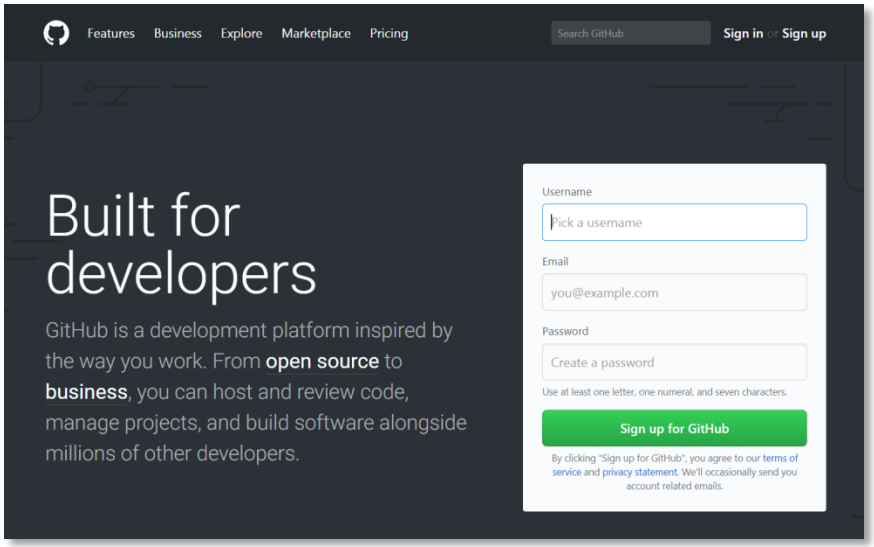


Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., … Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. Scientific Data, 3, 160018. https://doi.org/bdd4

3 things you need to do …

1

GET A FREE GITHUB ACCOUNT

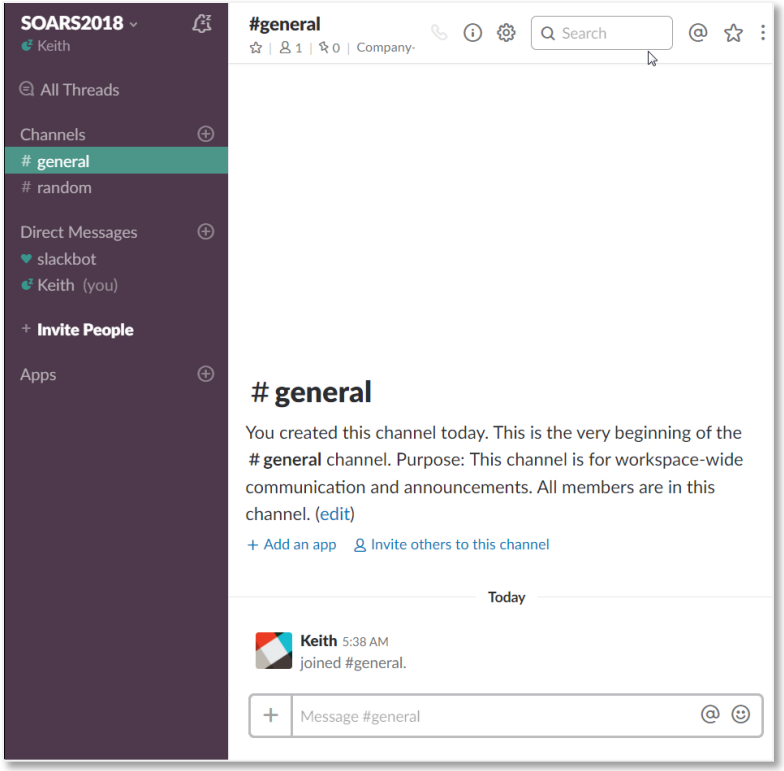


- Go to Set up a Github account at https://github.com **(make sure to use your .edu email address!)**
- **Send me (kmaull@ucar.edu) your Github ID**
- Bookmark the repository for this year's workshop (https://git.io/fjO0z)
- Install GithubDesktop (https://desktop.github.com) for Win/Mac
- Browse around Github and watch a tutorial!

3 things you need to do …

2

JOIN OUR SLACK CHANNEL



- Go to https://soarshq19.slack.com and set up a free account on our channel
- **Send me (kmaull@ucar.edu) if you have trouble getting on to the channel**
- Watch a video / tutorial about slack (there is one when you login)

3 things you need to do …

3

FAMILIARIZE / RE-ACQUAINT YOURSELF WITH PYTHON

- Skim a few of the online resources in the syllabus (on Github)
- https://python.org!
- You do **not** need to install Python on your computer, but if you do, install Anaconda from https://anaconda.com

Things to watch for …

1

INFORMATION ABOUT OUR JUPYTER ENVIRONMENT

- I should be sending an email out soon
- You can look at **prior workshops** to see what Jupyter is all about
- You will **not** need to install anything, **but** if you **want to play on your own machine**, do **contact me**

Things you might also do …

- Read the paper:
  - *Gil, Y., et al. (2016), Toward the Geoscience Paper of the Future: Best practices for documenting and sharing research from data to software to provenance, Earth and Space Science, 3, 388–415, doi:10.1002/2015EA000136.*
- Explore the awesome Github repository `Python for the Geosciences`:
  - https://git.io/vhLhr
- Check out Jupyter Notebooks examples
  - http://nb.bianp.net/sort/views/
- Check out some of the prior workshops:
  - https://git.io/v6XyK (2016)
  - https://git.io/vHqof (2017)
  - (2018)
- Check out the website for this year:
  - https://ncar.github.io/soars19cdws/

Some inspiration …

Here is a paper …

that actually started as a **pre-print**

Atmospheric Chemistry and Physics
An interactive open-access journal of the European Geosciences Unic

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CWTS SNIP 1.330
SJR SJR 3.207
CWTS IPP 4.756
h5-index 89

Discussion papers

Abstract | Assets | Discussion | Metrics

https://doi.org/10.5194/acp-2018-118
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Research article

02 May 2018

Review status
This discussion paper is a preprint. It is a manuscript under review for the journal Atmospheric Chemistry and Physics (ACP).

Effective radiative forcing in the aerosol–climate model CAM5.3-MARC-ARG

Benjamin S. Grandey[1], Daniel Rothenberg[2], Alexander Avramov[2,3], Qinjian Jin[2], Hsiang-He Lee[1], Xiaohong Liu[4], Zheng Lu[4], Samuel Albani[5,6], and Chien Wang[2,1]
[1]Center for Environmental Sensing and Modeling, Singapore - MIT Alliance for Research and Technology, Singapore
[2]Center for Global Change Science, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
[3]Department of Environmental Sciences, Emory University, Atlanta, Georgia, USA
[4]Department of Atmospheric Science, University of Wyoming, Laramie, Wyoming, USA
[5]Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, New York, USA
[6]Laboratoire des Sciences du Climat et de l'Environnement, LSCE/IPSL, CEA-CNRS-UVSQ, Gif-sur-Yvette, France

Received: 01 Feb 2018 – Accepted for review: 01 May 2018 – Discussion started: 02 May 2018

Abstract. We quantify the effective radiative forcing (ERF) of anthropogenic aerosols modelled by the aerosol–climate model CAM5.3-MARC-ARG. CAM5.3-MARC-ARG is a new configuration of the Community Atmosphere Model version 5.3 (CAM5.3) in which the default aerosol module has been replaced by the two-Moment, Multi-Modal, Mixing-state-resolving Aerosol model for Research of Climate (MARC). CAM5.3-MARC-ARG uses the default ARG aerosol

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Short summary
Anthropogenic emissions of aerosol particles likely cool the climate system. We investigate…
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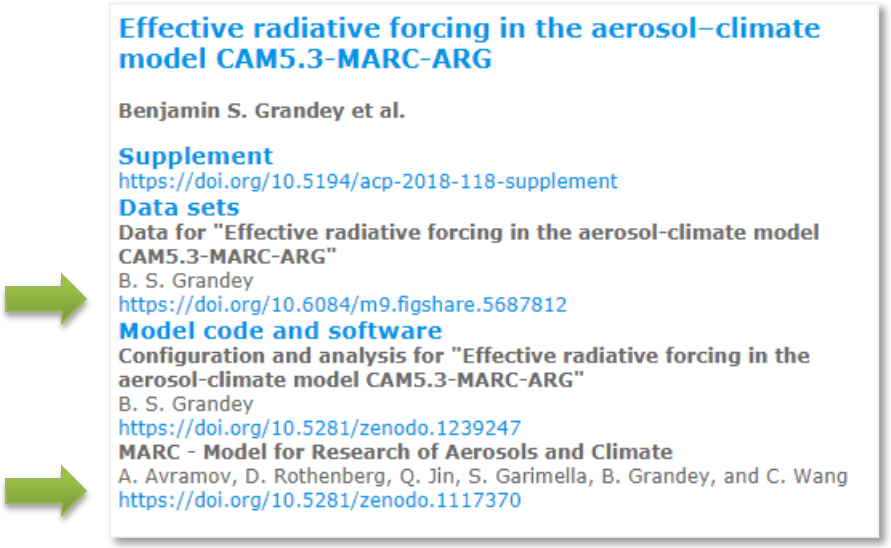
Some inspiration …

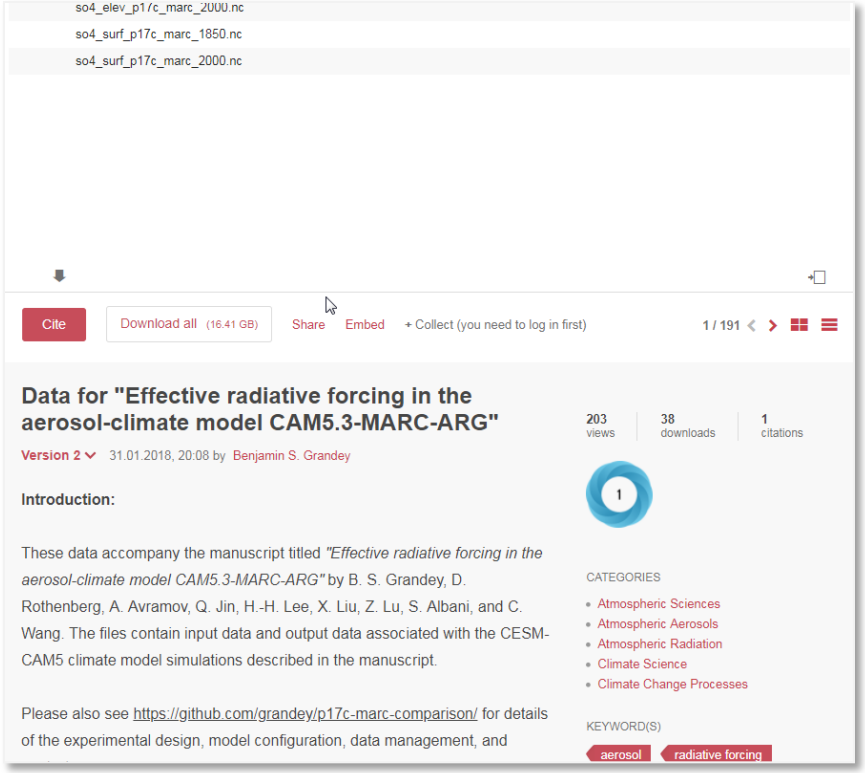
This paper includes **analysis** … done with some **data** and **code**



Some inspiration …

The **data is findable** here:

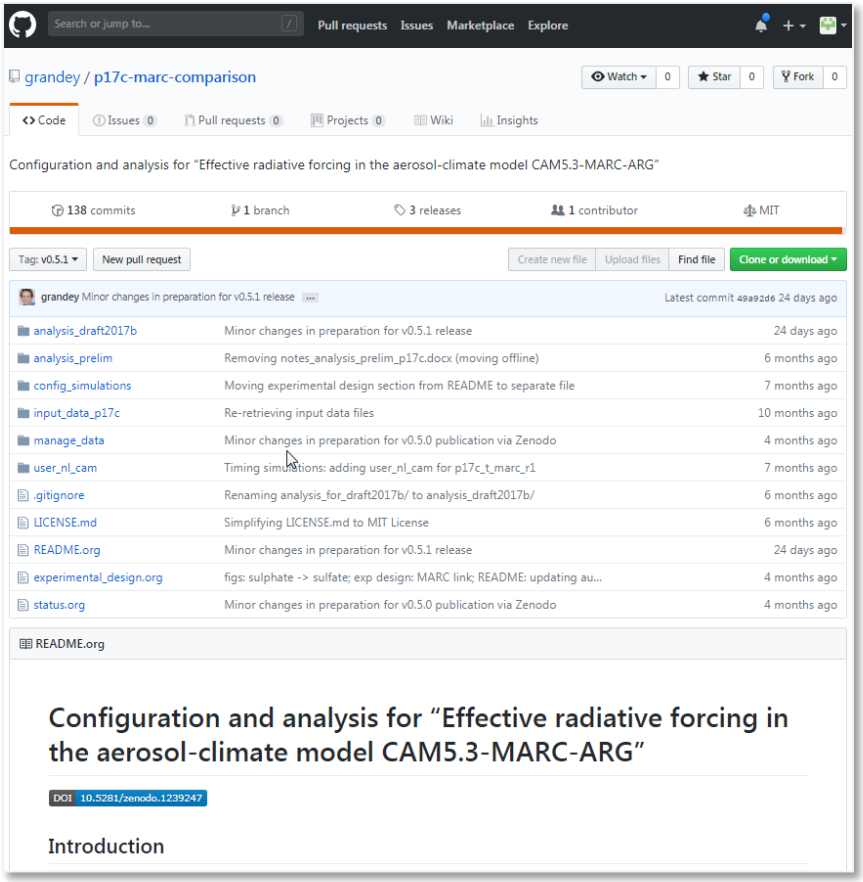
https://doi.org/10.6084/m9.figshare.5687812



Some inspiration …

The **code is also findable** here:

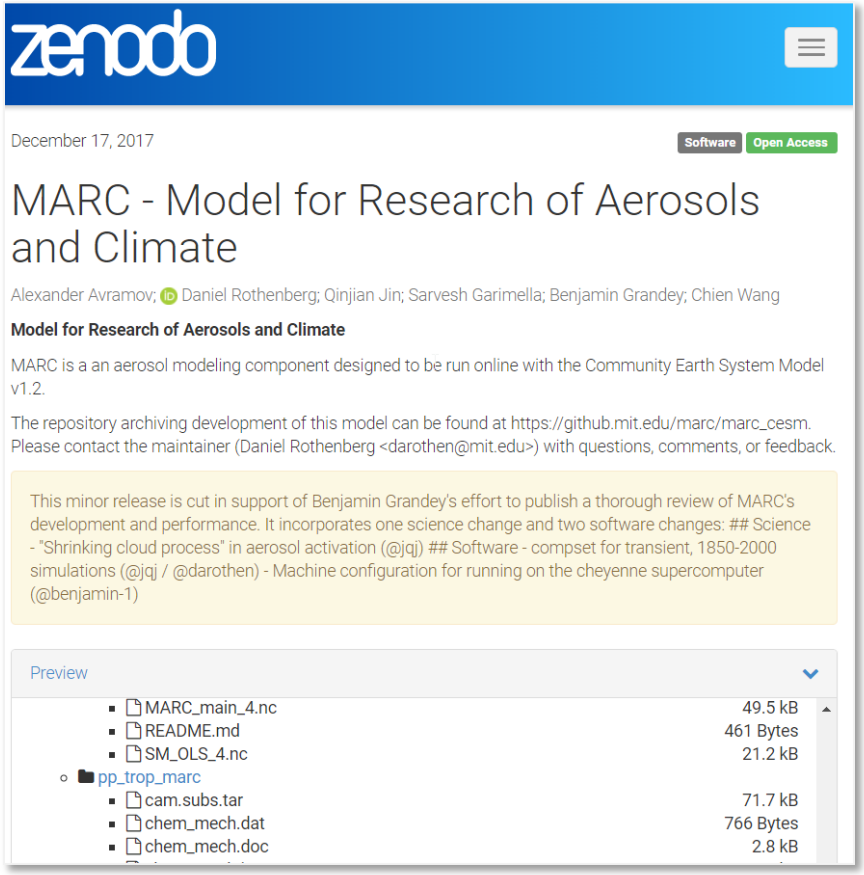
https://doi.org/10.5281/zenodo.1239247



Some inspiration …

The model code upon which this work is build is here …

https://doi.org/10.5281/zenodo.1117370



Some inspiration …

And if that wasn't enough …

Acknowledgements

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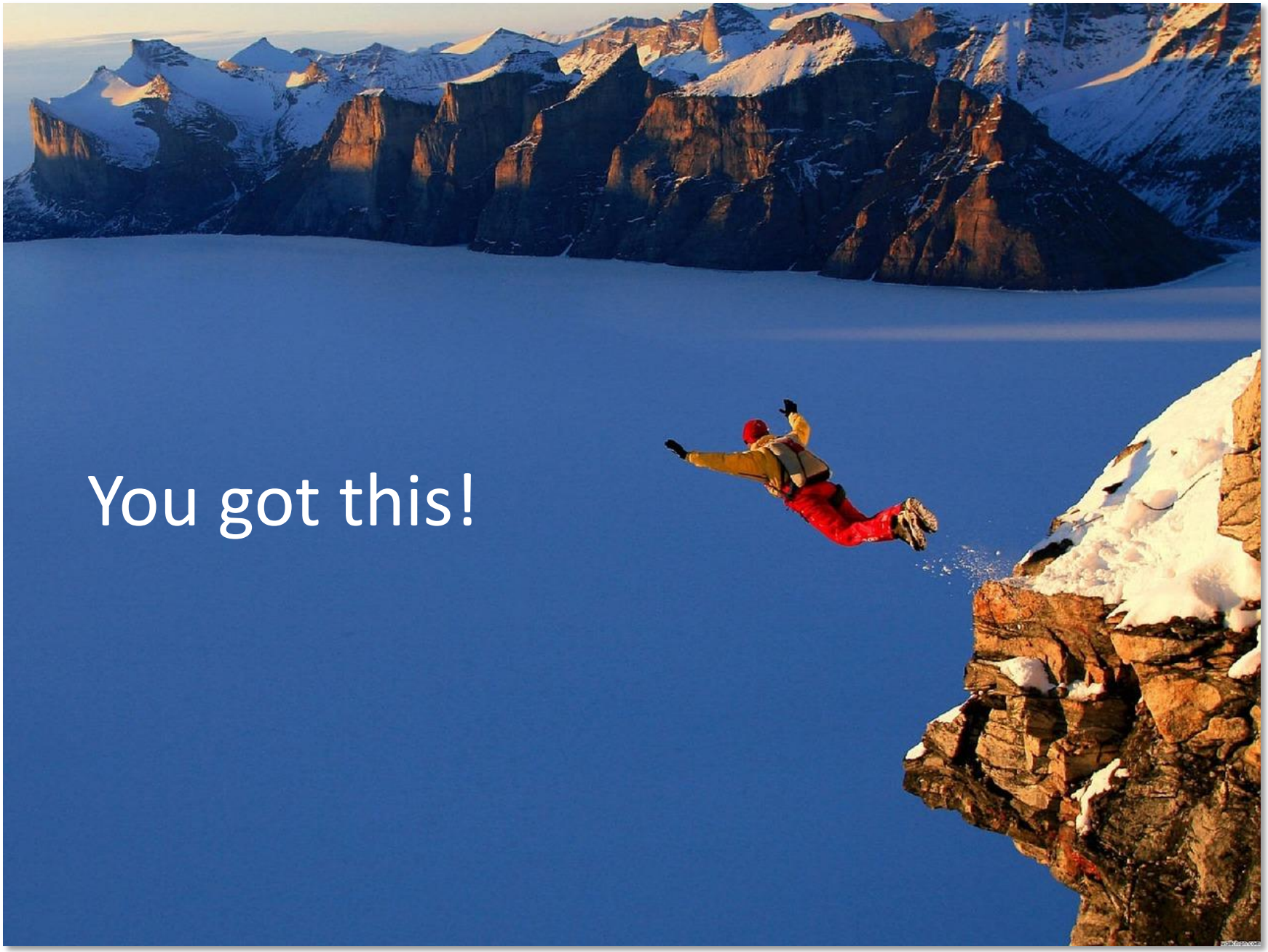
Wow!



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