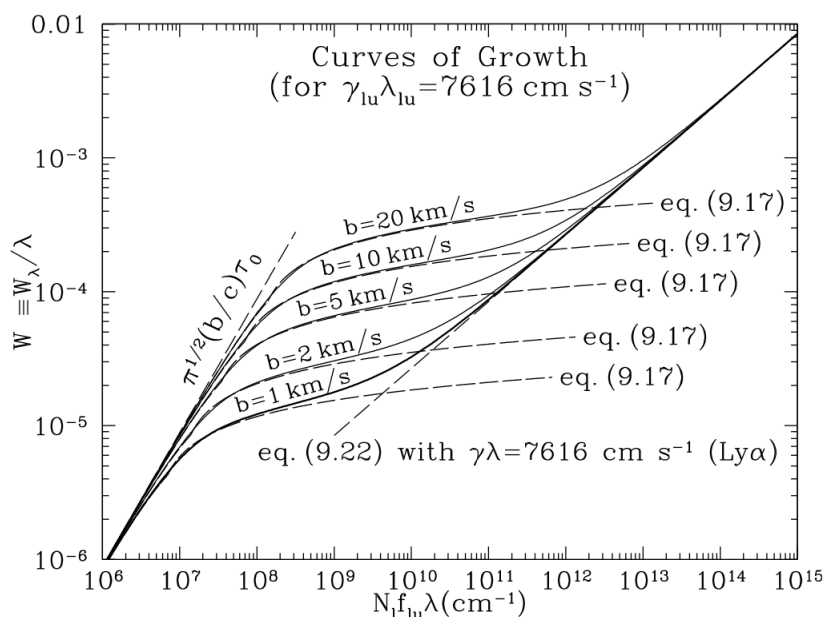


5. Naloga: Spektralne črte

1. Voigtov profil spektralne črte je konvolucija Gaussovega in Lorentzovega profila. Numerično izračunaj obliko Voigtovega profila in ga primerjaj z Gaussovimi in Lorentzovimi.
2. Izračunaj kakšen je profil saturirane absorpcijske črte in nariši nekaj primerov (od nesaaturirane do močno staurirane črte).
3. Krivulja rasti je zveza med izmerjeno ekvivalenčno širino črte in stolpično gostoto nekega absorberja. Ta zveza ni nujno linearna, na kar vpliva profil črte, ko se ta bliža saturaciji. Izračunaj in nariši obliko krivulje rasti. Primer za neko črto je narisano spodaj. Za prikaz grafa lahko uporabiš druge enote.



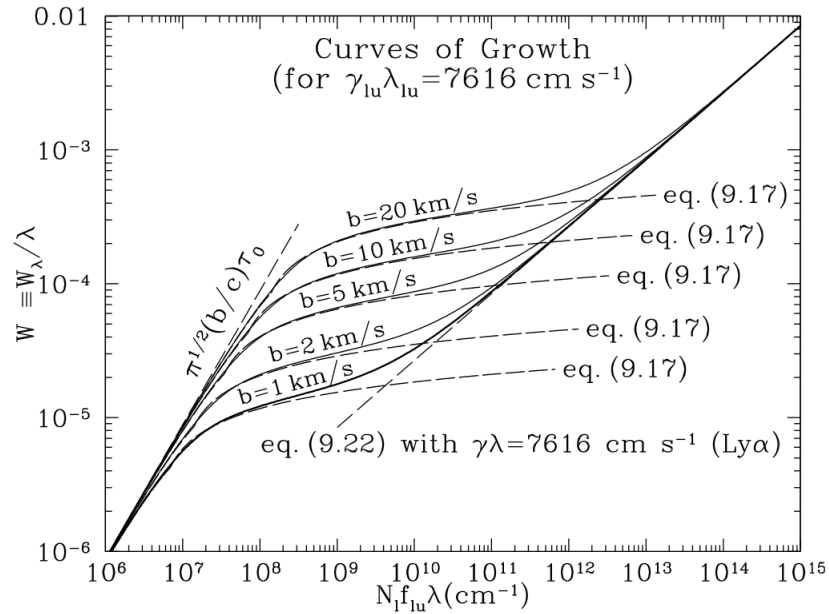
4. Obdelaj oba spektra iz vaj (za HD161056 in HD194839). Izračunaj stolpično gostoto natrija med nami in obema zvezdama. Za to lahko uporabiš Na D dublet. Izmeri ekvivalenčno širino dubleta in predpostavi, da je oscilatorska moč 0.641 za črto pri 5891.5 Å in 0.320 za črto pri 5897.5 Å, naravna širina obeh črt je 5 m s⁻¹, tipična termična razširitev pa je med 2 in 20 km s⁻¹.

Razmisli kako bi v krivulji rasti upošteval resolucijo spektroskopa.

Kaj so možni razlogi, da gostota natrija izmerjena iz obeh črt ni enaka?

5. Homework: Spectral lines

1. Voigt line profile is a convolution of Gaussian and Lorentzian profiles. Calculate numerically the shape of the Voigt profile and compare it to the Gaussian and the Lorentzian profile.
2. Calculate the line profile of a saturated spectral line and plot some examples (from a non-saturated to an extremely saturated line).
3. Curve-of-growth gives the relation between the equivalent width of a spectral line and the column density of the absorber. This relation is not necessary linear, which is the consequence of the line profile when it approaches saturation. Calculate and plot the curve-of-growth. An example is plotted below, but you can use different units.



4. Reduce both high resolution spectra (HD161056 and HD194839). Calculate the column density of Sodium between us and both stars. Use the Sodium D doublet for this. Measure the equivalent widths of the lines and assume the oscillator strengths are 0.641 for the line at 5891.5 Å and 0.320 for the line at 5897.5 Å. Natural width of both lines is 5 m s⁻¹, typical thermal broadening is between 2 and 20 km s⁻¹.

Think how would you incorporate the resolution of the spectra into the curve-of-growth. What are possible reasons that the column density measured from both lines is different?