

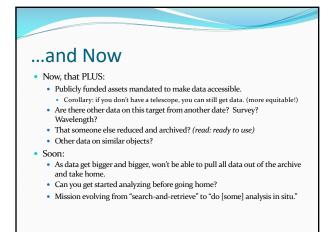
1



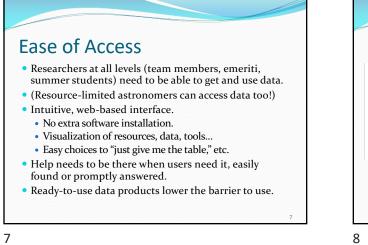
Then ...

2

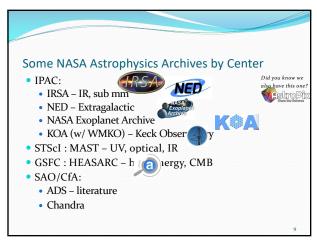
- For decades (centuries?), you just took your data home when you left the telescope.
- Corollary: if you didn't have a telescope, no data.
- Early archives are where you went to:
 - Retrieve your own (unreduced) data. (read: not "ready to use")
 Maybe you might look for other data from a particular source (at a
 - particular location) from a particular data set you knew was there.
 - Mostly, "download the whole thing and sort it out later"...



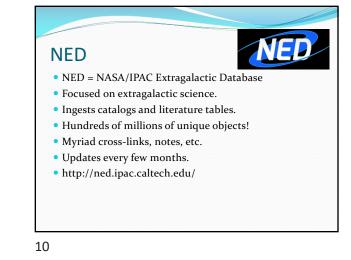


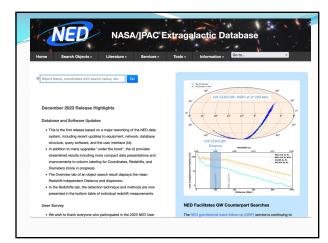


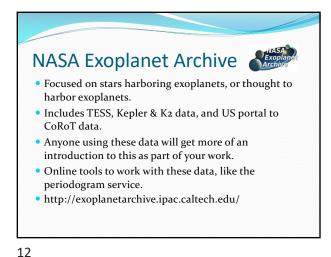
Archives double scientific output! 90% 80% 70% 60% 50% 40% 30% 20% Spitzer archival Both





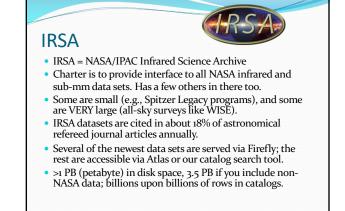




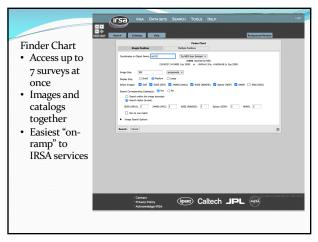


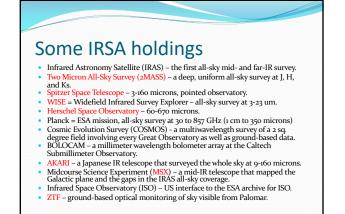




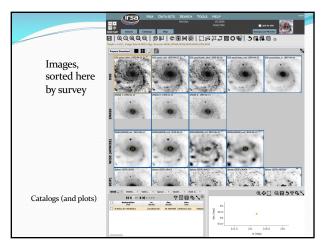


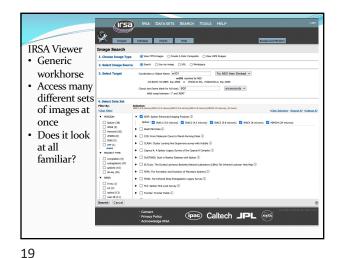


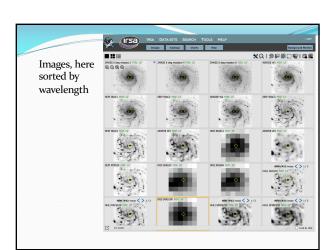


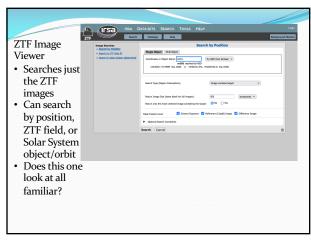


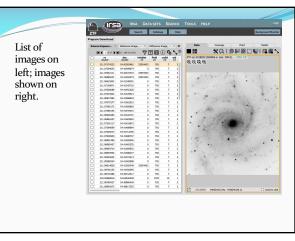


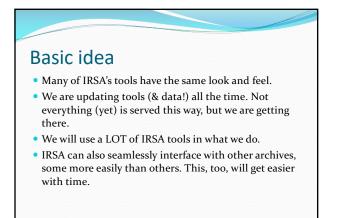


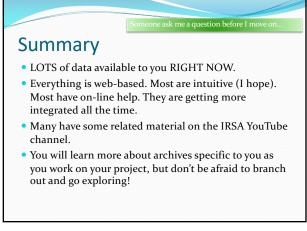












Appendix: "kinds" of data

What do astronomers mean? • Raw data • Reduced data • Calibrated data • Extracted data

- Real-time data
- New data
- Archival data

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Raw data

- Photons hit detector,
- Photons dislodge electrons,
- Electrons get counted.
- THAT is raw data: DN (data number).
- OK, so it is more complicated in the IR because we don't have CCDs, but I'm going for high-level conceptual things here.
- This isn't useful for doing astronomy... yet.

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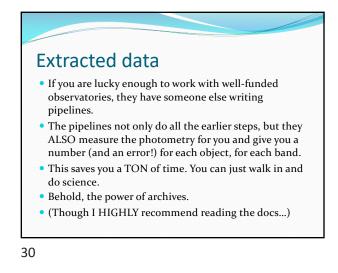
25

Reduced data

- Each pixel responds a little differently.
- There may be stuff on the optics affecting how light gets through to the detector.
- You have to calibrate each pixel separately.
- Biases, flatfields, etc. take into account detector noise and different responses of each pixel.
- (again, it's more complicated for IR detectors, but I'm going for a high-level summary here.)
- More useful for astronomy, but still not ready to use.
- ("reduced the data" often means this entire process.)

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Calibrated data Now we're talking! I know how bright that star is (Vega). This star is 5.31 times fainter than Vega. This final step takes into account all prior steps AND compares your target to the brightness of known objects. NOW you are nearly ready to do astronomy! You can do your own photometry on these images.



Real-time data

- You are sitting at the telescope.
- You read out the detector.
- You run the pipelines (or a portion of them; usually you don't get all the calibrations you need until the end of the night).
- You look at the results.
- You adjust your next observation based on what the results are.
- THAT is real-time data.

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(Also) Real-time data

- Robotic telescopes scan sky for interesting things (supernovae, asteroids/comets, GWs).
- They tell their minders, "hey, this might be interesting."
- Sometimes this requires a human in the loop, sometimes not: small (often dedicated) telescopes slew to follow-up as soon as they can (minutes to hours).
- Humans follow up in hours, days, weeks with larger assets.

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New data

- I wrote the proposal & I won the telescope time, or I built and own the telescope and instrument;
- I obtained the data, or I specified the details of the request of the robotic telescope;
- I took all the calibrations too and wrote the code to reduce all the data, or I took the output of whatever pipeline exists and did whatever additional work was required to meet whatever standards I have;
- (I did science based on the new data.)

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Archival data

- Someone else took the data (built the telescope/instrument/pipeline, ran the pipeline, delivered the data where I could get it).
- I downloaded the data and did new science with it.
- I need to acknowledge those people who did all that work, but they are not co-authors on my work.

