

# Announcements

- Check in on labs
  - First lab write-ups are due by 2:00 PM Mountain Time Wed/Thurs
  - Labs turned in using the Microsoft Form on the [Lab 1 assignment page](#)
- Second Voices of GIS guest next Thursday!
  - Zach Hoylman, Montana Asst. State Climatologist on the [UMRB Drought Indicators Dashboard](#)
  - Submit questions for Zach by 2:00 PM on Tuesday (I'll send link)

# Color and Choropleths

Kyle Bocinsky

FORS350 / GPHY488

(Forestry) Applications of GIS

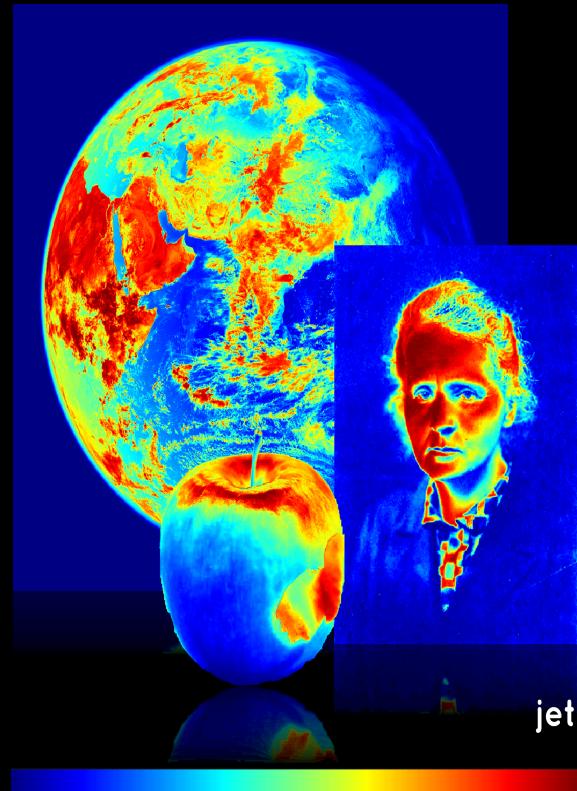
University of Montana

WA Franke College of Forestry & Conservation

a.

c.

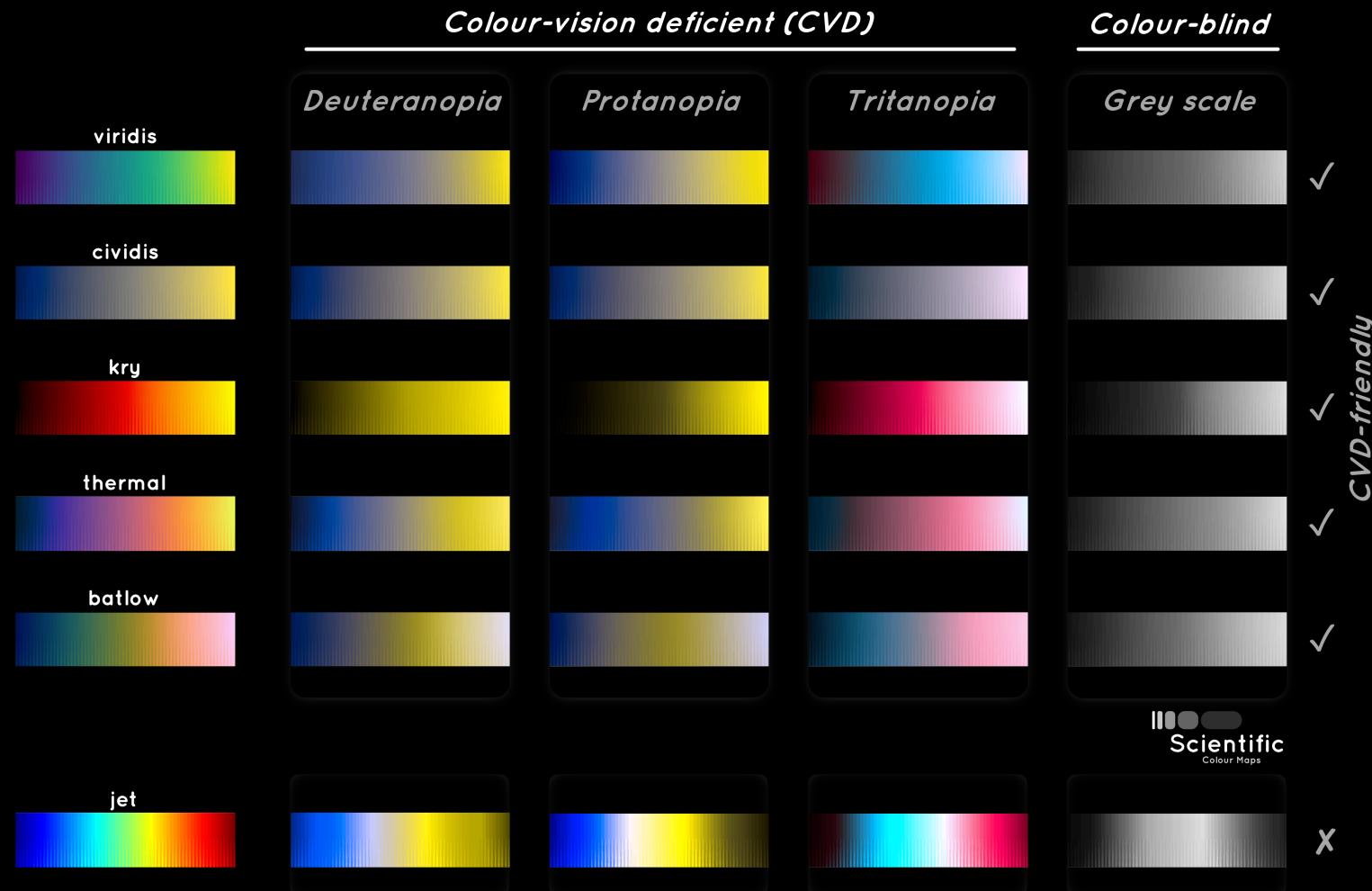
b.



Scientific  
Colour Maps

The distortion of unscientific color maps.<sup>1</sup>



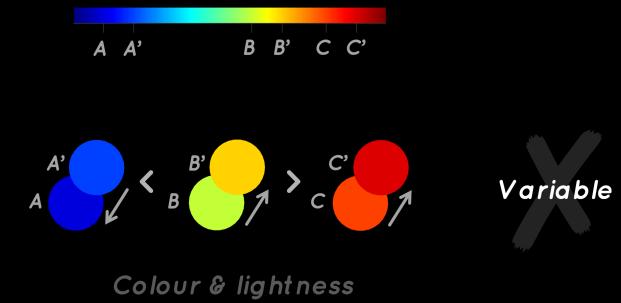


Color vision deficiency accessibility.<sup>1</sup>

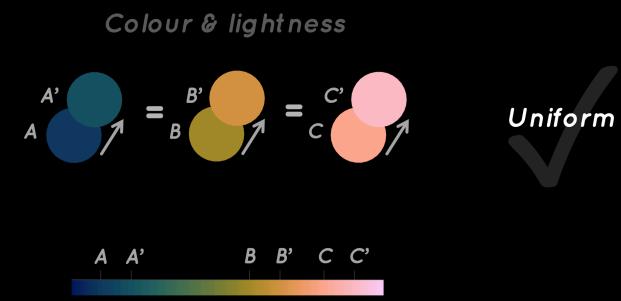
# Perception Matters!

- Perceptually **uniform**: constant incremental colour and lightness contrast along a color map
- Perceptually **ordered**: both lightness and brightness should increase linearly

a.

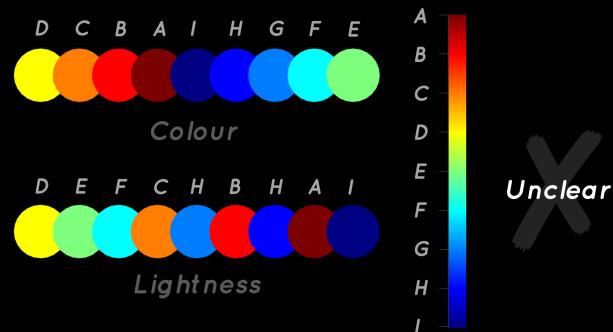


Incremental contrast

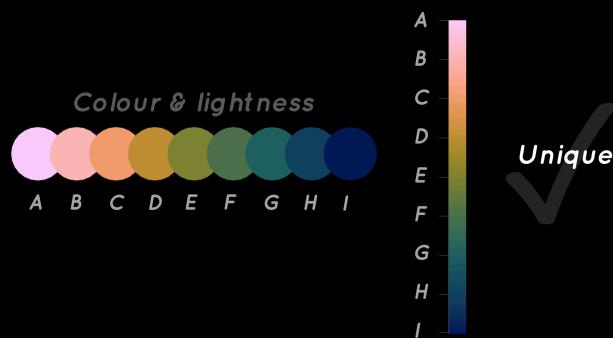


b.

c.



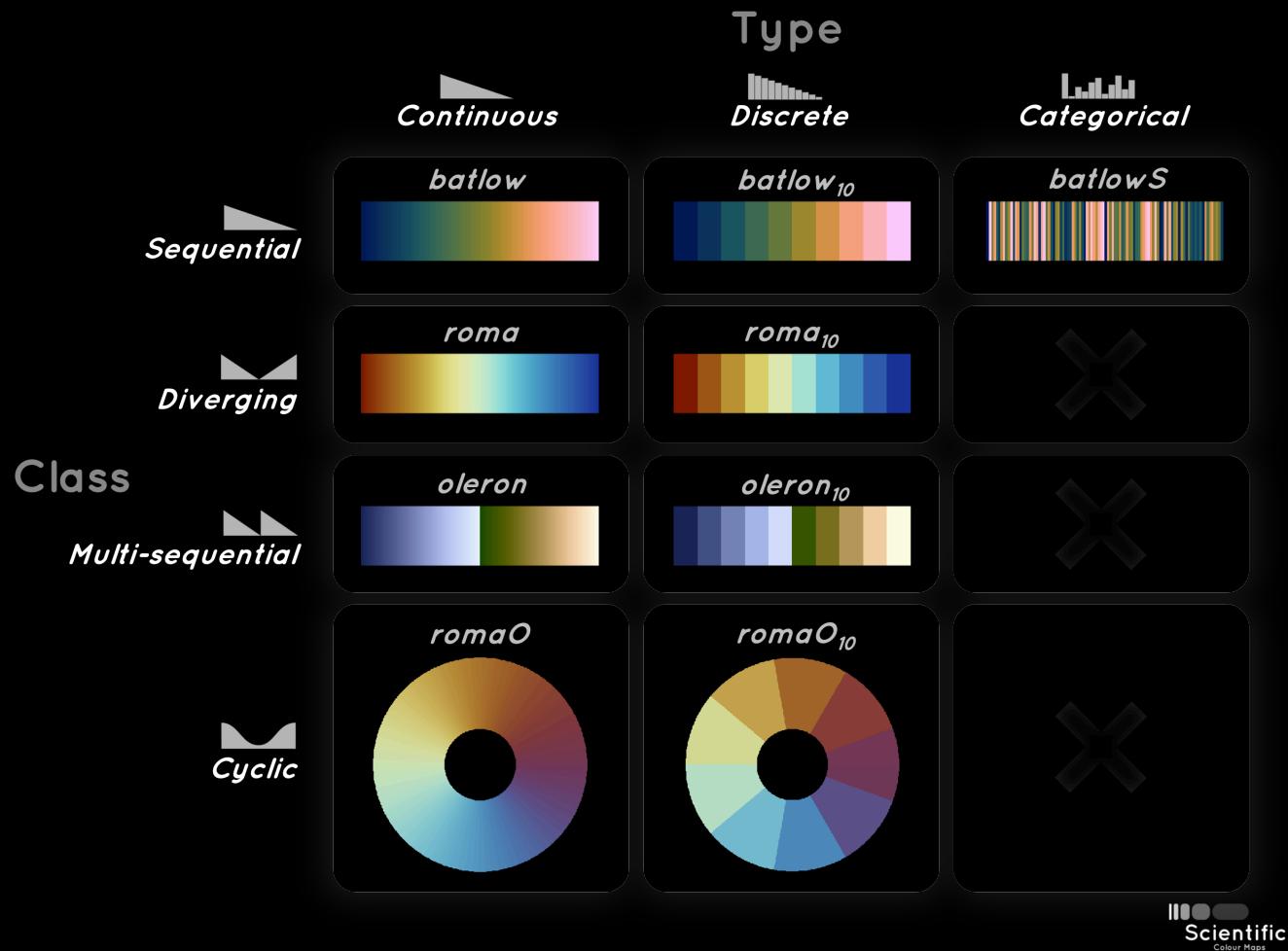
Intuitive order



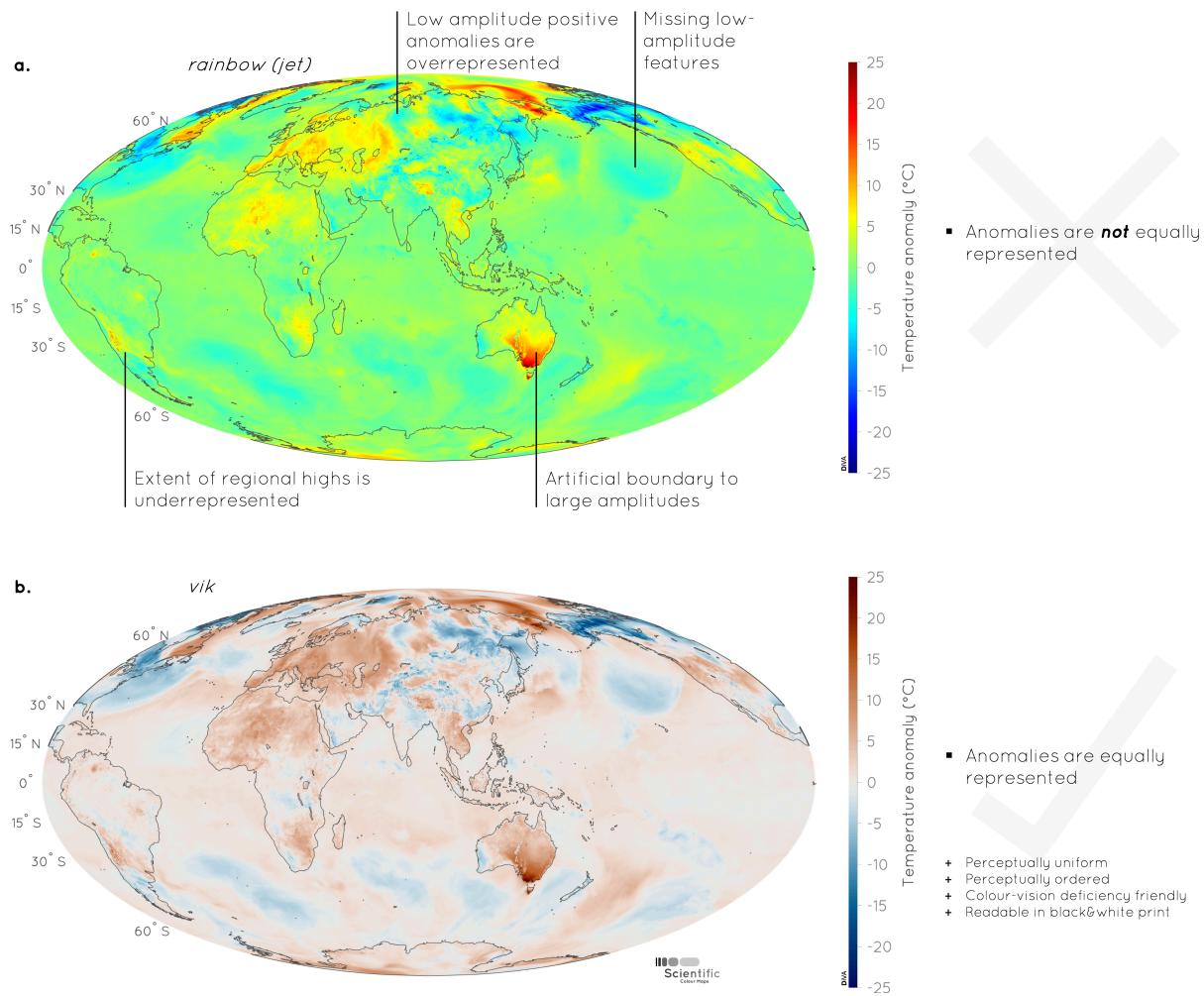
d.

Scientific  
Colour Maps

Perceptual uniformity and order.<sup>1</sup>

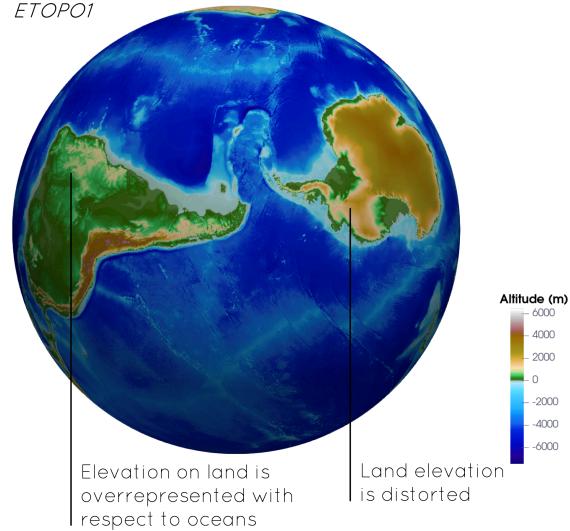


Color map classes and types.<sup>1</sup>



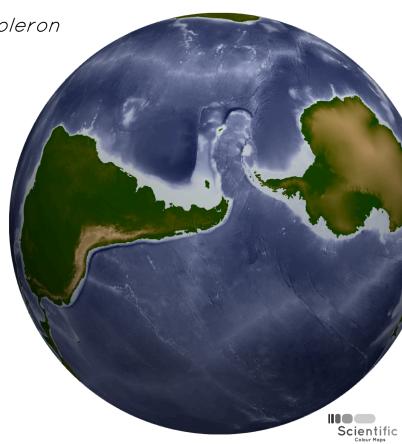
Climate mapping.<sup>1</sup>

a. ETOPO1



- Surface elevation is misrepresented

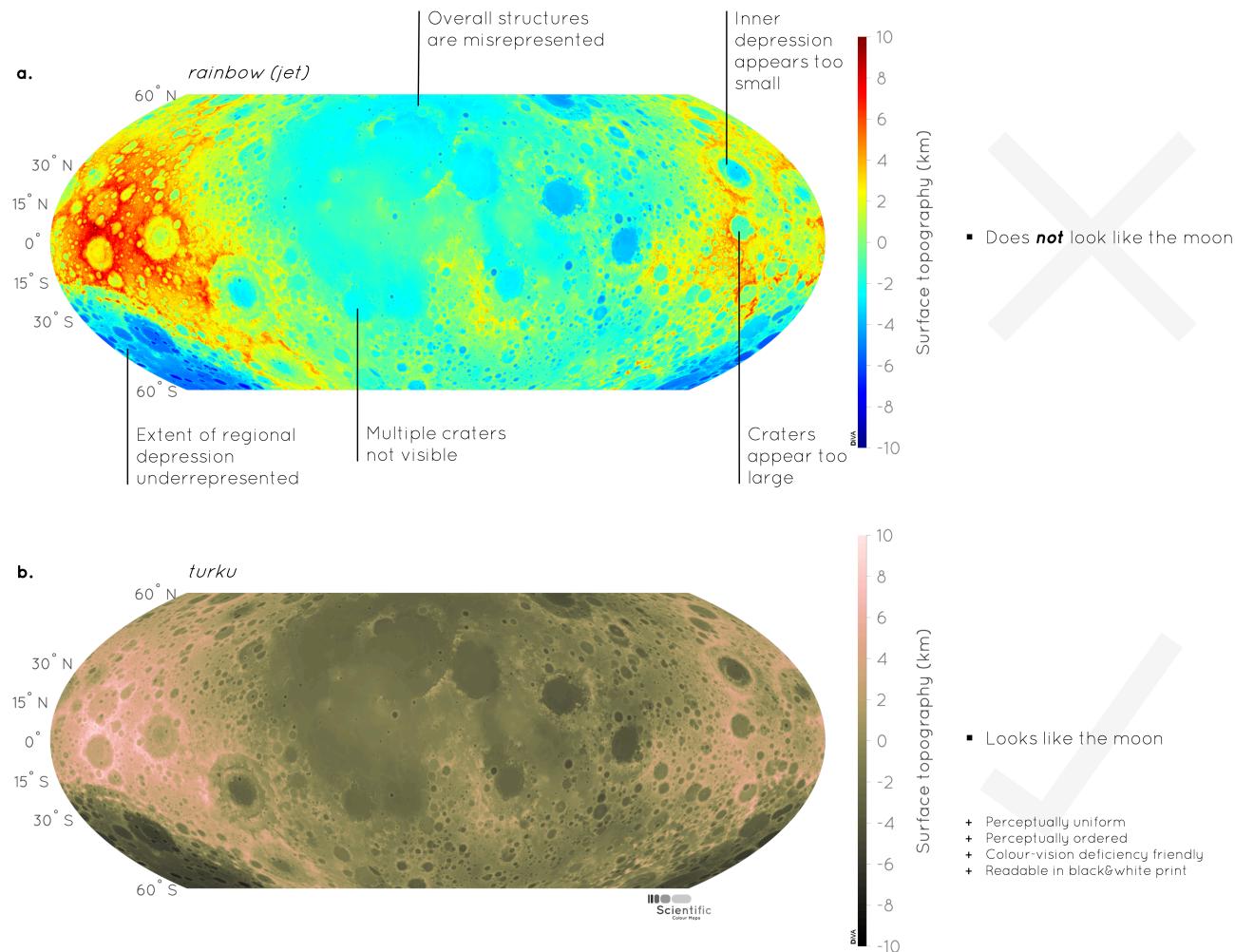
b. oleron



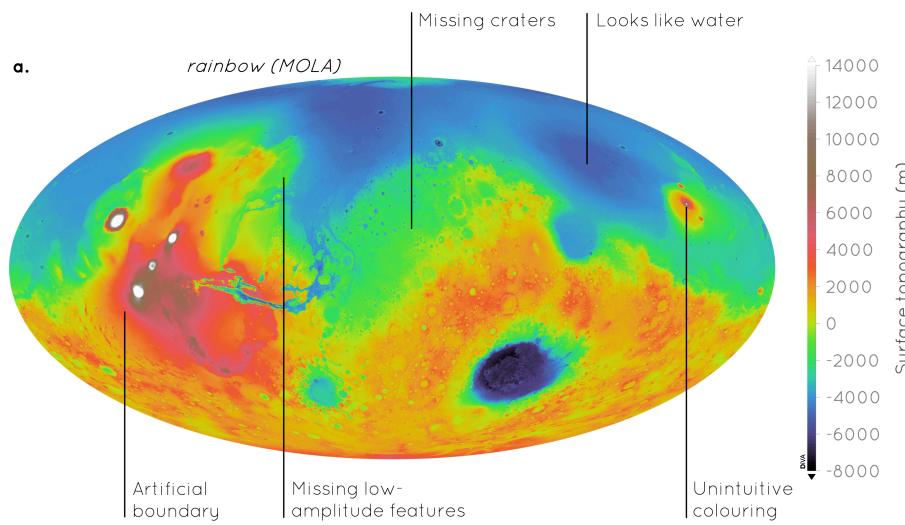
- Surface elevation is truthfully represented

- + Perceptually uniform
- + Perceptually ordered
- + Colour-vision deficiency friendly
- + Readable in black&white print

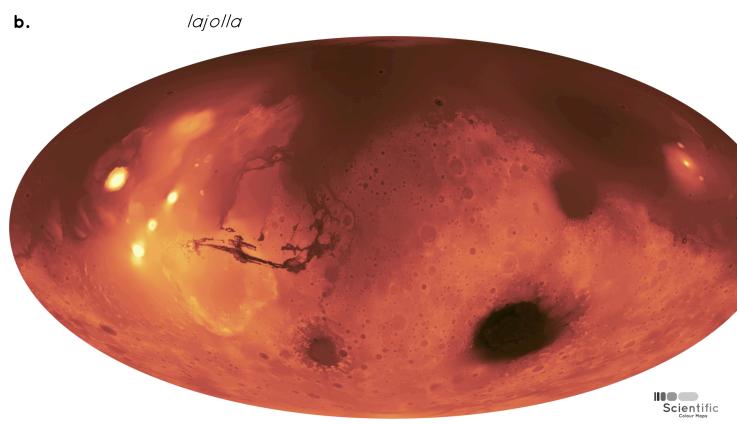
# Earth topography.<sup>1</sup>



# Moon topography.<sup>1</sup>



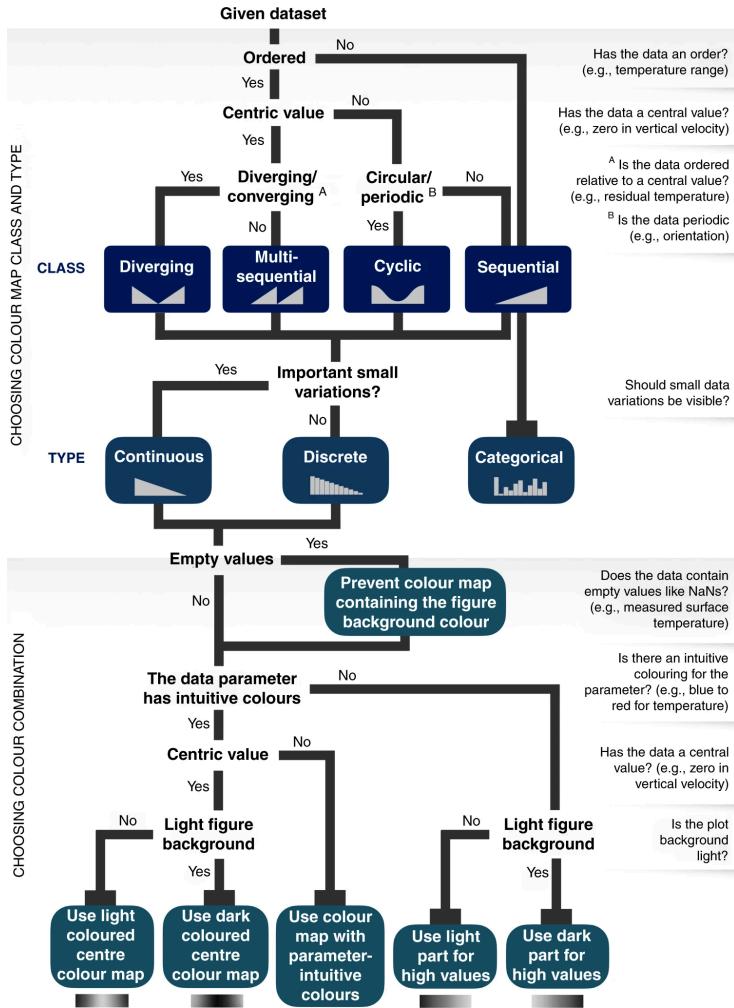
▪ Misrepresents Mars



▪ Represents Mars

- + Perceptually uniform
- + Perceptually ordered
- + Colour-vision deficiency friendly
- + Readable in black&white print

# Mars topography.<sup>1</sup>



Guideline for choosing the right scientific colour map.<sup>1</sup>

# Available colour maps and toolkits

\* Built into ArcGIS Pro

+ Available as ArcGIS Pro style

- Colorbrewer\* (<https://colorbrewer2.org>): The Colorbrewer colour maps are provided through an online tool to manually produce and export a variety of discrete colour maps, which can, optionally, be colour-vision deficiency friendly and exported to a given a variety of formats.
- Matplotlib\* (<https://bids.github.io/colormap/>): The MPL maps aim for the most accurate perceptual uniformity with its widely applied colour maps being: viridis, magma, plasma and inferno.
- Cividis\*: The cividis colour map aims to represent an almost identical appearance for red–green colour-vision deficiencies, the closest of all currently available colour maps, while also being perceptually uniform.
- CMOcean<sup>+</sup> (<https://matplotlib.org/cmocean/>): The CMOcean colour maps aim to provide the most intuitive colours for a given suite of physical parameters, while now also being perceptually uniform.
- CET (<https://colorcet.com>): The CET colour maps aim to offer a large choice of the most common colour combinations in a wide variety of data formats.
- Scientific colour maps<sup>+</sup> (<https://www.fabiocramerich.ch/colourmaps/>): The Scientific colour maps are perceptually uniform, perceptually ordered, colour-vision deficiency and colour-blind friendly, readable in black and white prints, and, if applied properly, also data set specific and parameter intuitive.