

## ASTR 257: Writing Observations and Reductions Sections

1. Observing Sections should list all of the details somebody needs to interpret or reproduce your observations, and nothing more.
2. Observing Sections should contain the following information:
  - a. Date of Observation
    - i. Always use UT dates
    - ii. Include the time (in UT) if it is relevant, for example, if the source is changing or moving
  - b. Observatory/Telescope/Instrument
    - i. Include the name and a brief description of the instrument
    - ii. If there is a paper describing the instrument in ADS, include a citation
    - iii. Try to avoid links to instrument webpages, which may become out-of-date
  - c. Instrument Configuration
    - i. What filter/grating/slit/decker/dichroic/etc. were used.
    - ii. If the name of the optic is common (e.g. V-band filter), then the name is sufficient.
    - iii. If the name of the optic is unique to the instrument (e.g. D5700 dichroic), describe it.
    - iv. For items with movable positions (e.g. gratings), list the position/tilt, or a number like central wavelength that can be converted into a position/tilt.
    - v. Again, try to avoid links to instrument webpages.
    - vi. Describe the field-of-view and plate-scale of the instrument
    - vii. Describe the detector configuration, e.g. windowing and binning
  - d. Weather Conditions
    - i. Describe the transparency
      1. No clouds anywhere is “photometric”
      2. Some clouds, not necessarily over the observatory is “spectroscopic”
      3. You can also describe clouds as cirrus, patchy, intermittent, etc.
    - ii. Quantify the seeing in arcseconds
      1. If you are on an infrared instrument, keep in mind that seeing is a function of wavelength, so specify wavelength when you specify seeing. It is common to list seeing at V-band, even when observing in the infrared.
    - iii. Give the moon phase if observing in the optical

- e. Calibrations
  - i. List what calibrations you took (biases, darks, dome-flats, sky-flats, arcs)
  - ii. Give integration times and the number of exposures for each cal
- f. Describe Observations
  - i. List the name of the object and RA/Dec
  - ii. Describe any abnormal setups
    - 1. focusing and pointing don't count as abnormal
    - 2. Anything you had to ask the operator (rotate the instrument, offset, etc.) should be described
  - iii. List the exposure time and number of exposures.
  - iv. If dealing with a large number of frames, list the total integration time.
- 3. If you are observing multiple objects, or are using multiple instrument configurations, include a table.
- 4. In some cases, you may want to describe why you chose to execute the observations the way you did. Why did you choose a specific filter or integration time?
- 5. The writing in an observing section doesn't need to be elegant. Typically, sentences will either use active first person ("We used the V-band filter") or passive voice ("The filter was set to V-band"). Personally, I prefer the active first person, but I mix it up a little bit so that not every sentence starts the same way. This is a stylistic choice, so read some other people's observing sections to see what you prefer.
- 6. Reduction Sections should list all of the details somebody needs to interpret or reproduce your data reductions, and nothing more.
- 7. The Reductions section can be part of the Observing section, or it can be its own section. To some extent, this is a stylistic choice, but remember that your goal is to be as clear and concise as possible. Usually, when I have an abnormal or complicated data reduction, I write a separate Reductions section. If what I'm doing is completely standard and can be written in a paragraph or two, I combine Observations and Reductions.
- 8. The Reductions section should include the following:
  - a. A statement that you used (or didn't use) the bias/flats/darks to process the raw frames
  - b. A description of how you calibrated any other quantities (e.g. wavelength solution)
  - c. A description of how you removed detector artifacts or background noise if you did so.
  - d. A description of how you combined multiple frames to make a final image/spectrum.

9. The conclusion of your reductions section would normally include an image if you are doing imaging, or a spectrum if you are doing spectroscopy.
  - a. Every astronomical image should have labeled, on the figure, a compass (usually, North is up and East is left), and a scale-bar.
  - b. Every figure should have a figure caption. However, don't count on your reader to read the figure caption. Include legends where necessary, and label things that you want your reader to see directly on the image (e.g. "Pluto" or "H-alpha")
  - c. Remember that you have stared at this figure longer than your reader. Think about whether a reader who is quickly skimming this paper will see what you see. Is the "blip" you're looking for obvious, or does it need to be labeled? Did an object obviously move, or do you need to label a fixed reference star to make the motion more clear?
10. If there is a substantial amount of work after you have displayed your final image/spectrum, save that for the analysis section. If there is only ~1 paragraph worth of work analyzing the image (e.g. how many arcseconds did Pluto move) describe your brief analysis in the Reductions section.

## ASTR 257: Writing the Technical Sections of Observing Proposals

1. Technical Sections should list all of the details somebody needs to:
  - a. determine if your observing plan is likely to achieve your science goals
  - b. determine if your observing plan is requesting an appropriate amount of time
    - i. generally, an appropriate amount of time is the minimum amount of time required to achieve your science goals
    - ii. almost no TAC will allow you to budget for weather losses
    - iii. exactly how flexible the TAC is with the previous two points varies from TAC to TAC--you can glean this, imperfectly, by talking to former TAC members
  - c. for some telescopes (e.g. Hubble), you need to prove that you can't accomplish the goal with less "valuable" facilities
2. Technical Sections should start by describing the science goal in 1-2 sentences
  - a. e.g. in order to distinguish between model Y and model Z, we require a S/N of X for every pixel between A and B nm.
  - b. this should have already been justified in the science justification, and you are reiterating the requirement here
3. Technical Sections should describe every aspect of the instrument setup and why the particular configuration was selected
  - a. Every choice of optic should be described and justified
  - b. Every choice of detector readout configuration should be described and justified
  - c. The amount of time required should be described and justified
4. If there are multiple sources, or multiple configurations, summarize them in a table.
  - a. Include the source name and its RA/Dec
  - b. Include important aspects of your planned instrument configuration, especially if you are planning to use multiple configurations.
  - c. Include the brightness of the source at the wavelength(s) you are observing
  - d. Include your estimate of the time required on each source.
5. If the telescope/instrument you're using has an Exposure Time Calculator, use it, and include a screenshot or hyperlink of the output.
6. If you are doing an observation that is similar to an observation that has previously been executed successfully, scale your integration time request from the previous observation (e.g. the source we're doing this year is 2x fainter than the one we did last year so we are asking for 4x as much time).
  - a. This is a really good way to convince skeptical reviewers.
  - b. The observations you scale from don't have to be your own--use the observatory archive to find similar observations as the one you are planning