



# Data Visualization in Publications and Presentations

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# I. Principle

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## ➤ “KISS” - Keep It Simple Stupid

Just because you can, doesn't mean you should.

**Problem:** they often are superfluous, or results in plots that have too high of information density

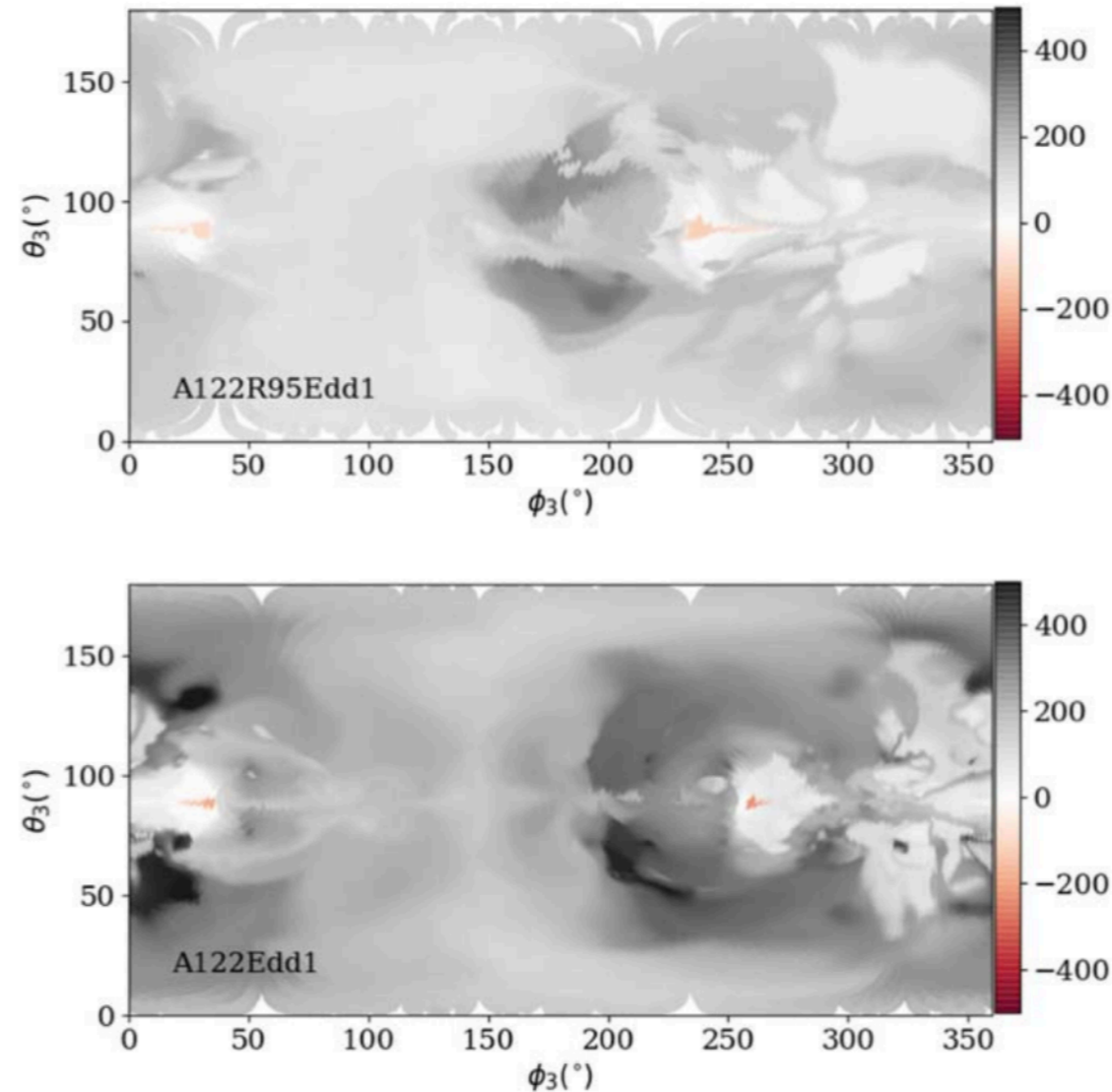
**Solution:** Use the **minimal** complexity that you need to make the point you are trying to make

Particularly important for presentations: Your audience usually has little time to process.

# I. Principle

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## ► A few examples

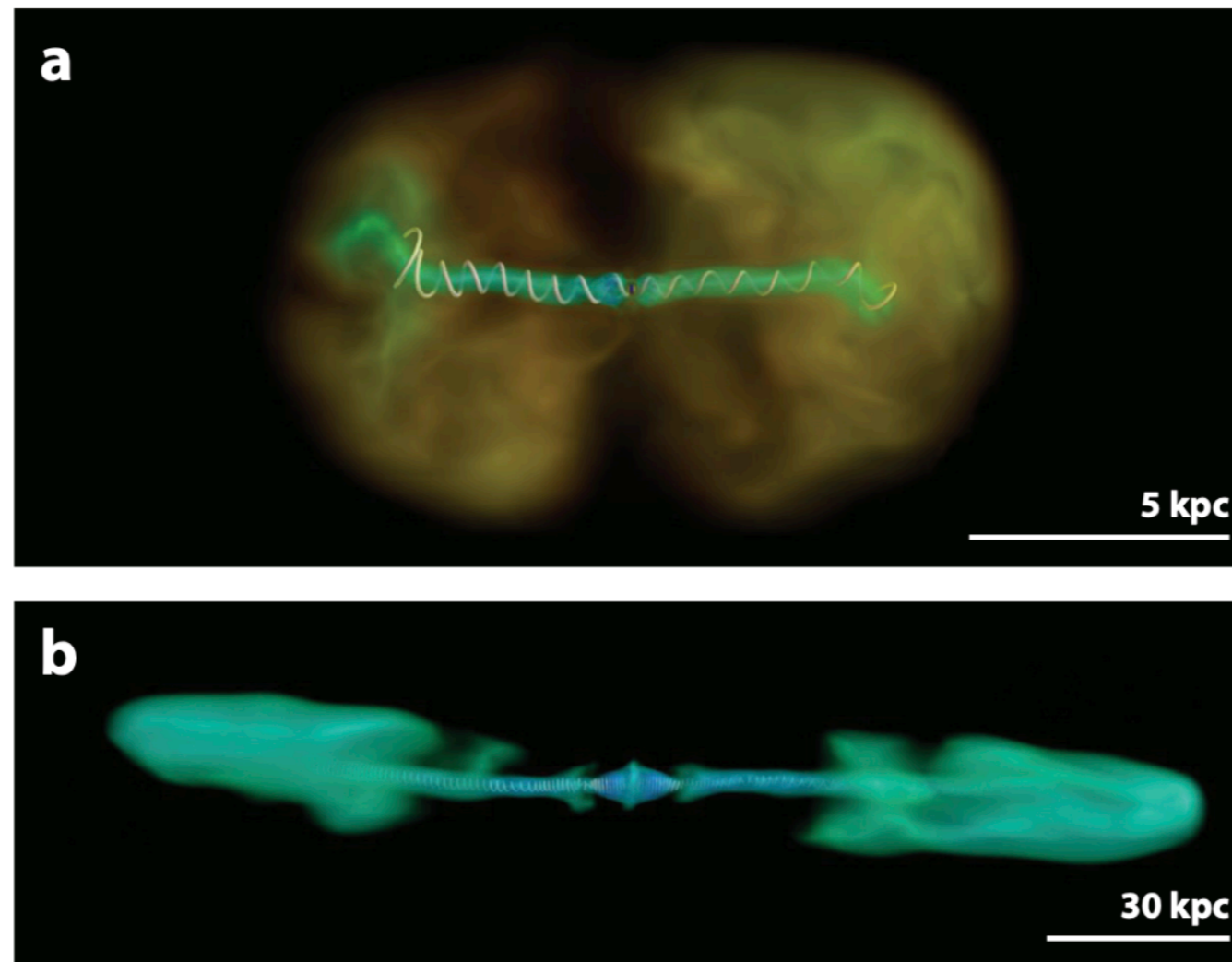


**Figure 14.** Angular distribution of radial velocity  $v_{r,3}$  relative to the collision point for all of the gas from  $\approx 5r_s$  to the collision point. Here  $\theta_3$  and  $\phi_3$  are the polar and azimuthal angles relative to the collision in the ranges  $0-\pi$  and  $0-2\pi$ , respectively. The negative  $v_{r,3}$  corresponds to the injected streams, and the positive  $v_{r,3}$  is normal to the sphere and pointed outward, representing the outflowing gas. The upper panel shows the distribution for A122R95Edd1 at  $t' = 0.52$ . The lower panel shows the distribution for A122Edd1 at  $t' = 0.45$ , roughly the same time after collision.

# I. Principle

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## ➤ A few examples



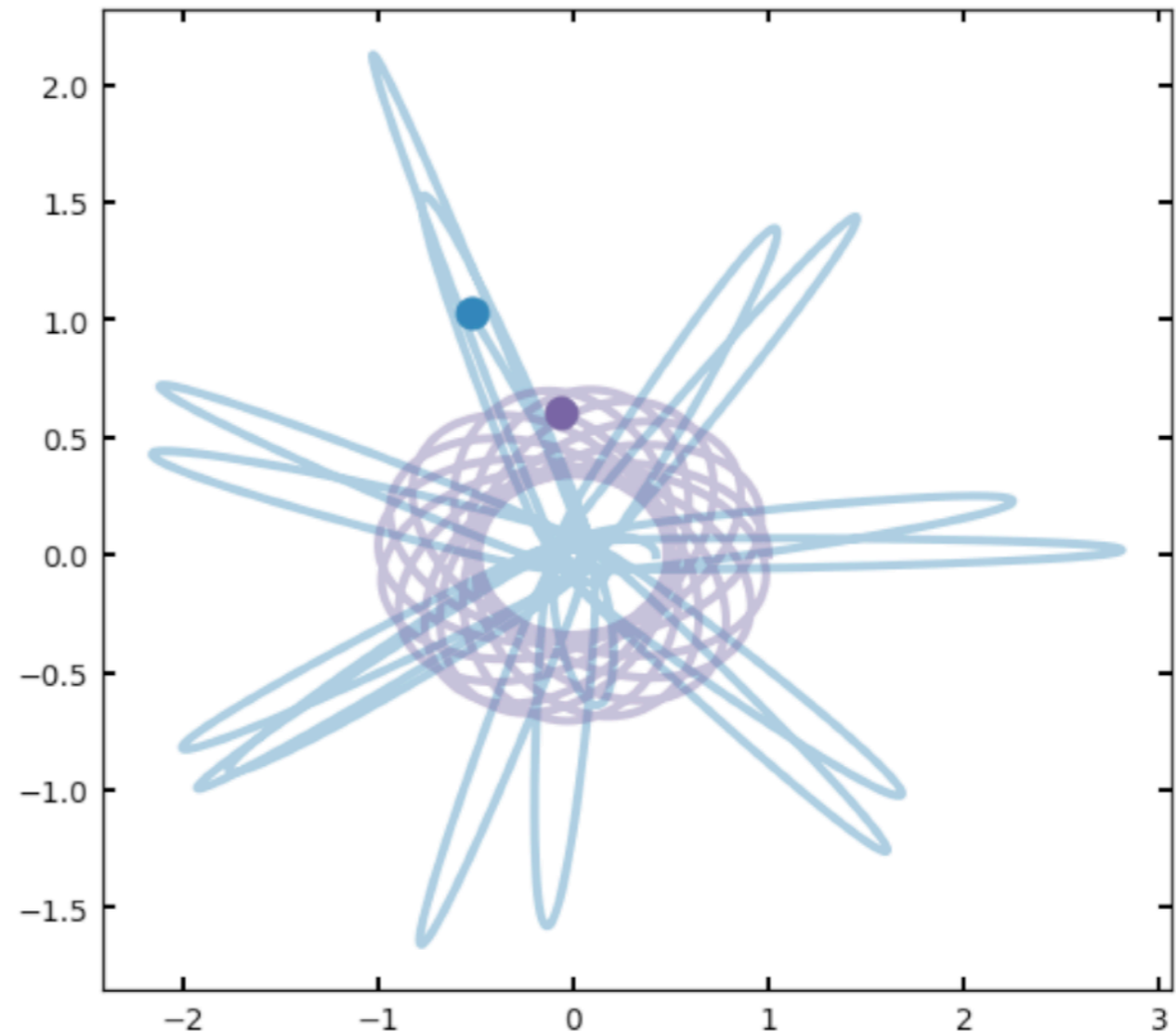
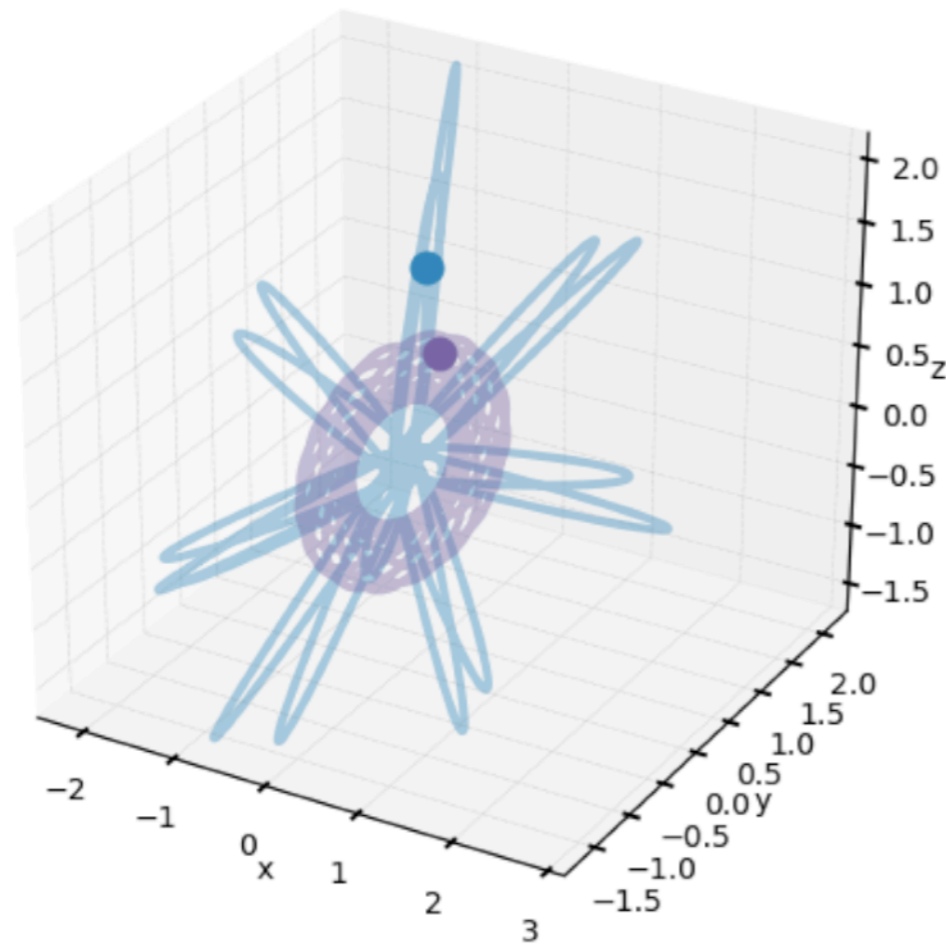
**Figure 8**

(a) Low-power AGN jets (*blue-green*) succumb to global magnetic instabilities, stall within their host galaxies, and inflate quasi-spherical cavities (*yellow*). (b) High-power jets maintain their stability, leave their host galaxies, and form strong backflows. Thus, magnetic instabilities can be the key to resolving a 40-year-long puzzle on the cause of the Fanaroff & Riley (1974) morphological dichotomy of AGNs (Tchekhovskoy & Bromberg 2016).

## II. Visualization Techniques

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### ► 2D/3D plots

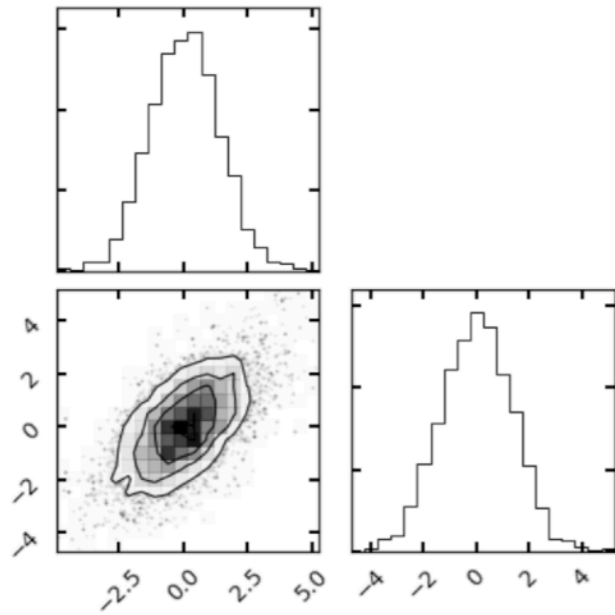


Example: Binary system orbital dynamics

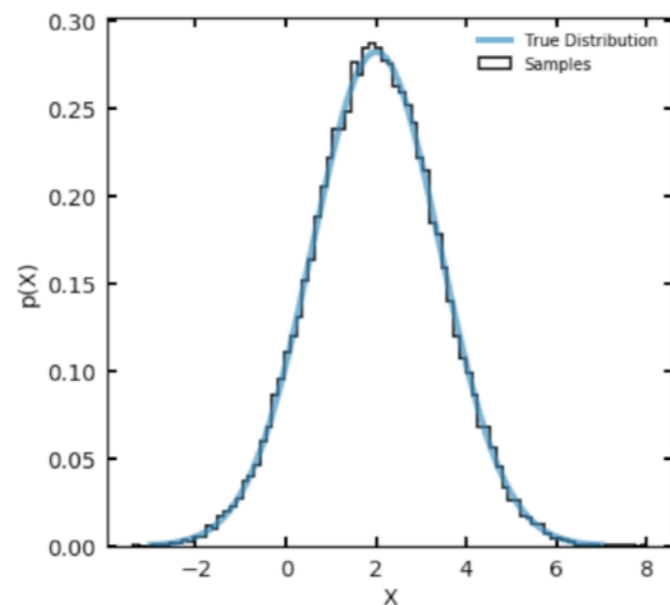
## II. Visualization Techniques

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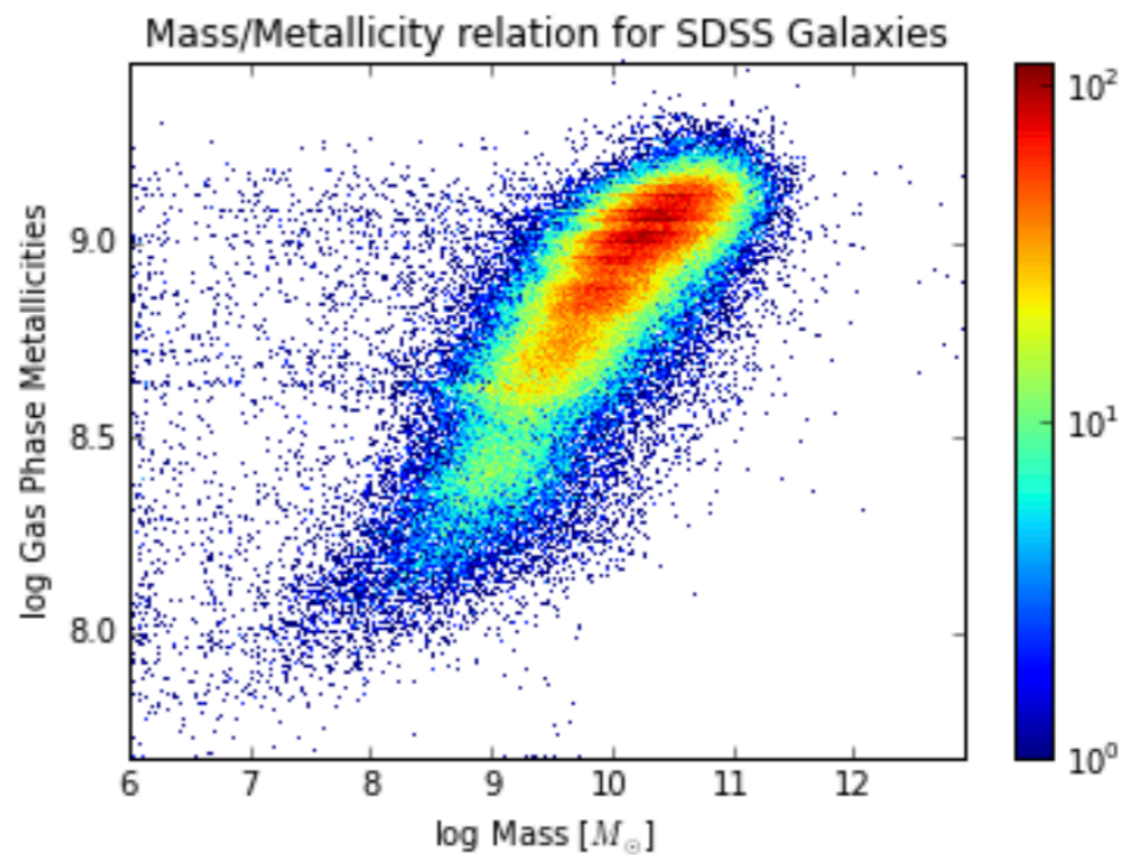
### ► Sampling



corner plots



Example: Fitting 1D Gaussian

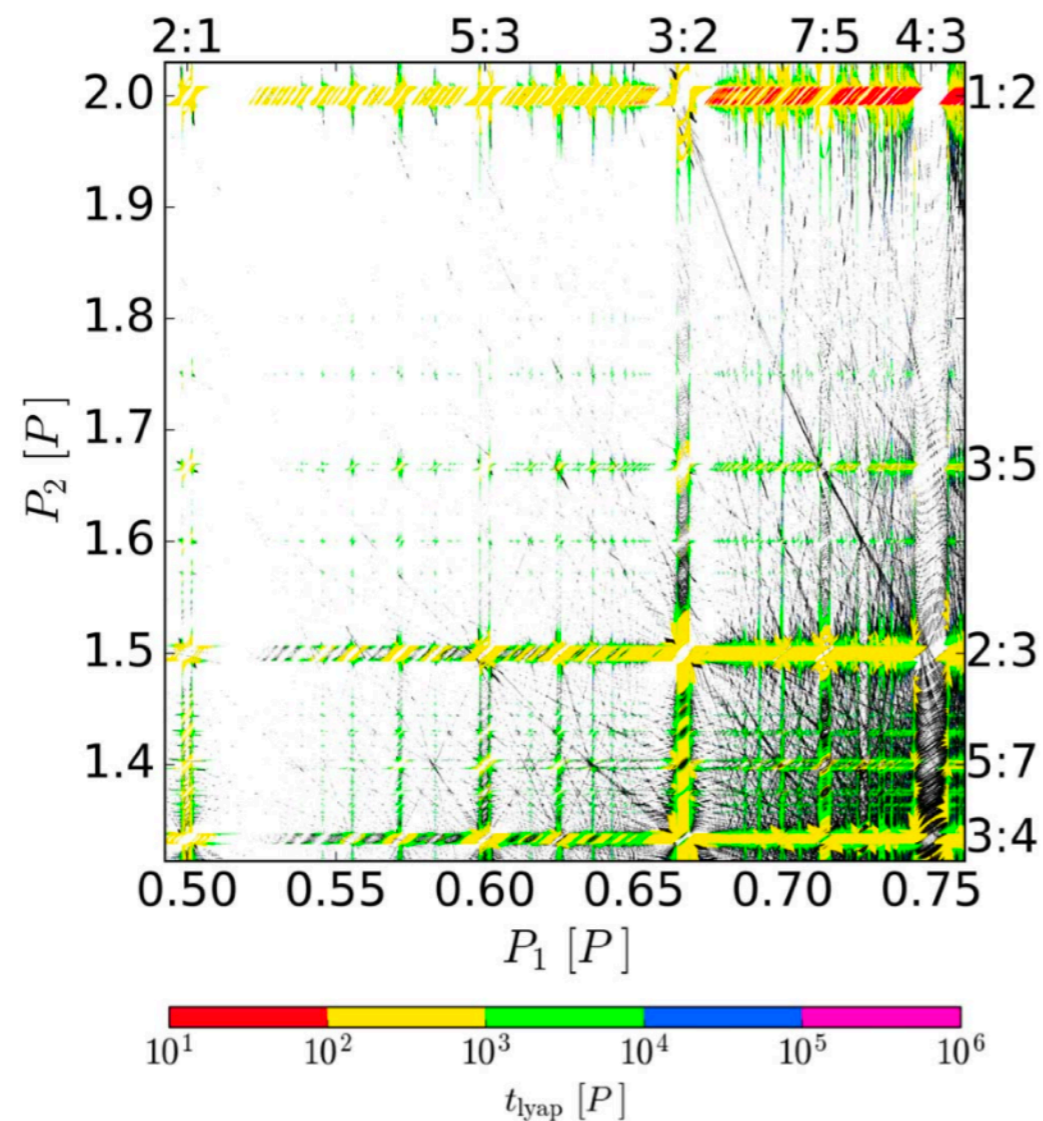


Example: SDSS galaxies



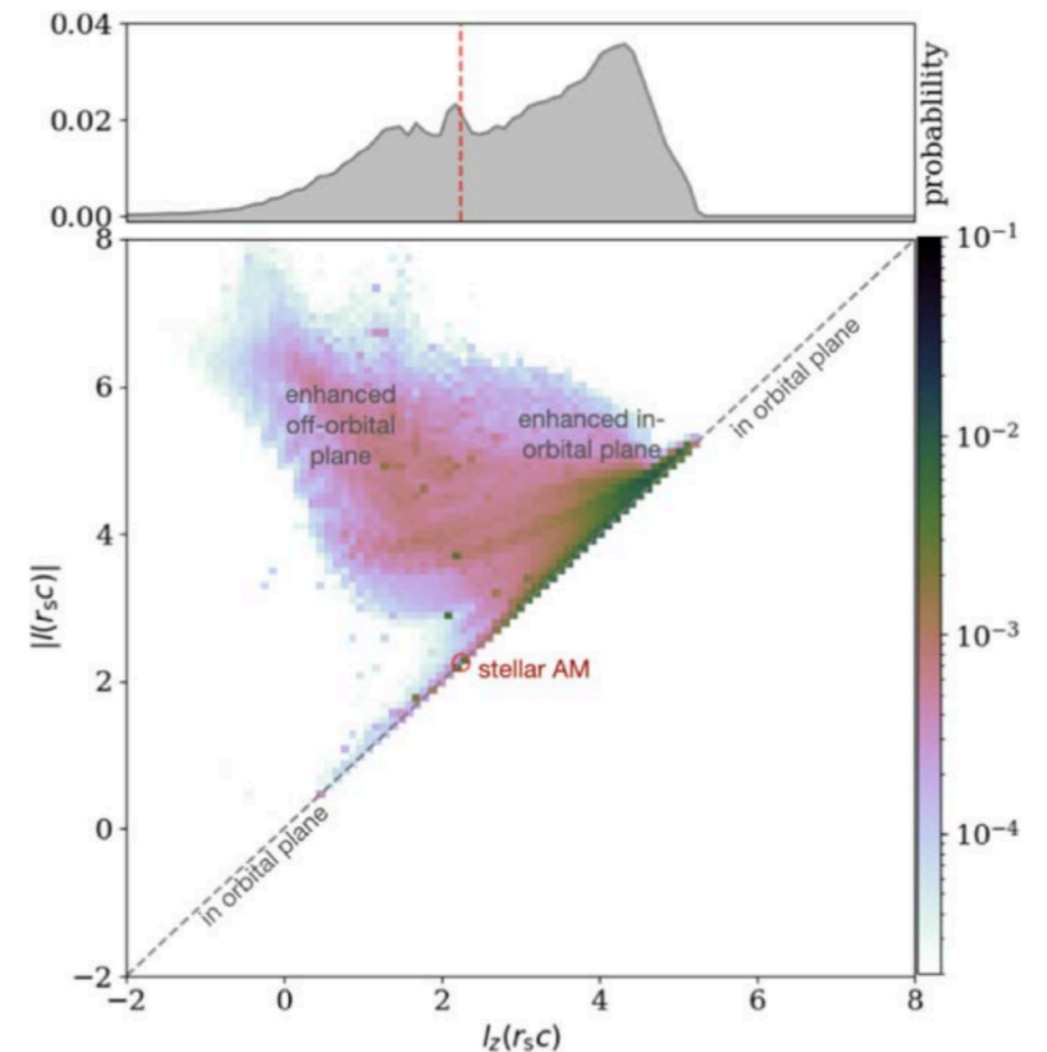
## II. Visualization Techniques

### ► Color plots



**Figure 13.** The predicted Lyapunov times, based on overlapping secondary resonances. For two secondaries from the same 2BR crossing, the prediction is color coded; but for two secondaries from different 2BR crossings, we are unable to make a prediction, and those overlaps are colored black.

Example: Resonance overlapping

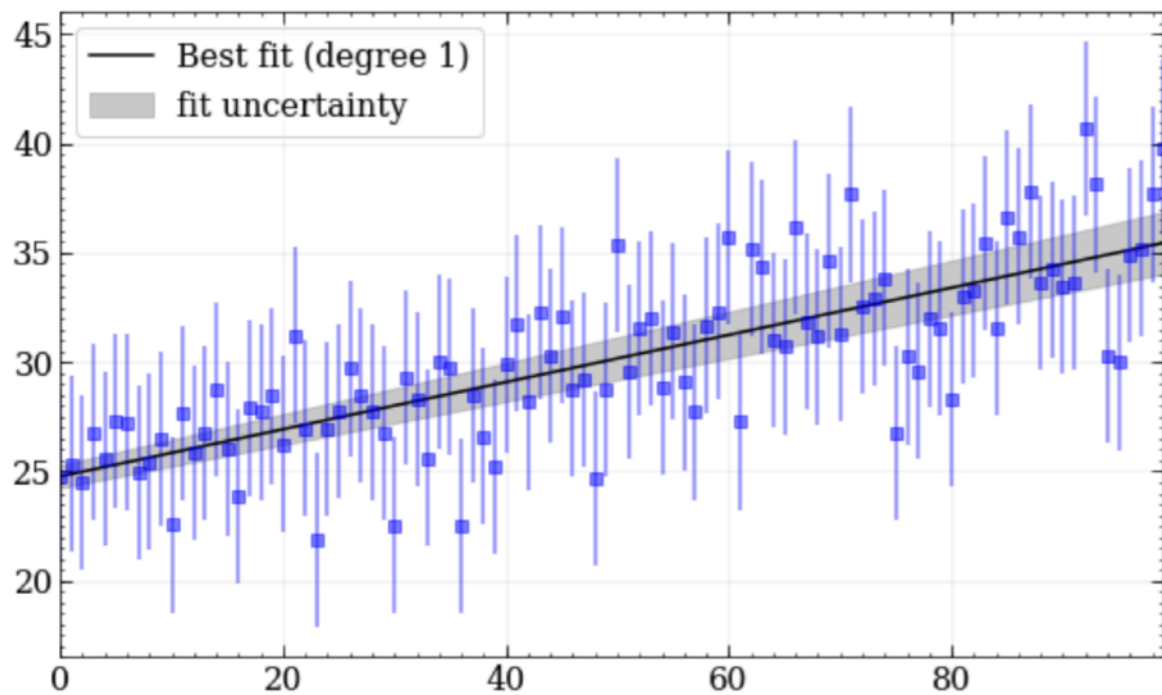


**Figure 20.** Downstream gas angular momentum distribution from A122Edd1 at  $t = 0.3$ . We only show gas with a positive radial velocity relative to the collision point  $v_{r,3} > 0$ . The top panel shows the (mass-weighted) angular momentum  $l_z$  distribution projected to the orbital plane. The red vertical line labels the original stellar debris stream angular momentum. The bottom panel shows the distribution of total angular momentum magnitude  $|l|$  and projected angular momentum  $l_z$ . The red circle shows the original stellar stream value, and the gray dashed line shows the angular momentum within the orbital plane.

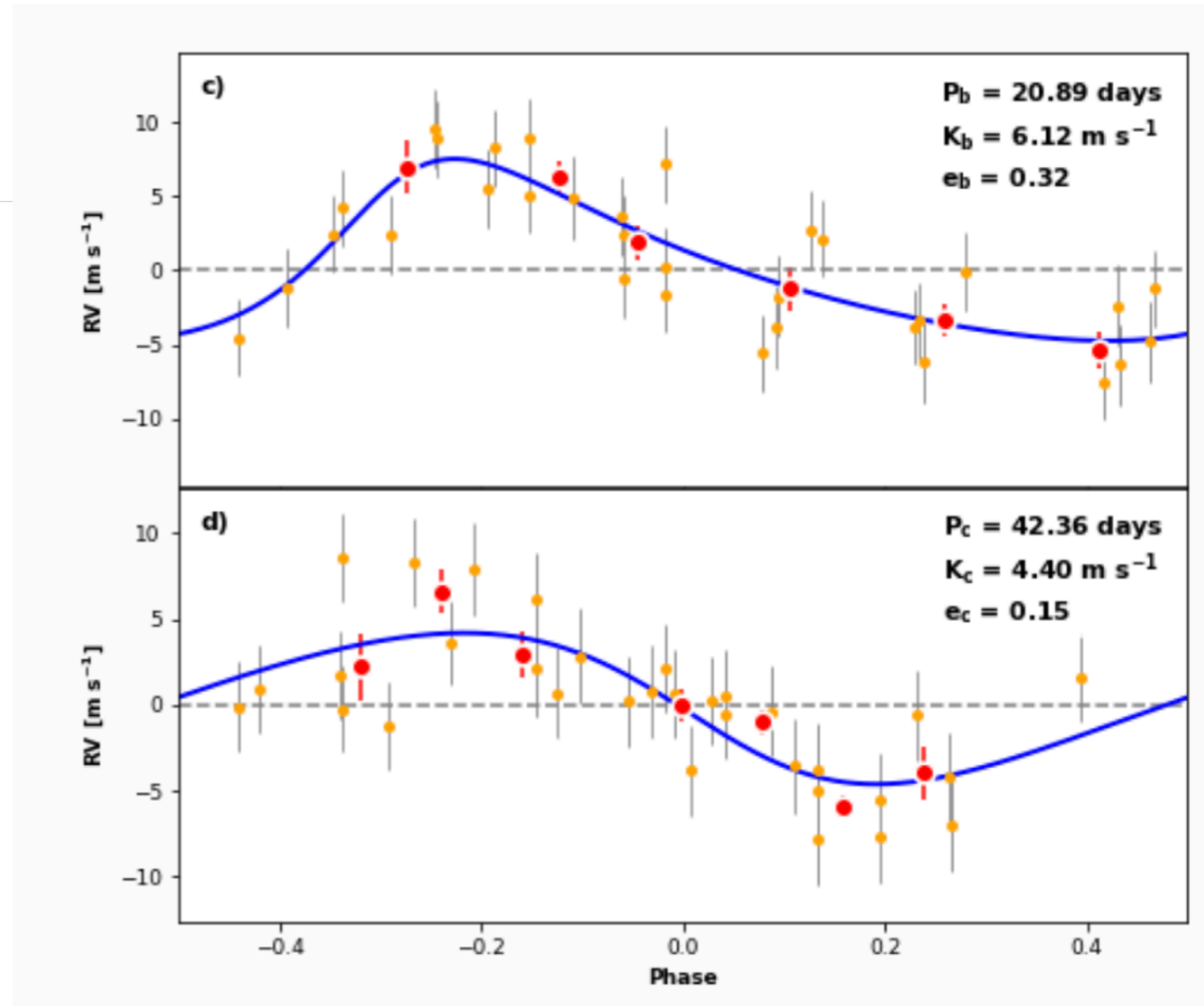
Example: Downstream gas a.m. distribution

## II. Visualization Techniques

### ► Uncertainty Visualization



Example: Linear regression



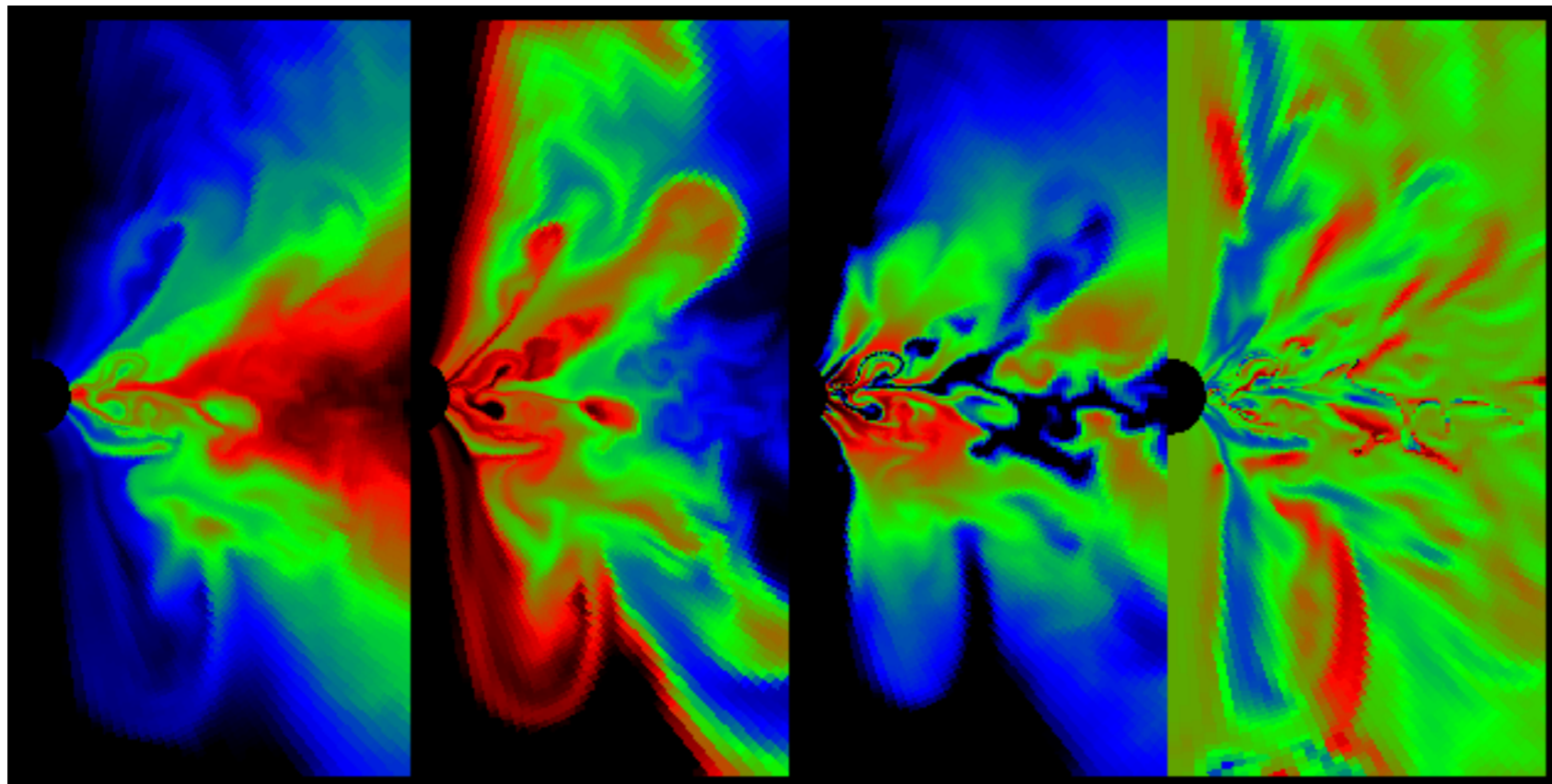
Example: Fitting RV data



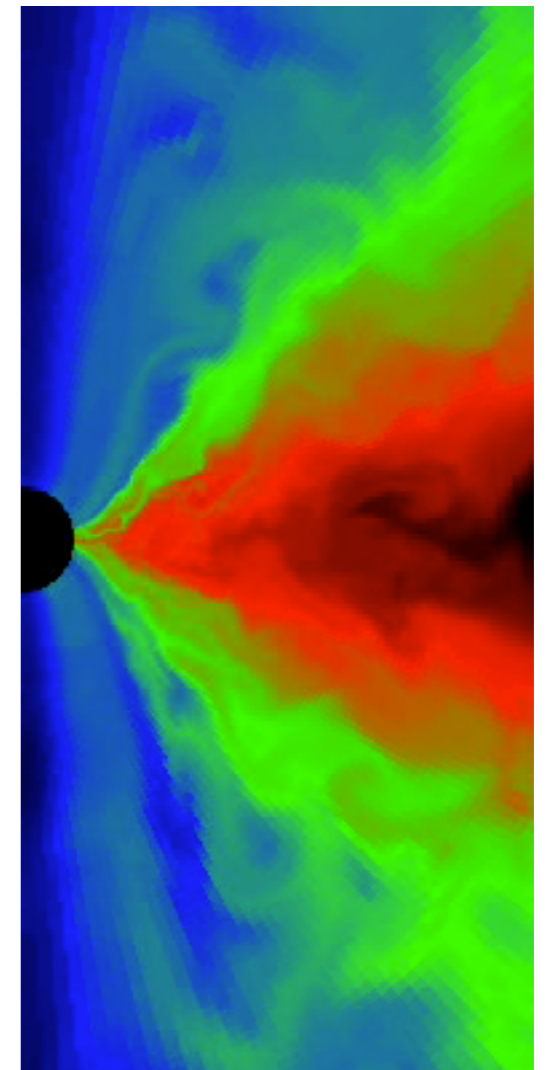
## II. Visualization Techniques

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### ► Movies



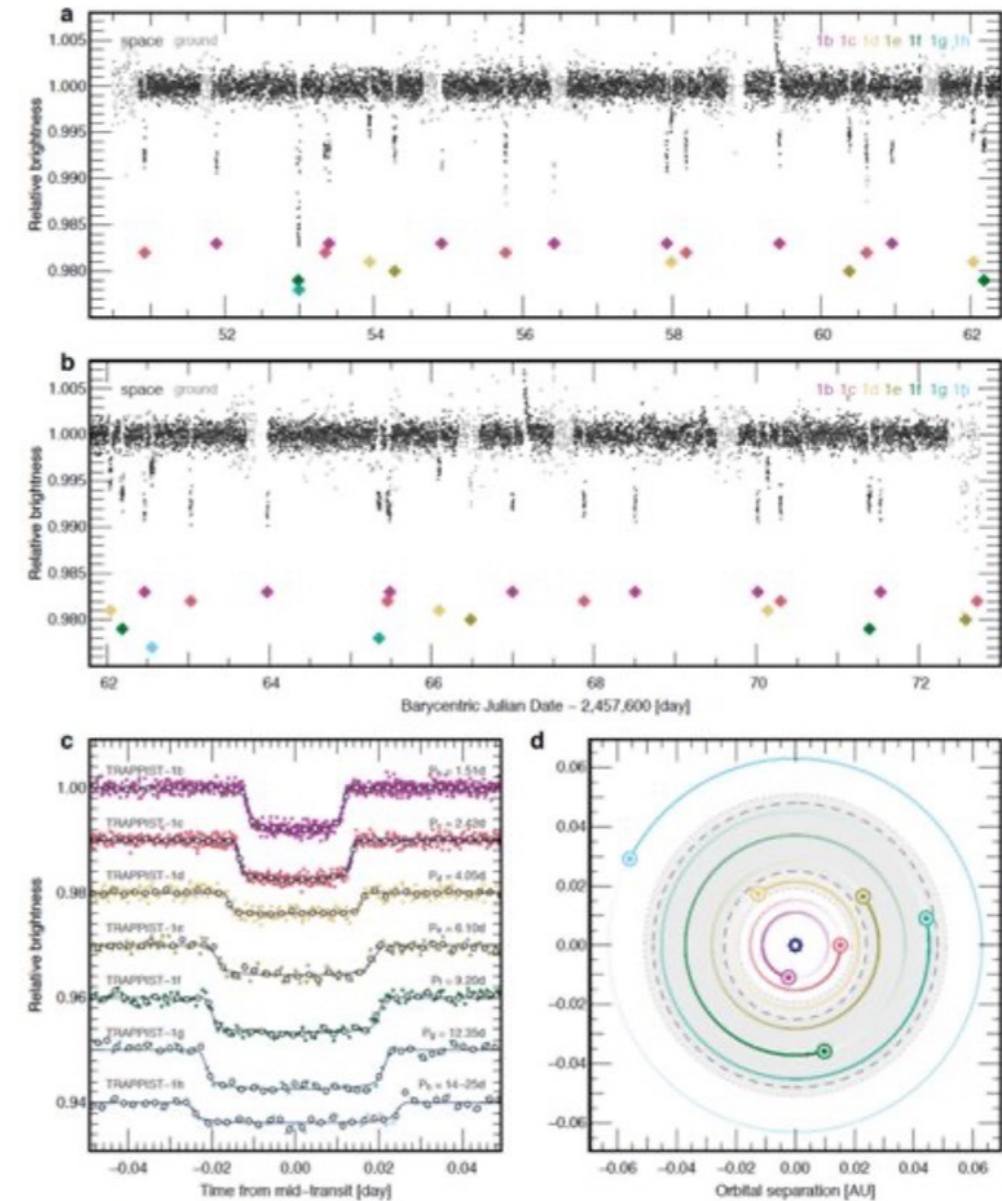
non-radiative accretion flows



Example: MRI

## II. Visualization Techniques

### ► Communications Visualization

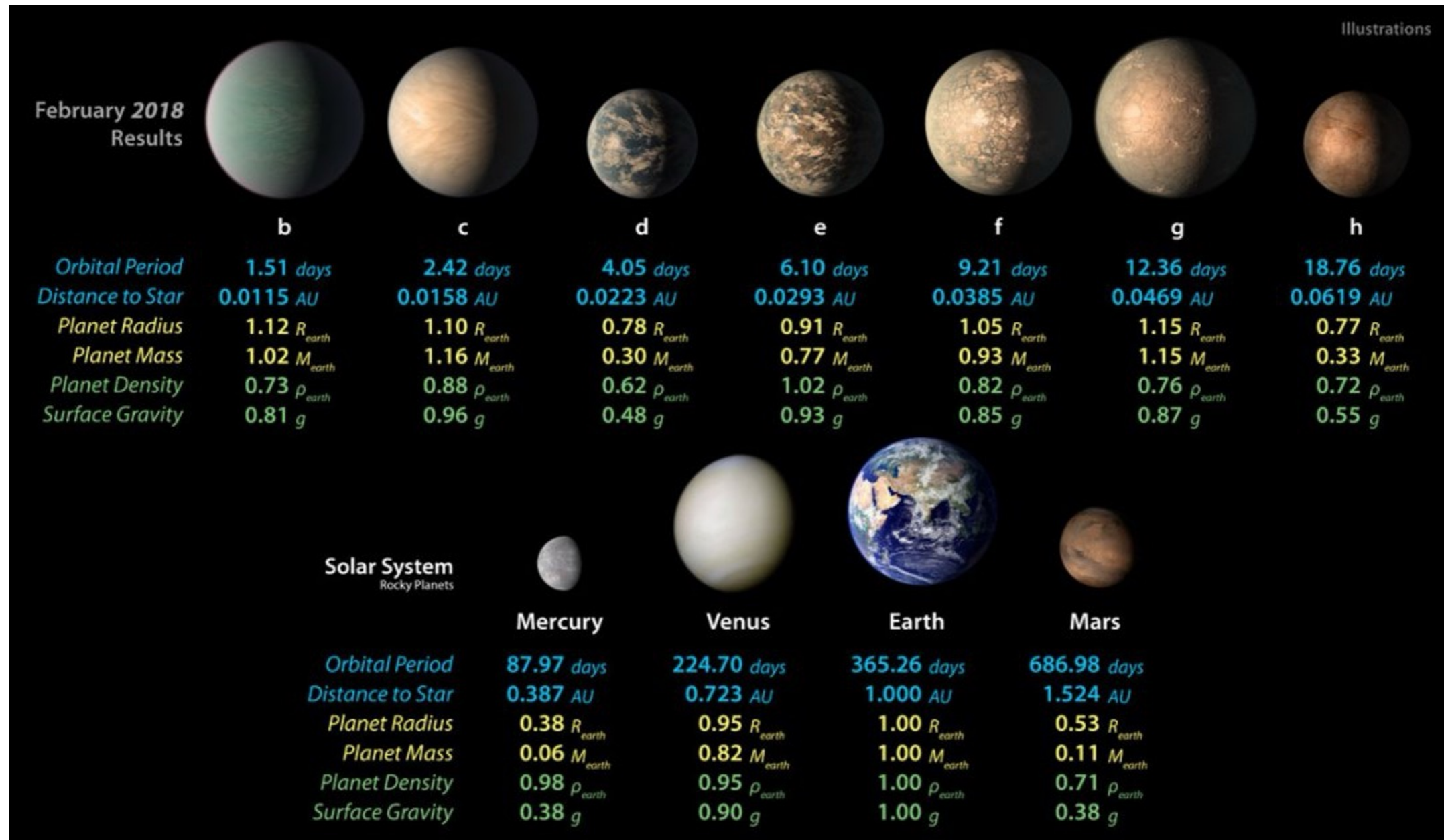


**Figure 1 | The TRAPPIST-1 system as seen by Spitzer.** *a* and *b*. Spitzer photometric measurements (dark points) resulting from the nearly-continuous observation of the star from 19 September to 10 October 2016. The ground-based measurements (binned per 5 min for



## II. Visualization Techniques

### ► Communications Visualization

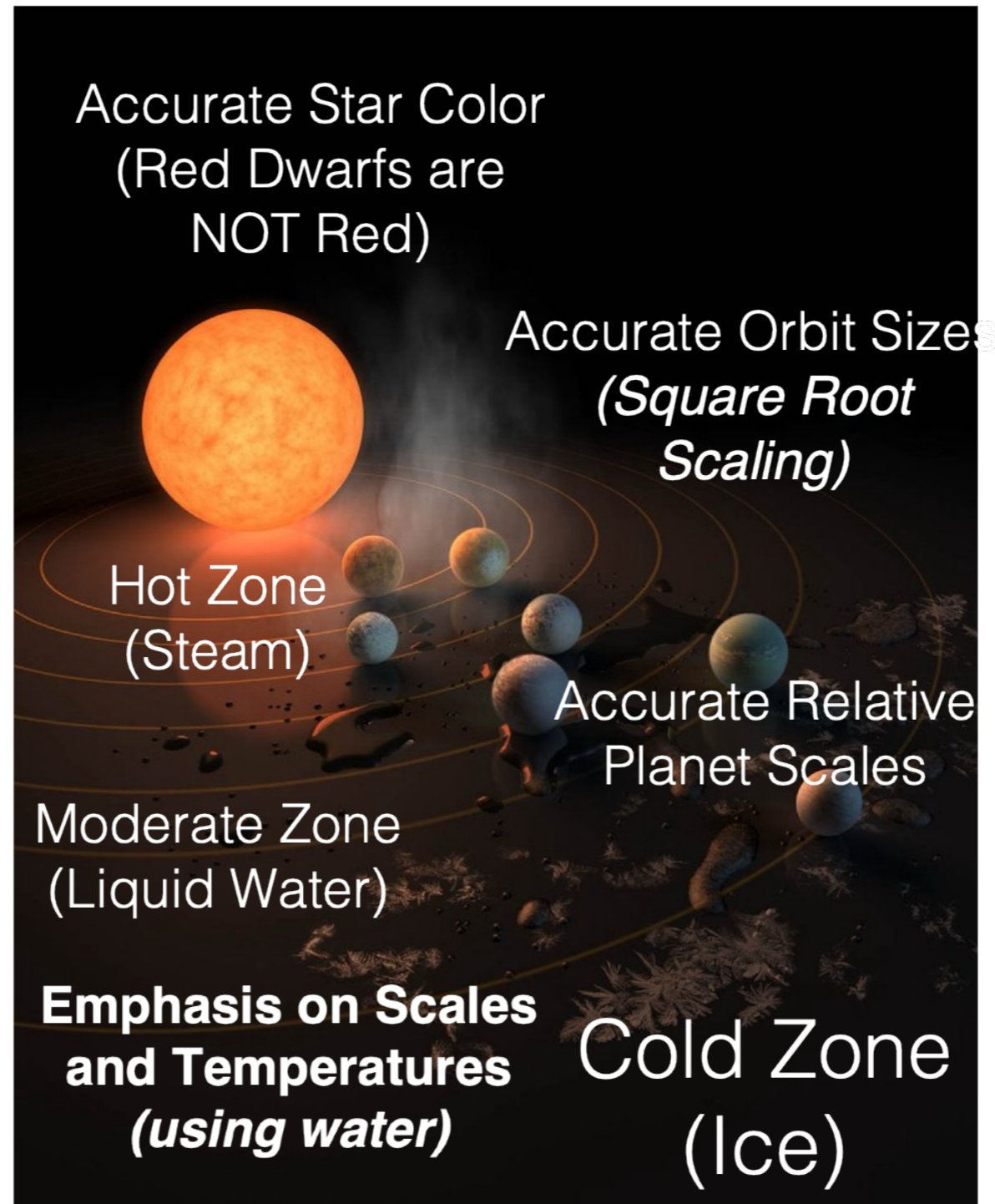




## II. Visualization Techniques

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### ➤ Communications Visualization



# III. Visualization Tools

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- Python: Matplotlib / Seaborn
- PowerBI / Tableau / Matlab
- AI: GPT4 / Claude3 / Midjourney

