

Ionized winds driven away from black holes

(SPEX/PION exercise)

(Appendix 1)

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Explore the influence of different parameters

This exploration is under the condition that we set one pion and we do not set the order of pion, which means that we are in the first case. u , h_{den} , and d_{v} do not change the model spectra.

`fcov`

We draw the model figure with different values of f_{cov} , Fig. 1 is in the range $0 - 30 \text{ \AA}$, and the Fig. 2 is in the range $15 - 18 \text{ \AA}$. We can see that:

1. The larger f_{cov} , the stronger absorption, no matter for continuum or lines.
2. The absorption lines become more when f_{cov} becomes larger.
3. The continuum decreases faster when f_{cov} becomes larger.

`v`

From the model figure with different v (see Fig. 3 and Fig. 4), we can see that:

1. This parameter could not lead to the red-/blue-shift of lines. It seems the center of a line does not change.
2. As v is larger, the absorption is stronger. At first, it is a sharp line, then it becomes a line with deeper depth, and finally, it changes into a broader line.
3. For the region that does not have absorption lines, the influence is smaller than that has absorption lines. $\lambda < 5 \text{ \AA}$, the spectrum almost does not change.

`rms`

From the model figure with different r_{rms} (see Fig. 5 and Fig. 6), we can see that:

1. This parameter could not change the center of a line as v .
2. When $r_{\text{rms}} \leq 10$, the spectra do not change. When $r_{\text{rms}} > 10$, as r_{rms} become larger, the absorption lines first become shallower but broader, and then we can see two near lines mix into one line, and finally, the lines become broader.
3. When $r_{\text{rms}} \geq 10^4$, that is after the adjacent lines mix, we can see the flux of the continuum in the range $5 - 30 \text{ \AA}$ become smaller, which means the absorptions stronger.

`zv`

From the model figure with different z_{v} (see Fig. 7 and Fig. 8), we can see that:

1. When z_{v} becomes larger, the whole spectra shift to the right, that is, a redshift occurs.

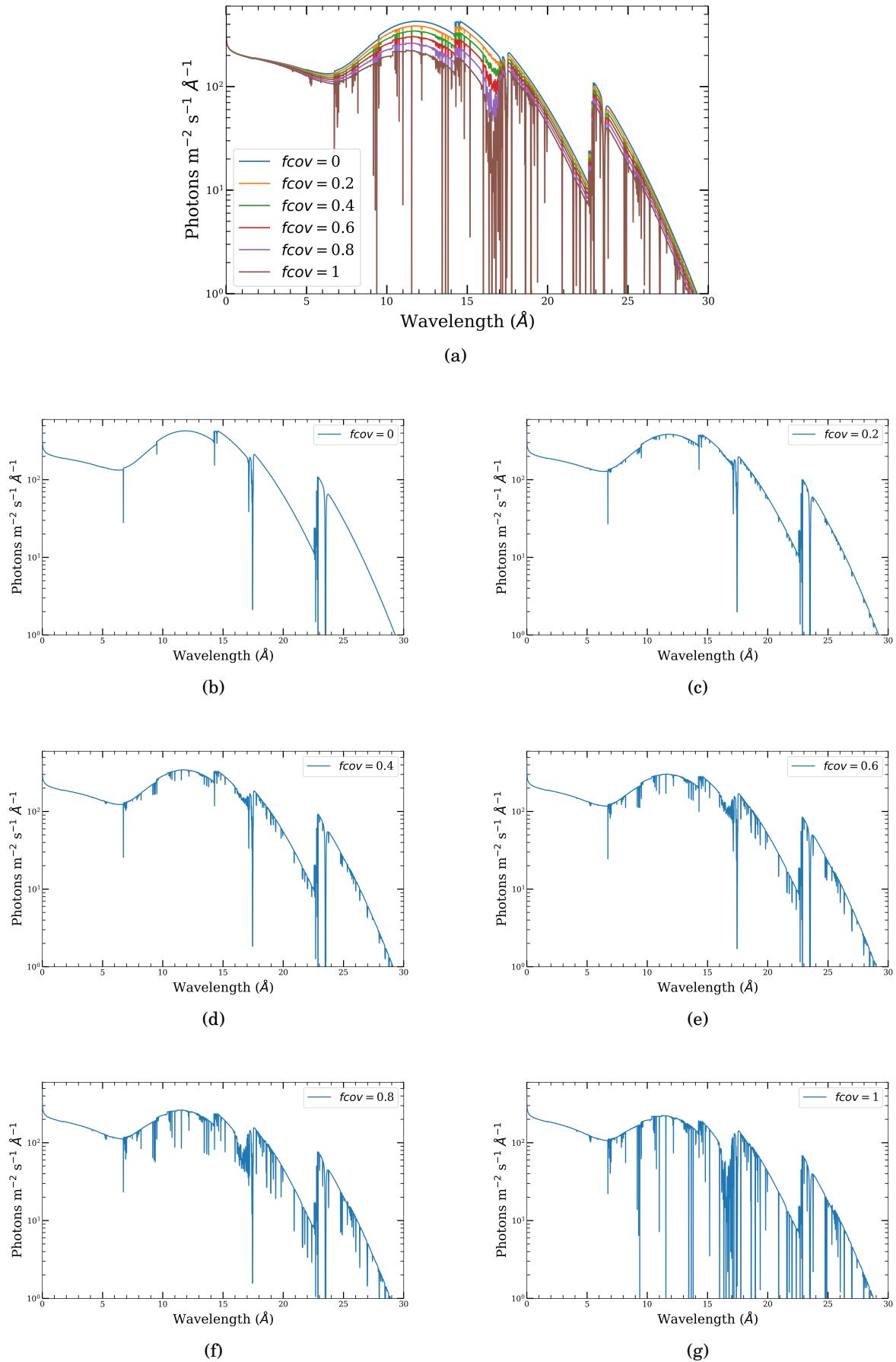


Figure 1: The Wavelength-Flux figure. The x-axis range is $0 - 30 \text{ \AA}$.

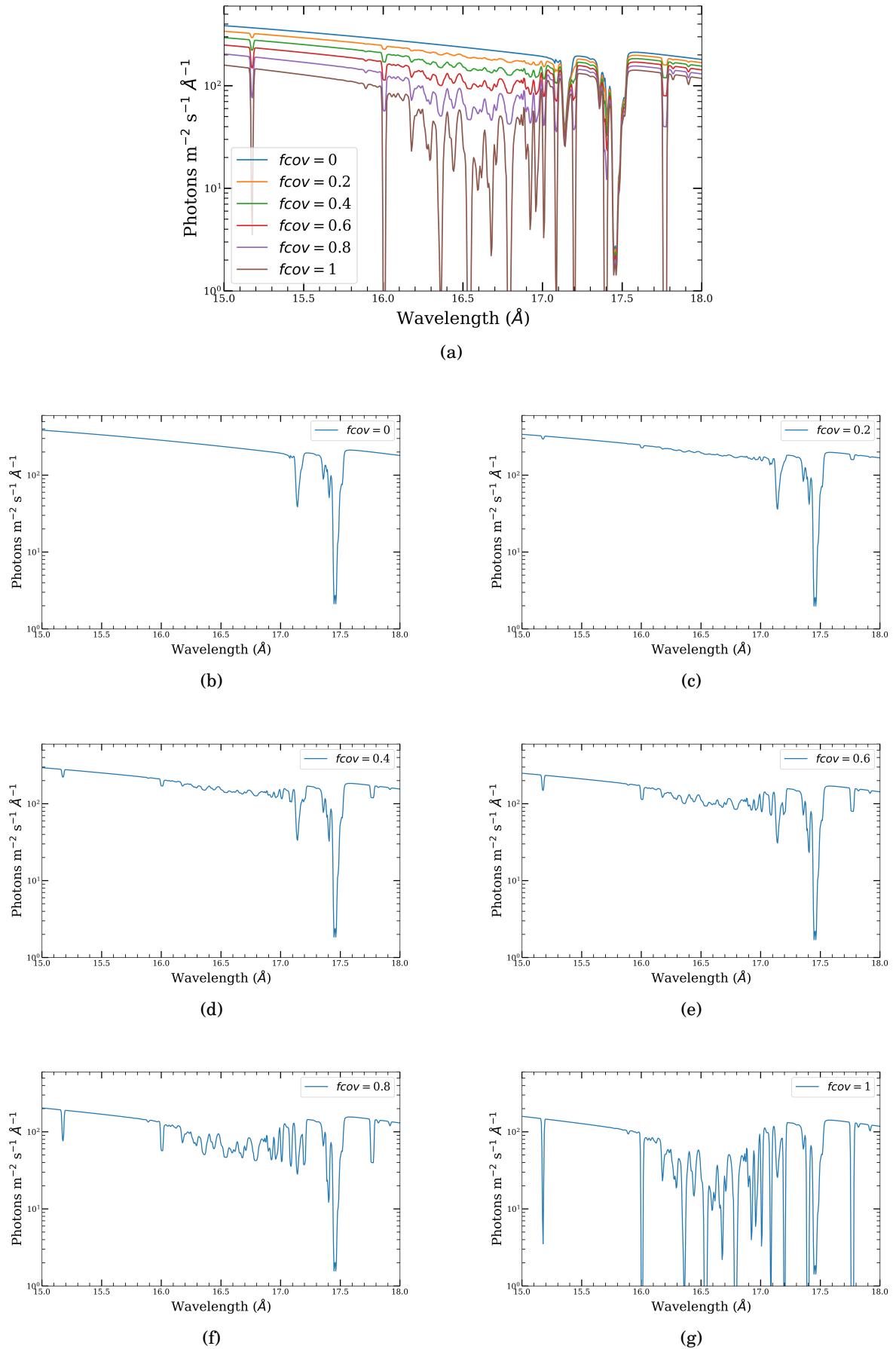
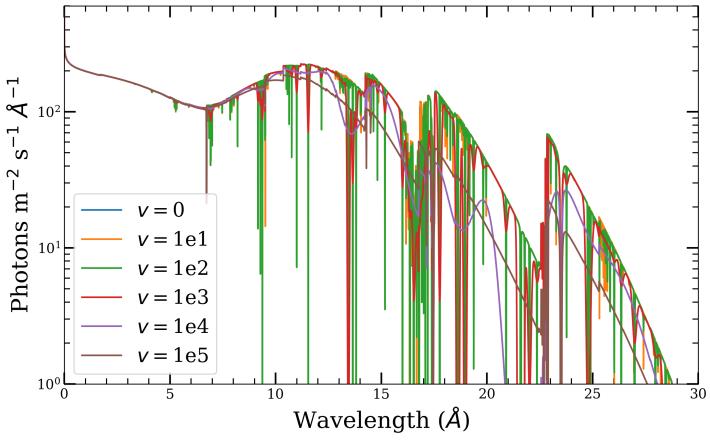
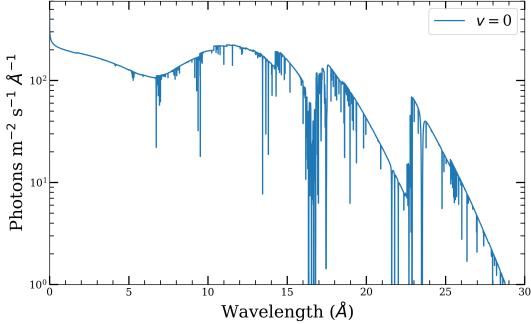


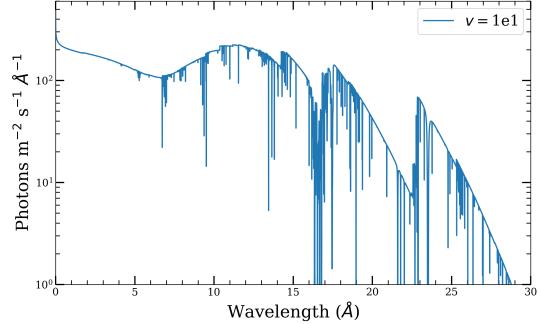
Figure 2: The Wavelength-Flux figure. The x-axis range is $15 - 18 \text{ \AA}$.



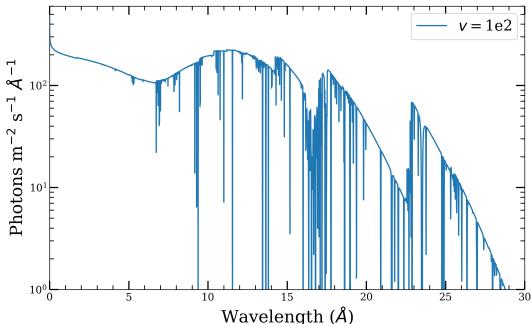
(a)



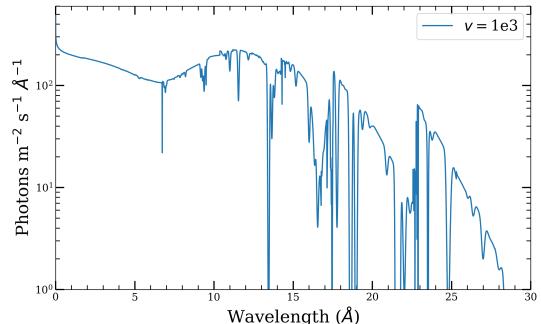
(b)



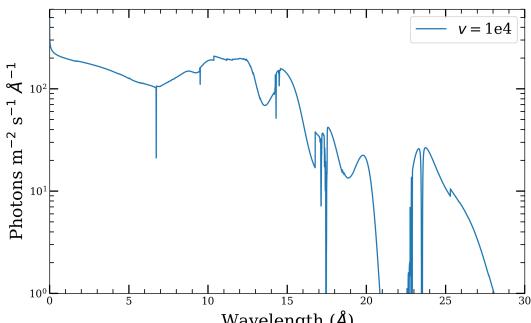
(c)



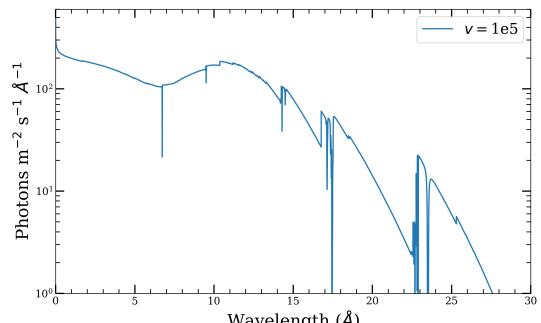
(d)



(e)



(f)



(g)

Figure 3: The Wavelength-Flux figure. The x-axis range is 0 – 30 Å.

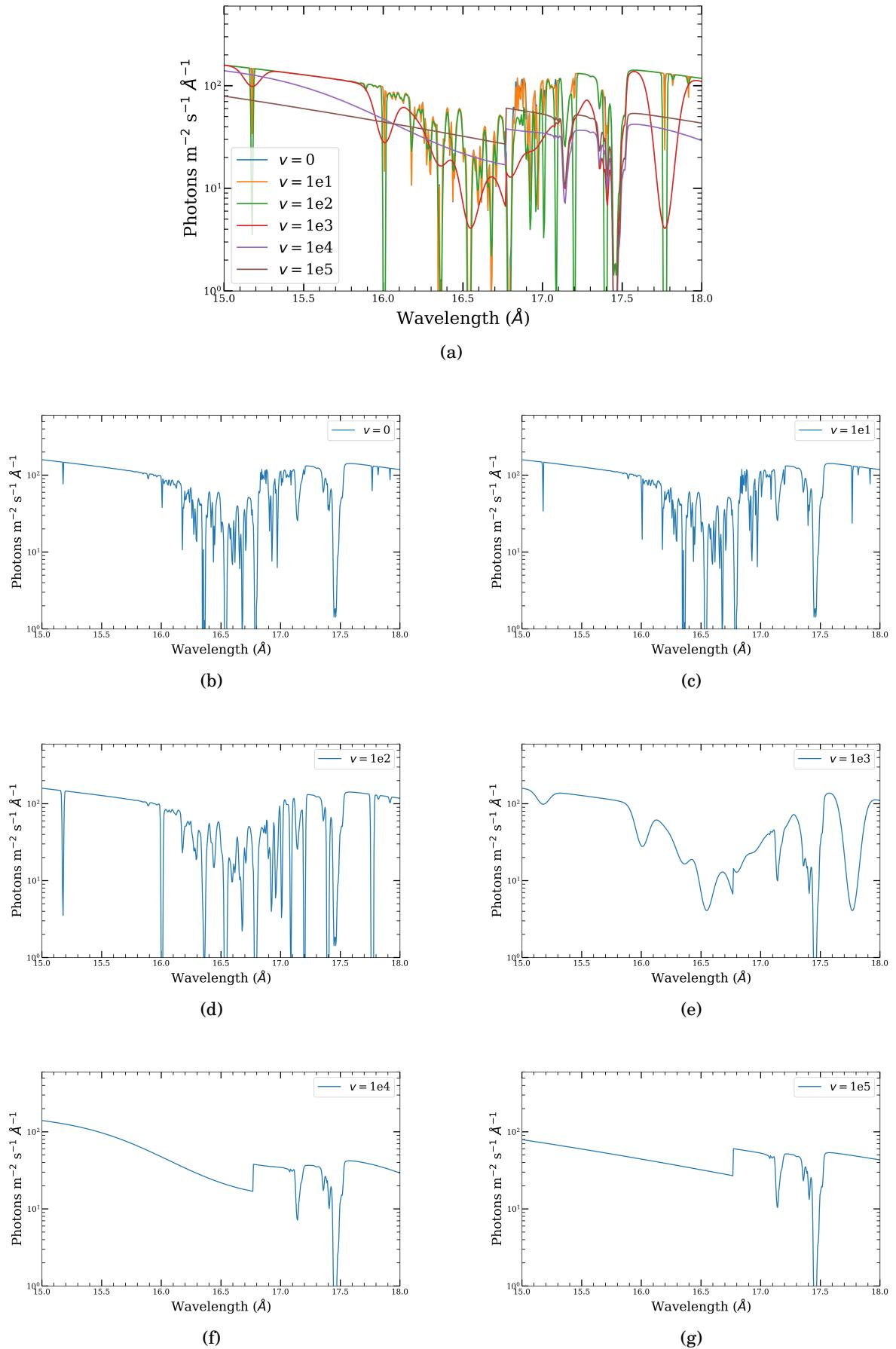


Figure 4: The Wavelength-Flux figure. The x-axis range is $15 - 18 \text{ \AA}$.

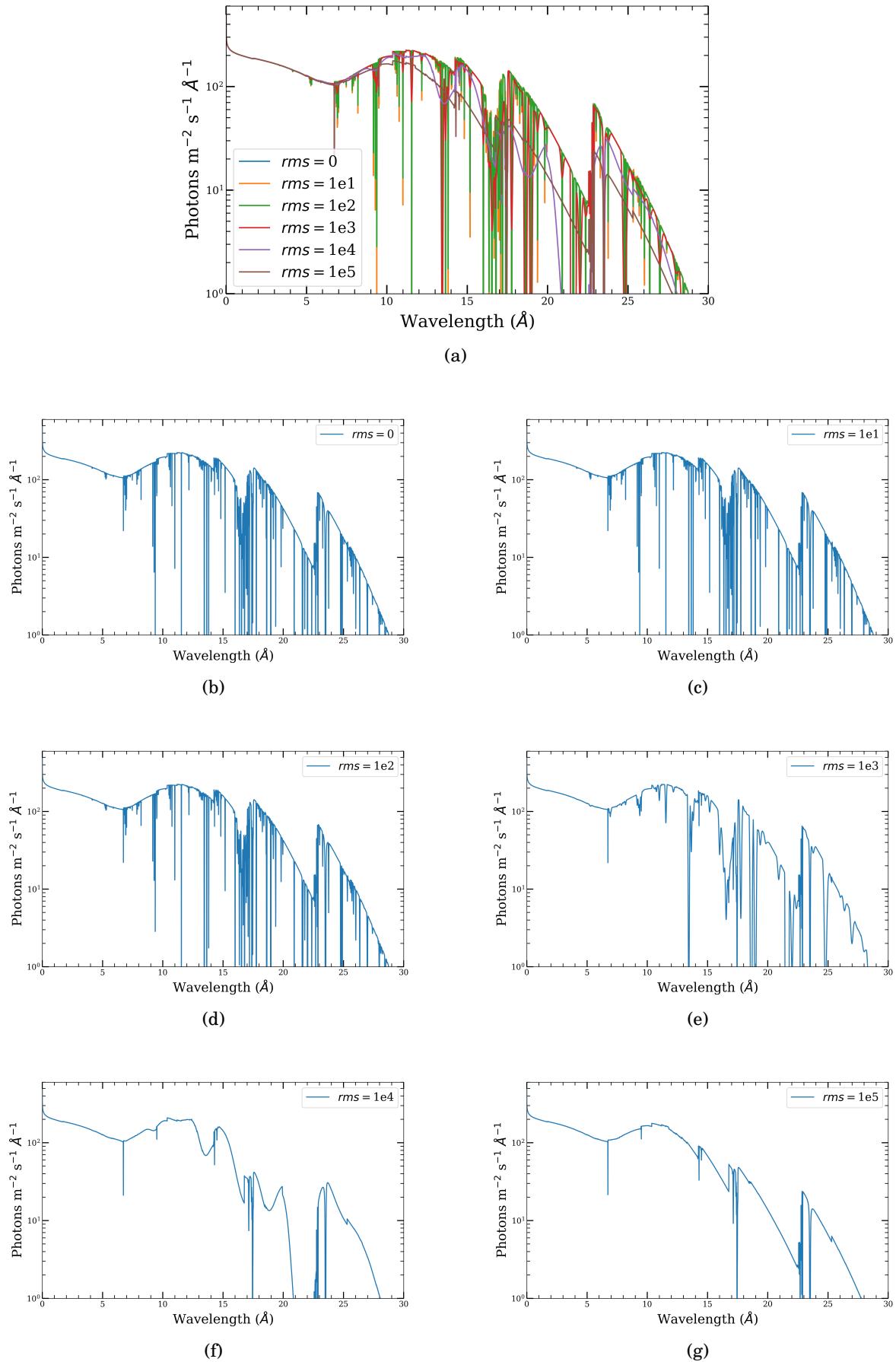


Figure 5: The Wavelength-Flux figure. The x-axis range is $0 - 30 \text{ \AA}$.

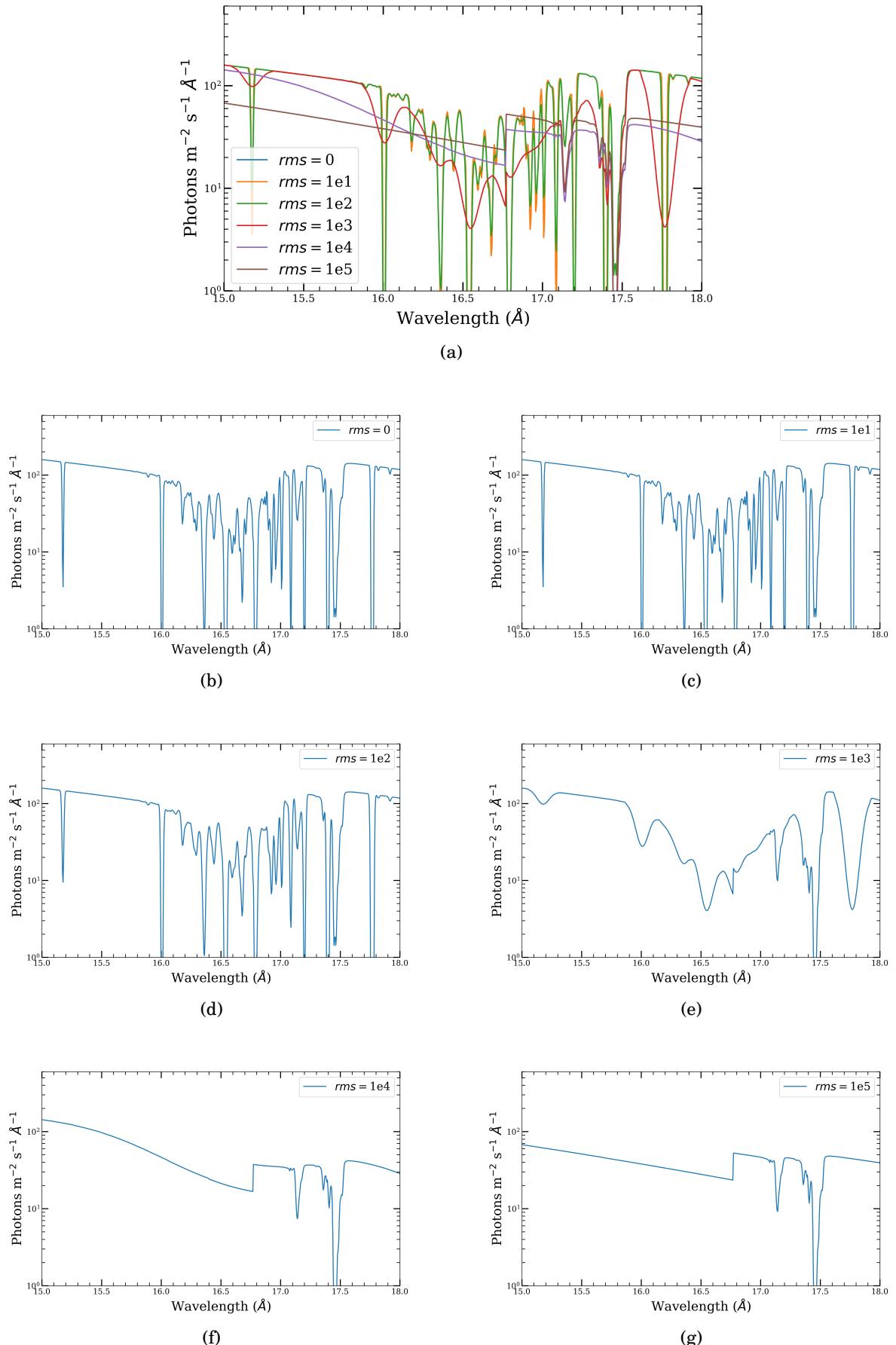


Figure 6: The Wavelength-Flux figure. The x-axis range is $15 - 18 \text{ \AA}$.

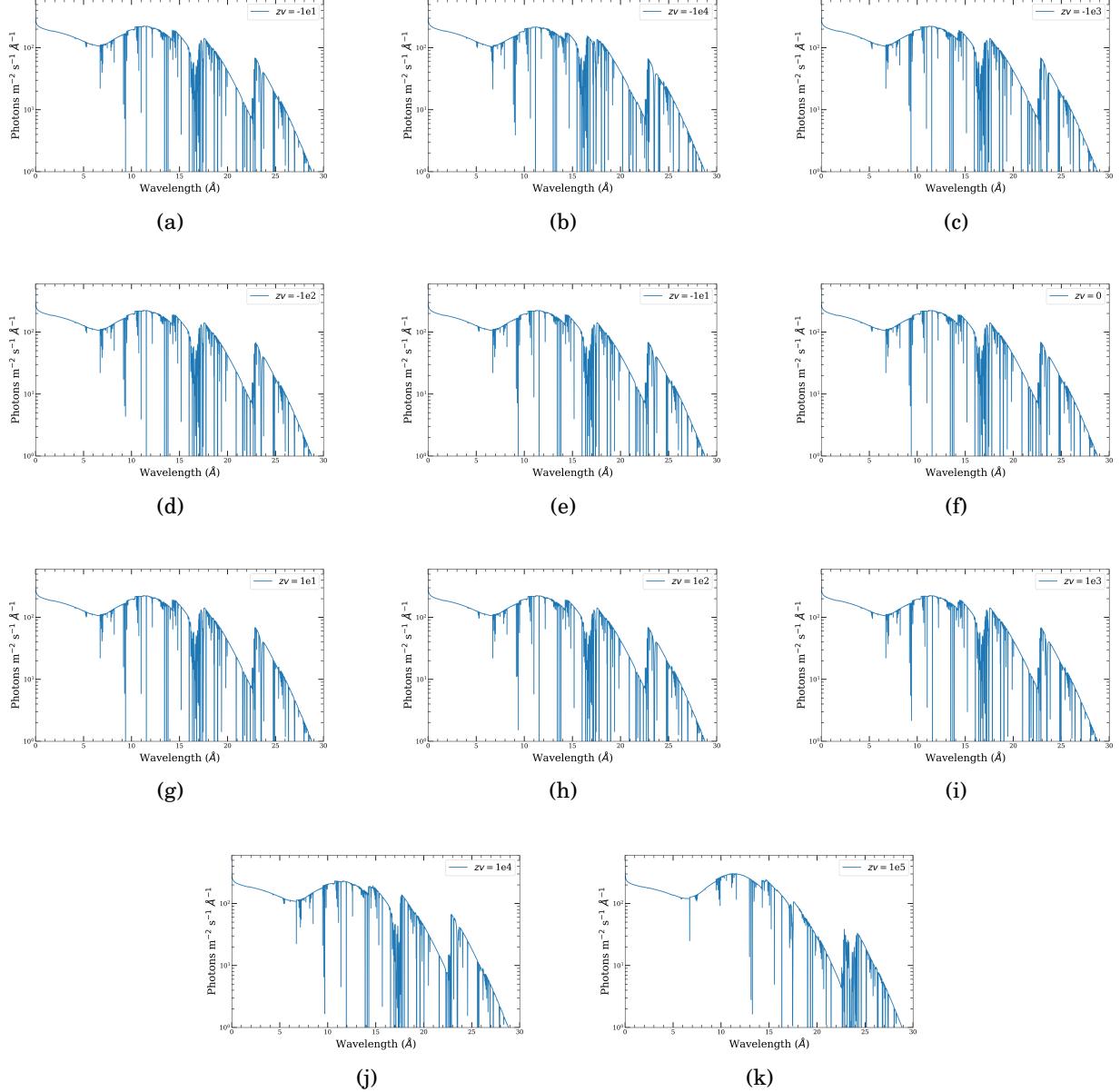


Figure 7: The Wavelength-Flux figure. The x-axis range is $0 - 30 \text{ \AA}^\circ$.

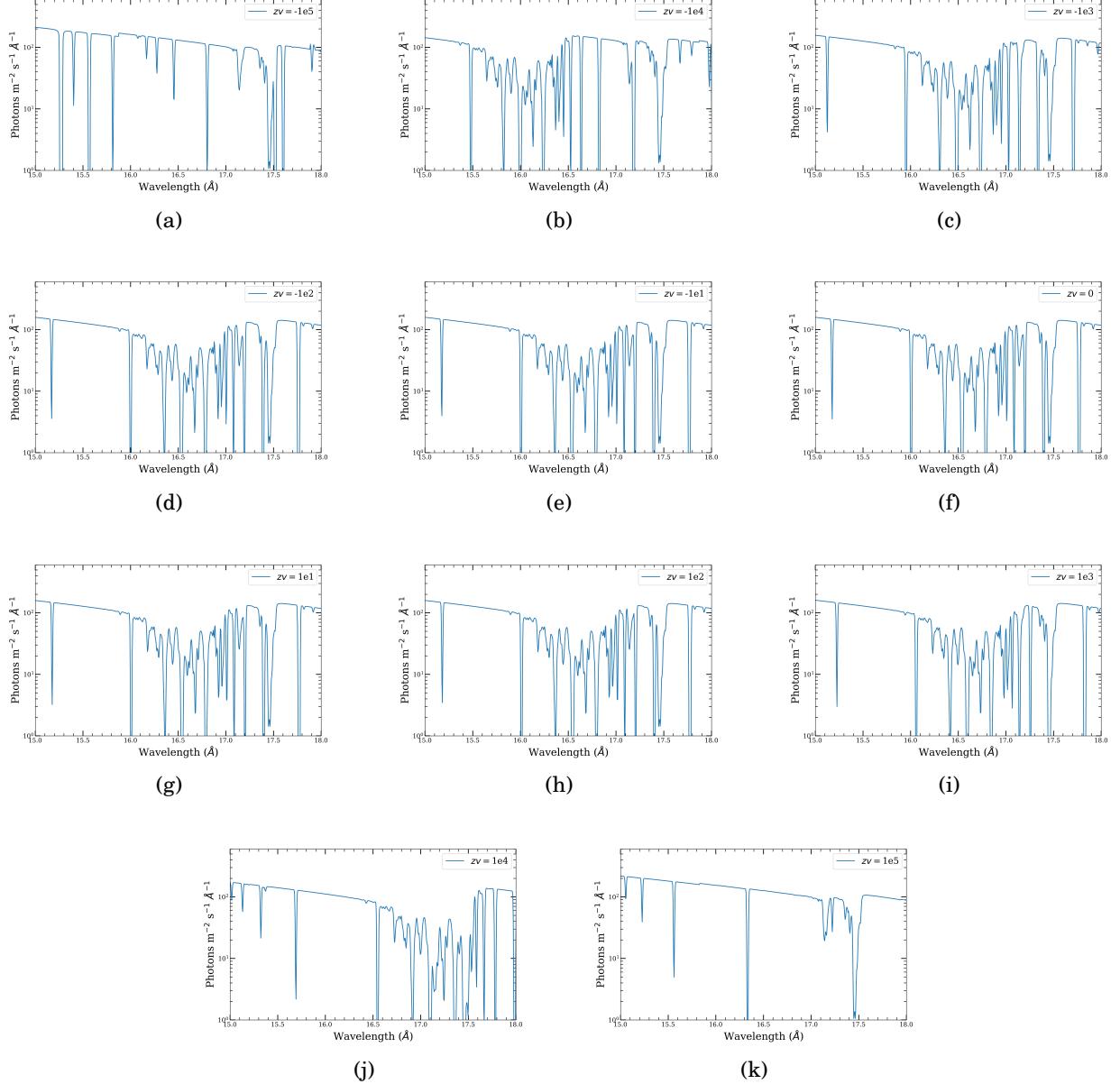


Figure 8: The Wavelength-Flux figure. The x-axis range is $15 - 18 \text{ \AA}$.