Announcements

• “Astro 100” questions due next Tuesday (March 30)
• New assignment today: popular article for a broader audience

Popular article for a broader audience

• Context: assume that you are writing the article for *The New York Times, Sky & Telescope*, or some similar publication written primarily for a lay readership
• Topic: use the topic of your research paper
• Length: 2-3 pages
• First draft due date: April 1
Next major project:
Write a paper, in the style appropriate for submission to *The Astrophysical Journal*, based on analysis of data from the Hubble Space Telescope

This paper should include:
- An abstract
- Appropriate sections (e.g., introduction, analysis, conclusions...)
- Figures
- Tabular data
- References

**Absorption Spectroscopy**

![Absorption Spectroscopy Diagram]

Redshift →

Normalized Flux

Wavelength →
So, there’s a blob out in space. What do we want to learn about it?

- Mass
- Temperature and density (and therefore pressure)
- Composition

How can we measure the properties of such a cloud?
• The cloud has some finite temperature
• Cloud particles will move at various velocities with a Maxwellian velocity distribution

In principle, the shape of the absorption line can be used to determine the temperature of the gas.

But, what if there are macroscopic motions within the cloud?

• If the line broadening is only due to (microscopic) thermal motions, then

\[ T = A(4.66 \text{ FWHM}) \]

where \( A \) is the atomic mass number (e.g., \( A(\text{H}) = 1 \), \( A(\text{O}) = 16 \)) and FWHM = full width half maximum

• Because of these possible sources of bulk motion, the line shape only provides an upper limit on the gas temperature.
But, what if there are macroscopic motions within the cloud? If the line broadening is only due to (microscopic) thermal motions, then because of these possible sources of bulk motion, the line shape only provides an upper limit on the gas temperature.

\[ T = A(4.66 \text{ FWHM}) \]

where \( A \) is the atomic mass number (e.g., \( A(\text{H}) = 1, A(\text{O}) = 16 \)) and FWHM = full width half maximum

Oh, and there's another thing…

Oh, and there’s another thing…


Theoretical model absorption profile

Model convolved with “instrument spread function”

Actual data
Consider the Far-Ultraviolet Si II transitions

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>log (f λ)</th>
<th>Strength Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si II 1190.416 Å</td>
<td>0.293</td>
<td>3</td>
</tr>
<tr>
<td>Si II 1193.290 Å</td>
<td>0.585</td>
<td>2</td>
</tr>
<tr>
<td>Si II 1260.422 Å</td>
<td>1.180</td>
<td>1</td>
</tr>
<tr>
<td>Si II 1304.370 Å</td>
<td>0.0917</td>
<td>5</td>
</tr>
<tr>
<td>Si II 1526.707 Å</td>
<td>0.132</td>
<td>4</td>
</tr>
</tbody>
</table>

![Graph showing Si II transitions](image)

*Si II 1260.4*
First goals:

- Plot up a batch of absorption lines (like the plot at left)
- Determine which lines have been detected
- Determine how many interstellar clouds (components) are detected toward the star
- Figure out a way to divide out the continuum shape