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the Google Earth for climate data

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This project has been supported by the Jean Golding Institute for data science and data-intensive research at the University of Bristol.

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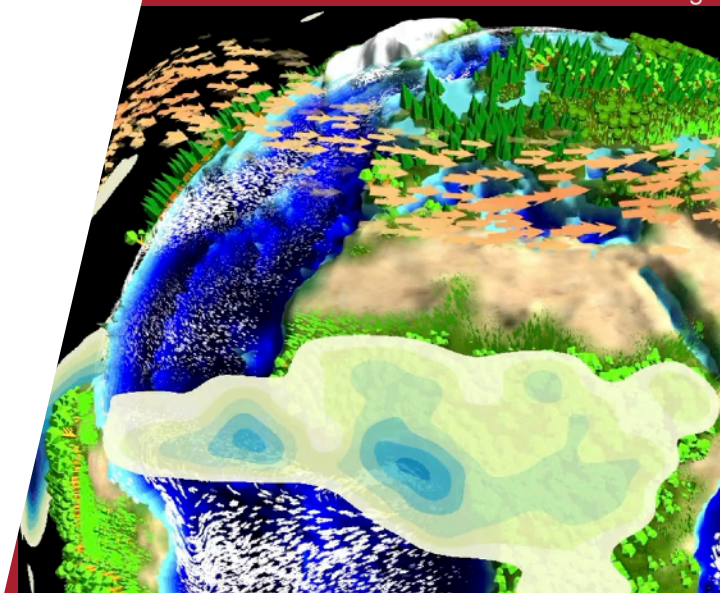

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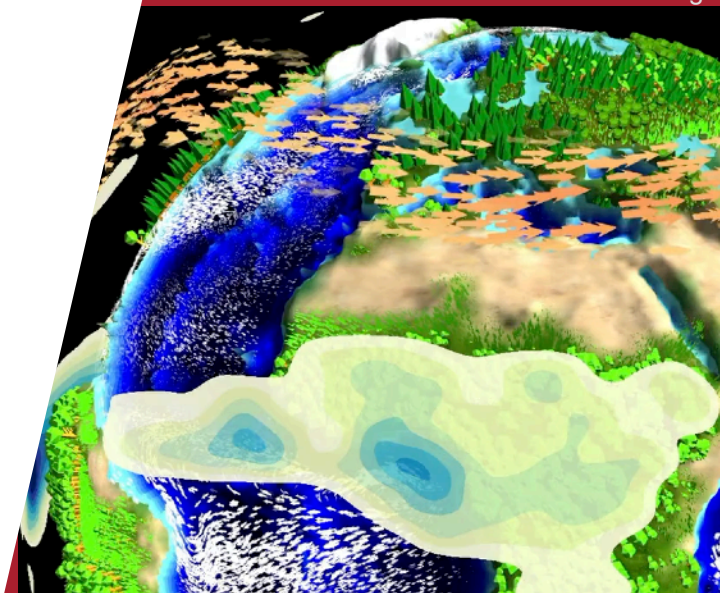
the Google Earth for climate data

1. Climate model data

2. Technical implementation (coding on the GPU)

3. Demo



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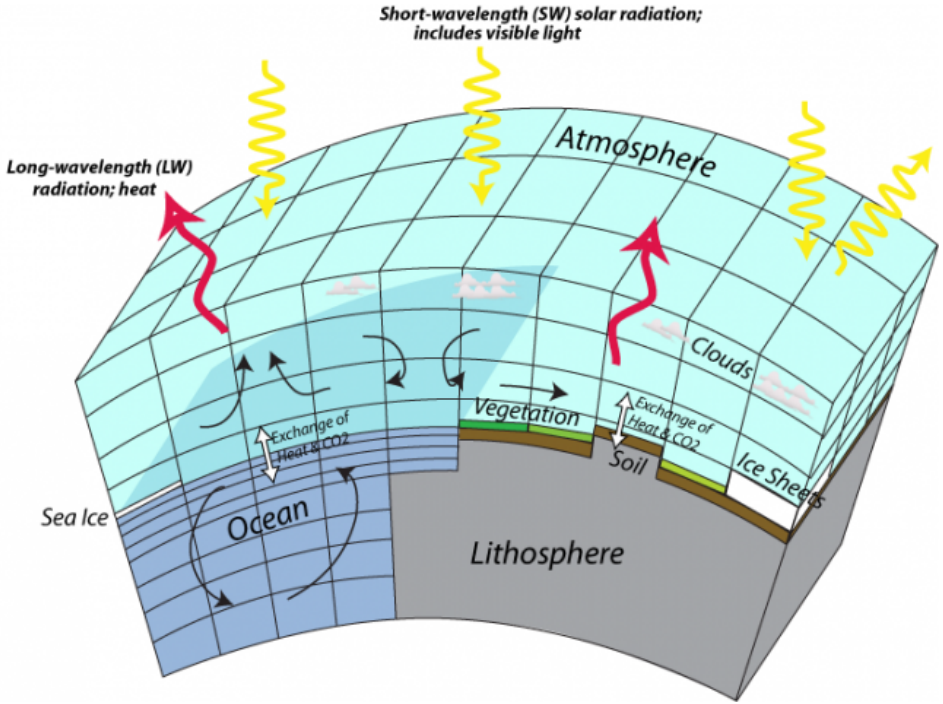
Climate Models

- numerical representations of physical, chemical and biological processes in the Earth system
- can be used for past, present and future climates and even exoplanets
- output large number of global, gridded datasets

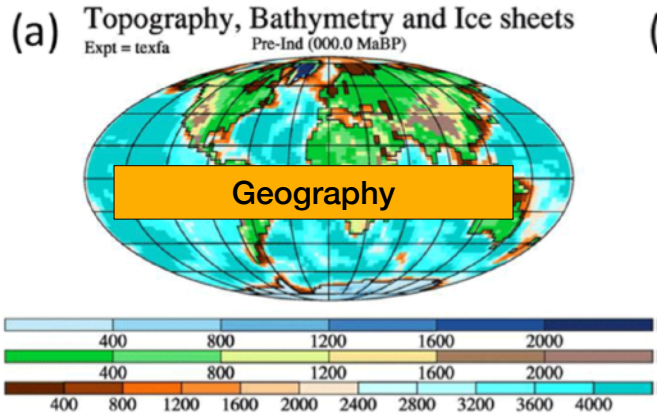


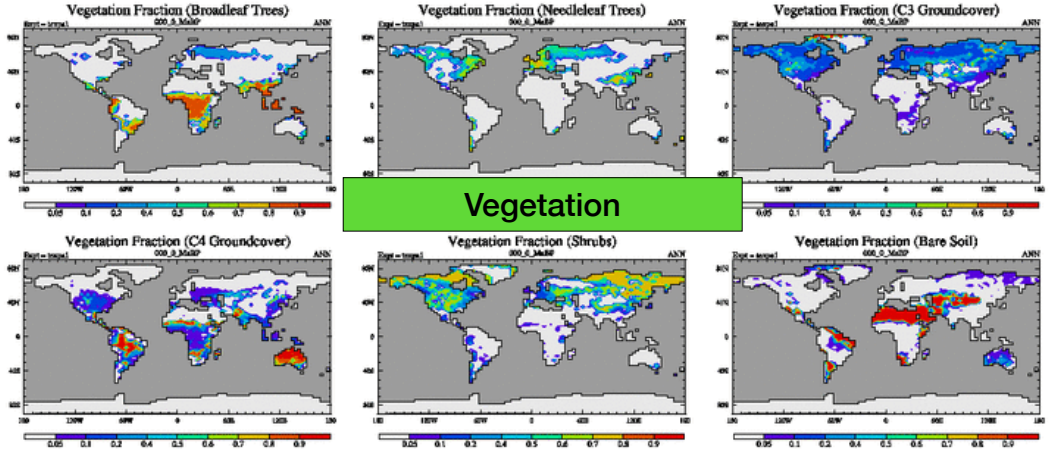
Credit: David Bice © Penn State University

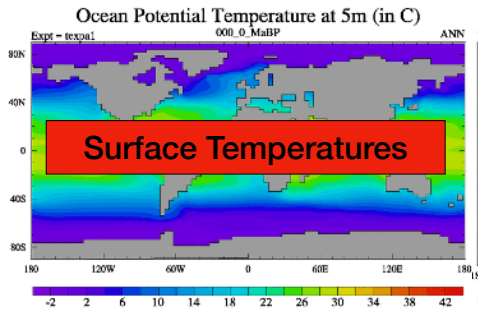
Climate Model Data - CMIP6/IPCC

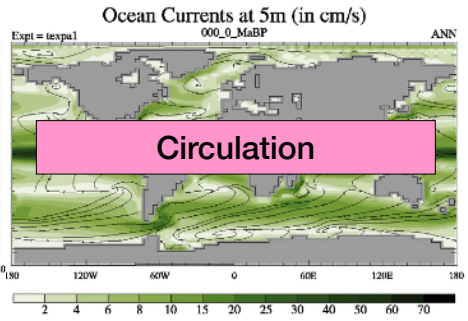
https://esgf-node.llnl.gov/search/cmip6/

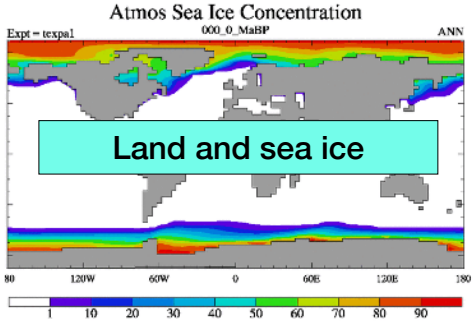
Climate Model Data - Bristol

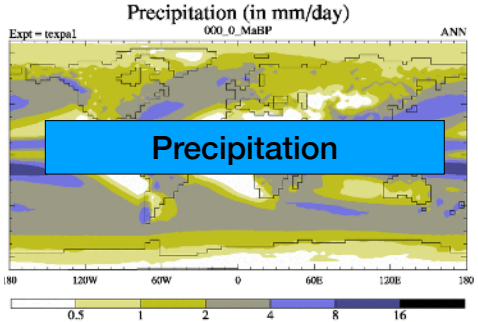












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https://www.paleo.bristol.ac.uk/ummodel/scripts/papers/?

Existing Solutions

- virtual globes provide intuitive user interface to access geospatial data, e.g.:
    - Google Earth
    - earth.nullschool.net

- potential to help interdisciplinary research, education and public outreach

About

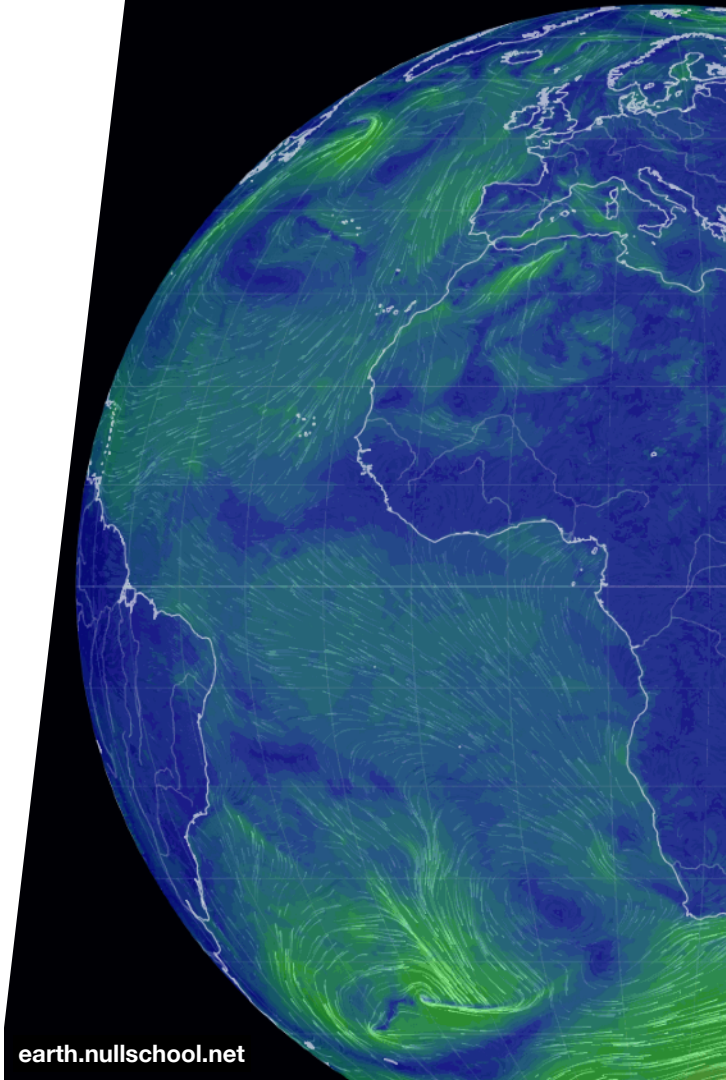
cambecc / earth

a project to visualize global weather conditions

earth.nullschool.net

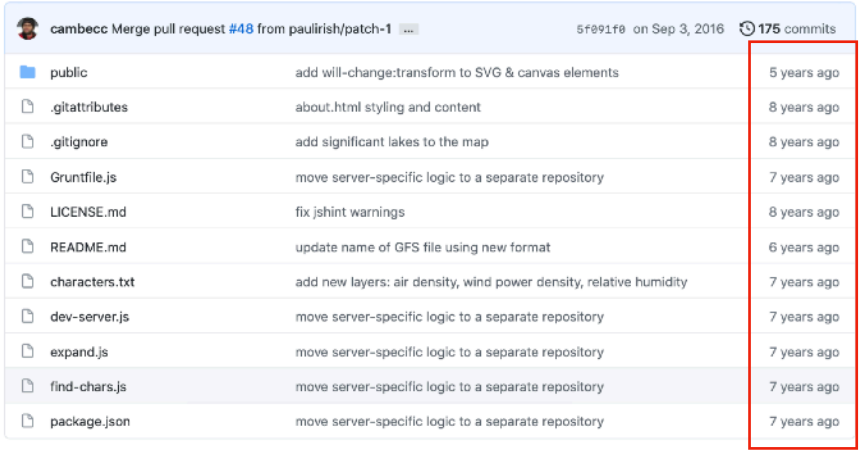
Readme

MIT License



JGI Seed Corn Funding

- problem: we are scientists, not software developers (at least most of us)
- seed corn funding enabled support from a professional software developer (Tessa Alexander) from the start
- UoB Research IT provides this on a consultancy basis



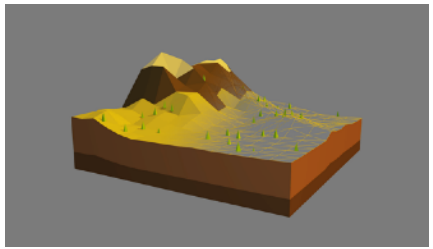
cambecc Merge pull request #48 from paulirish/patch-1 ... 5f091f0 on Sep 3, 2016 175 commits

public	add will-change:transform to SVG & canvas elements	5 years ago
.gitattributes	about.html styling and content	8 years ago
.gitignore	add significant lakes to the map	8 years ago
Gruntfile.js	move server-specific logic to a separate repository	7 years ago
LICENSE.md	fix jshint warnings	8 years ago
README.md	update name of GFS file using new format	6 years ago
characters.txt	add new layers: air density, wind power density, relative humidity	7 years ago
dev-server.js	move server-specific logic to a separate repository	7 years ago
expand.js	move server-specific logic to a separate repository	7 years ago
find-chars.js	move server-specific logic to a separate repository	7 years ago
package.json	move server-specific logic to a separate repository	7 years ago

- decided to write a new software from scratch

Technical Implementation

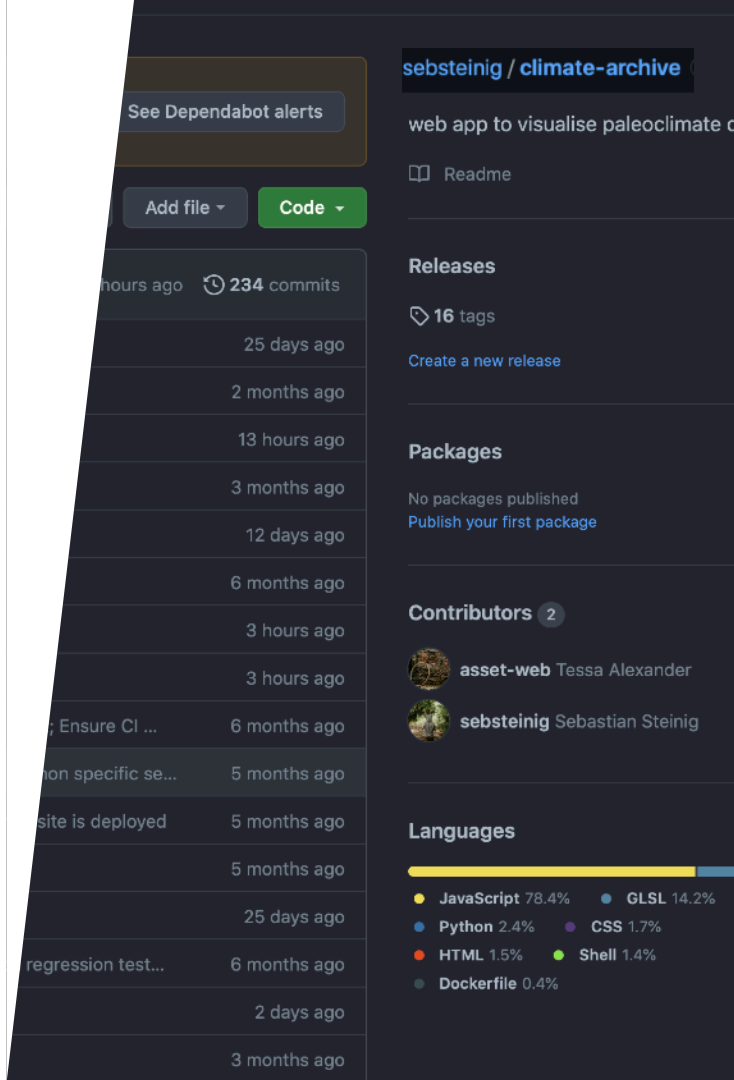
- a one-page website (application) running on any modern browser, including smartphones and tablets
- mainly 3D JavaScript library ‘three.js’



humaan.com/blog/web-3d-graphics-using-three-js/

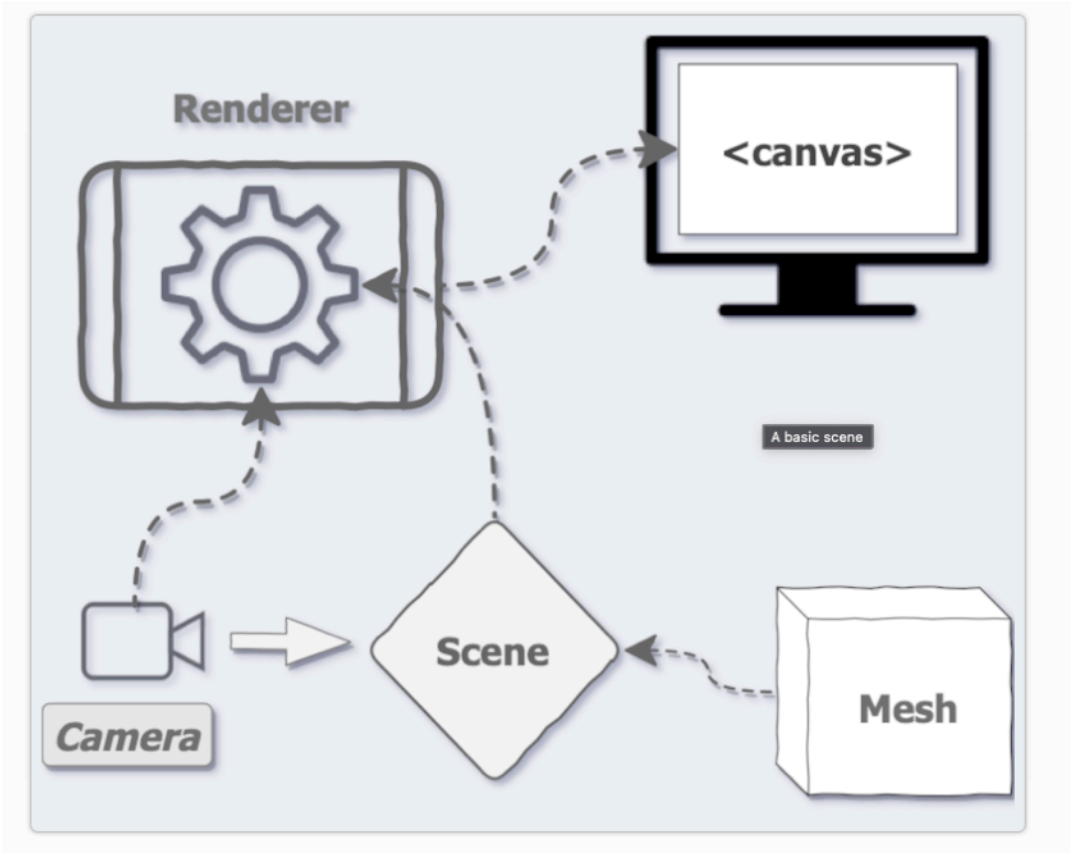
three.js

- uses WebGL (Web Graphics Library) real-time renderer
    - GPU-accelerated graphics power
    - more similar to a video game than a Python script



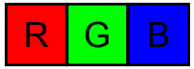
Real-Time 3D App

- two main app components:
    1. set up the scene
    2. render the scene
- renderer draws objects on the screen
- real-time: ~60 frames per second
- GPU support in browser via WebGL



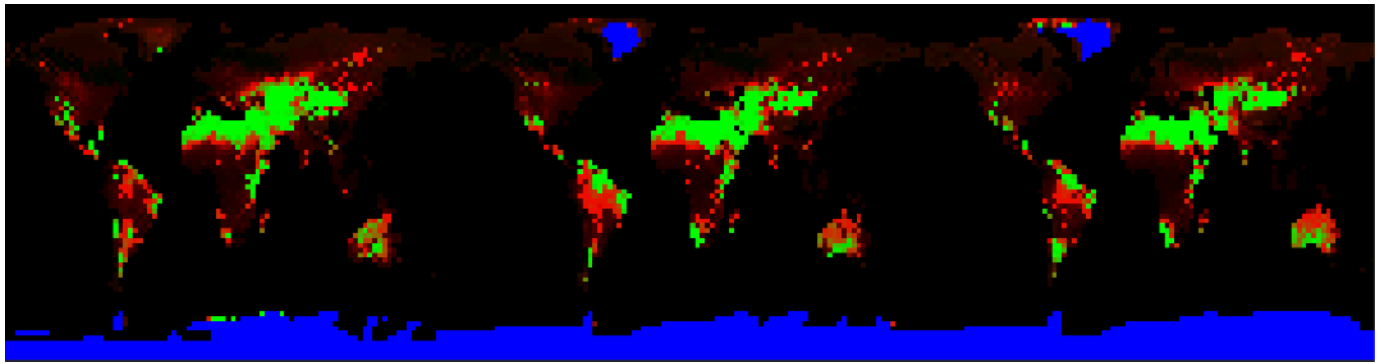
https://discoverthreejs.com/book/first-steps/first-scene/

Encoding data in PNG images

- GPUs work with textures/images
- preprocessing: transcode climate model data from NetCDF to PNG images
- each colour channel can store 8 bits of data (0-255) 

- PNG: easy to handle in browsers and lossless compression

10 million years ago 5 million years ago present day



Demo:
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