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Multidimensional and inhomogeneity effects on scattering polarization in simple prominence models

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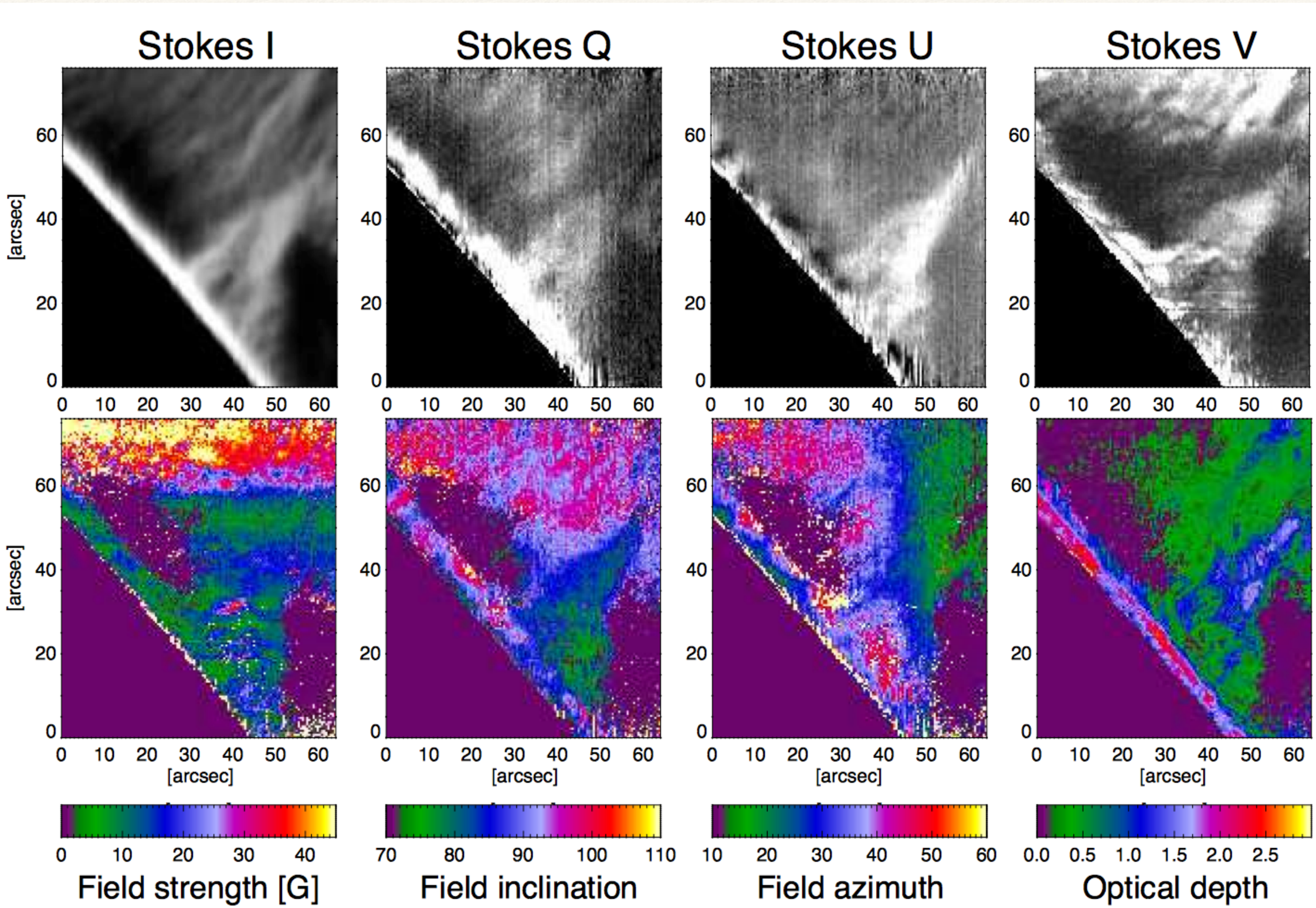
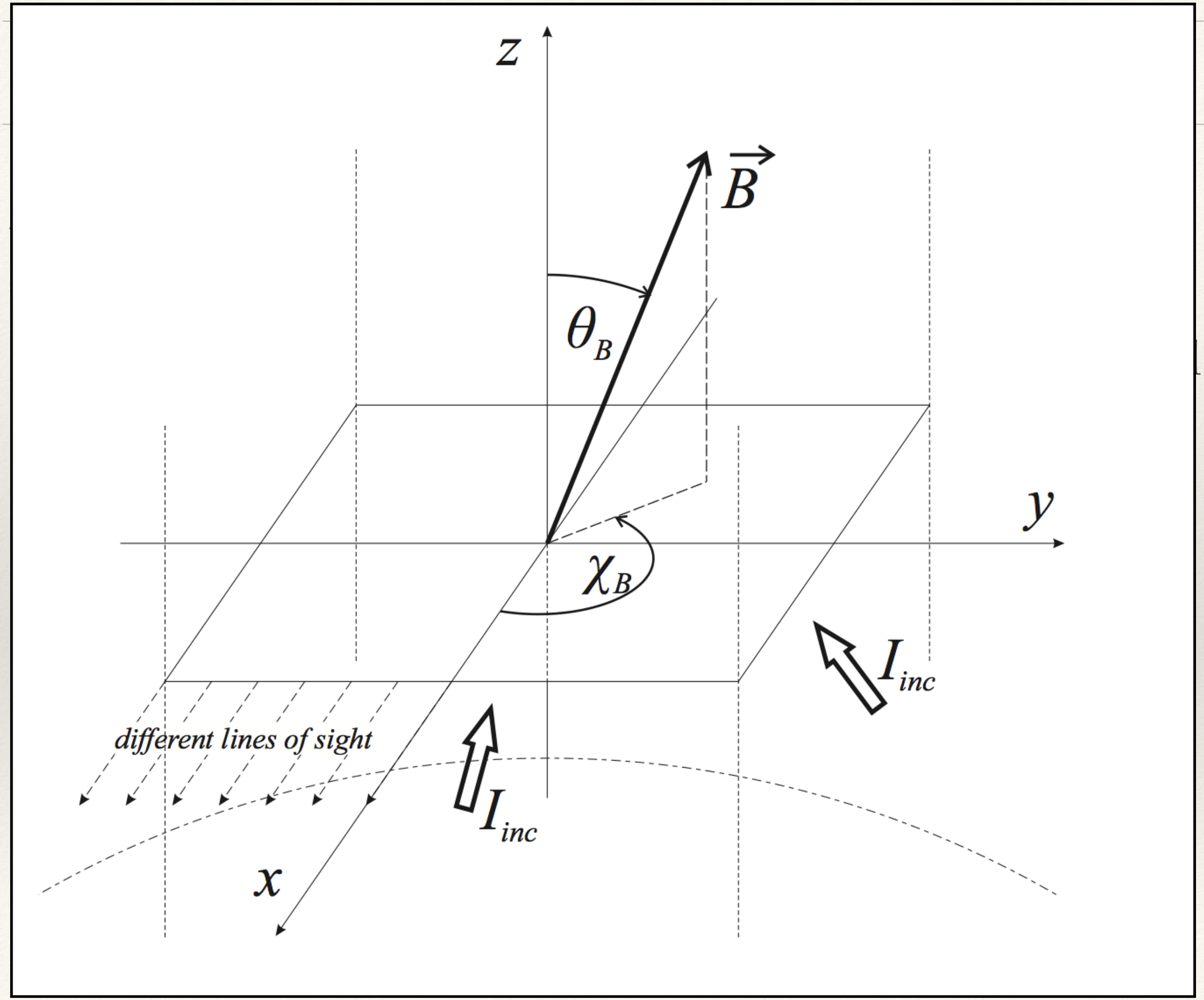
Motivation:Paper of Orosco Suarez et al. interpreting He1083 line



Aim:

- Inversions like this one usually follow from fairly simple generative model (e.g. single scattering or 1D slab)
- Let's investigate changes in emergent scattering polarization when more complicated model is introduced
- 2D (lateral) radiative transport
- Inhomogeneities
- Velocity fields
- And Hanle effect!


z
$\vec{B}$
θ_B
y
χ_B
I_{inc}
different lines of sight
I_{inc}
x

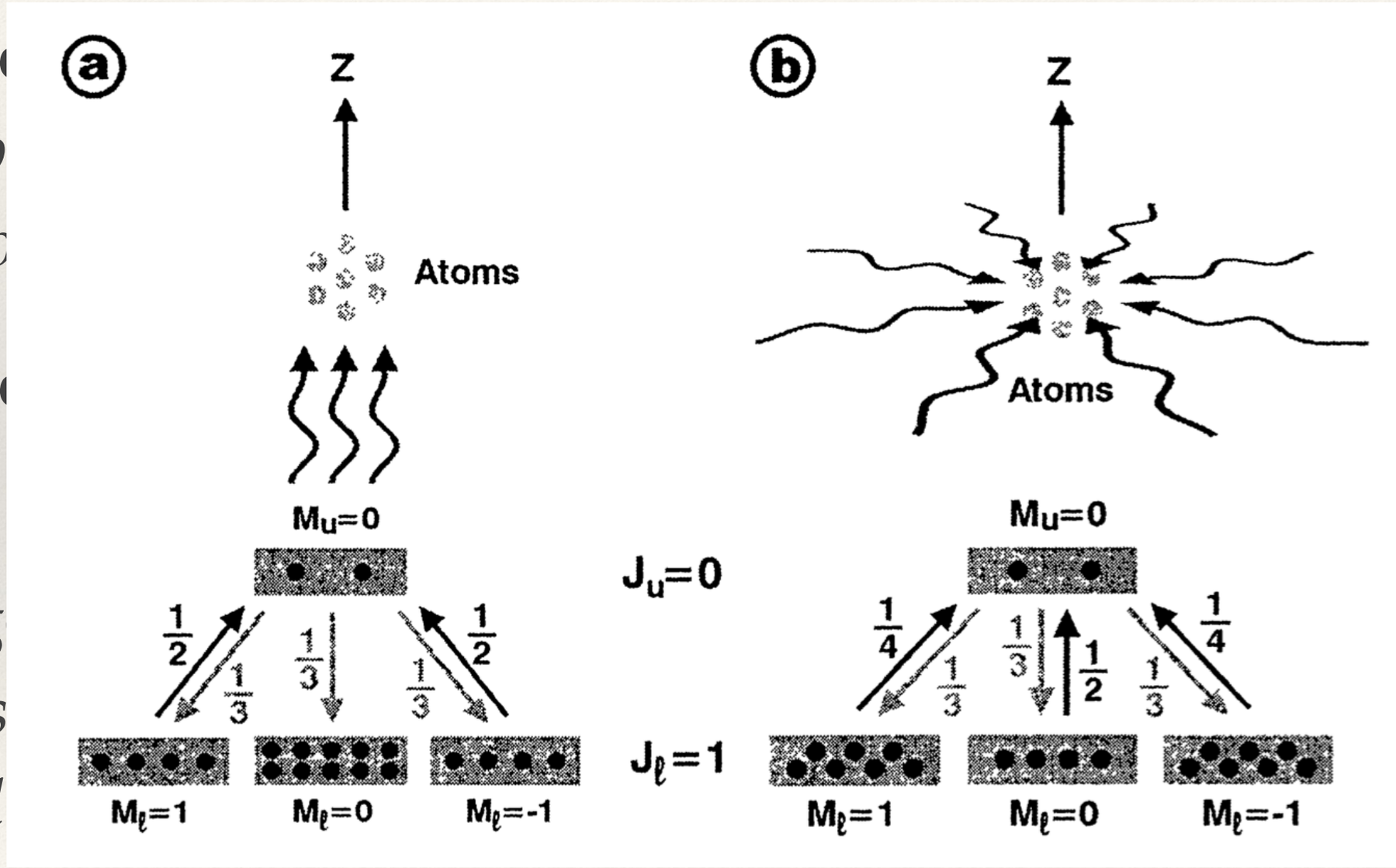
Before playing around…

- **Let us discuss the geometric meaning of Stokes *Q* and *U* parameters:**

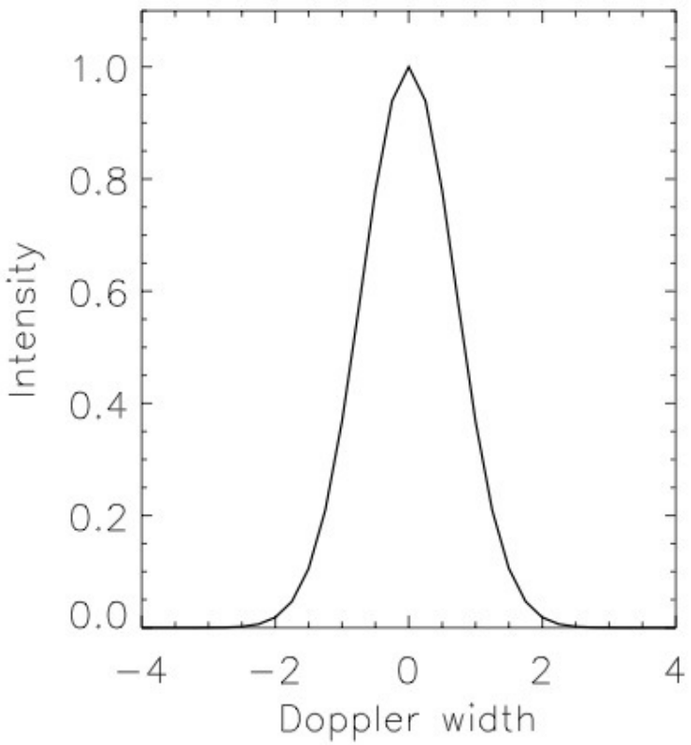
- Stok… …on field (*if yo… …ere is no po…*

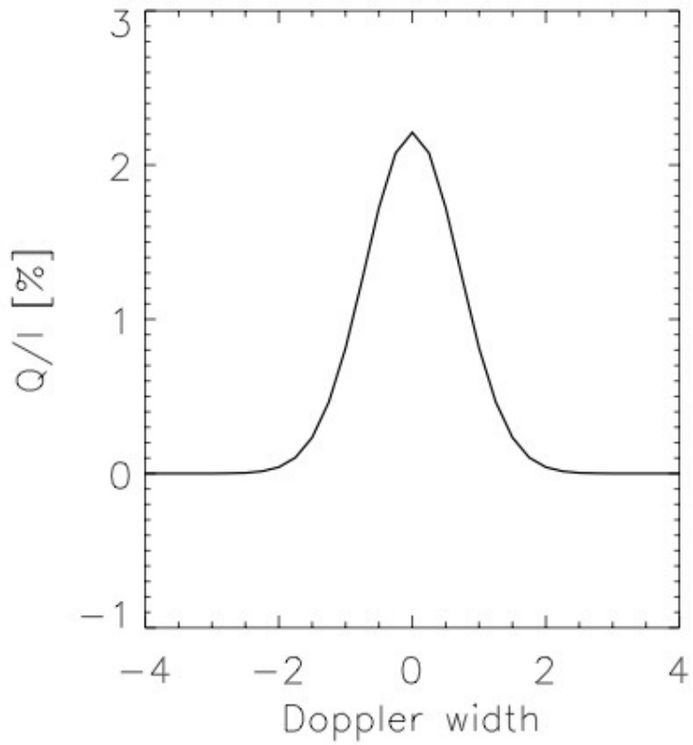
- Stok… …ation field …

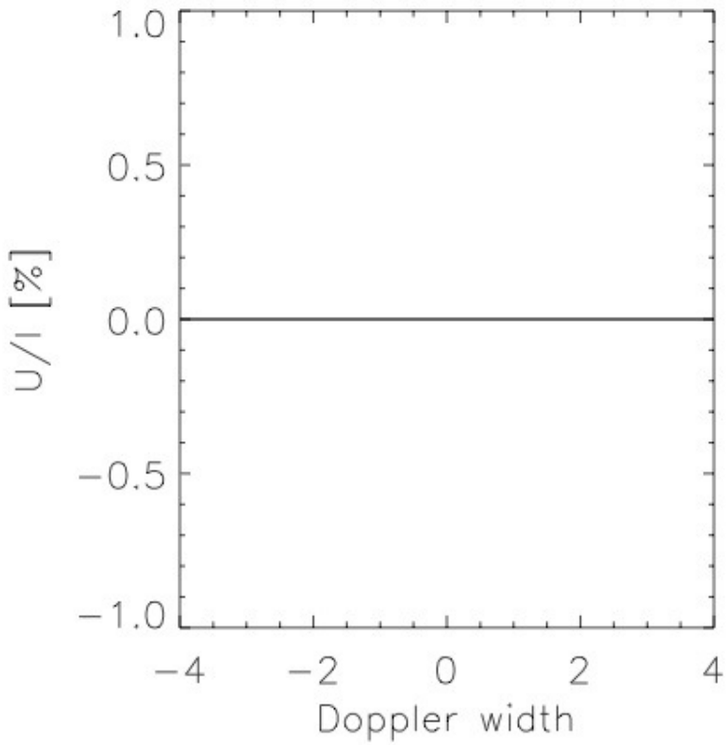
- Larg… …vo. (*This… …ia Hanl…*

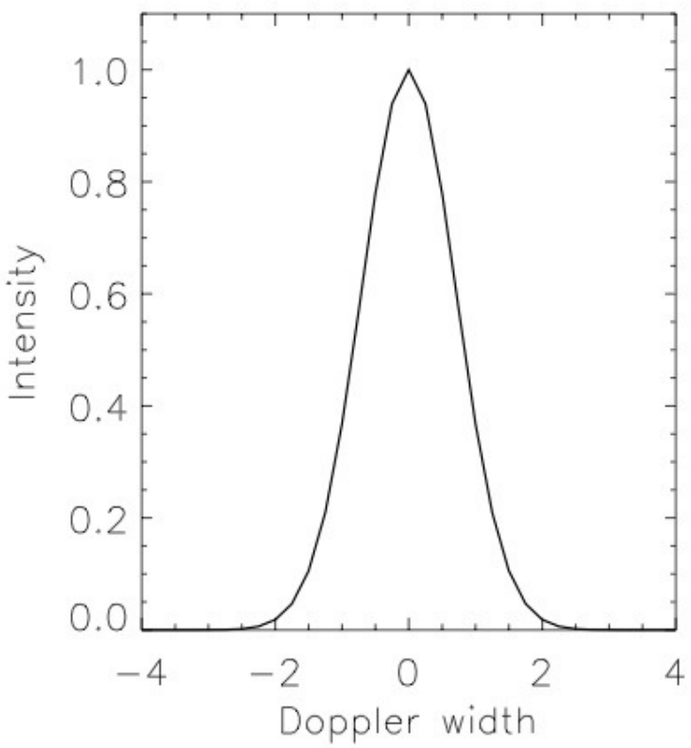


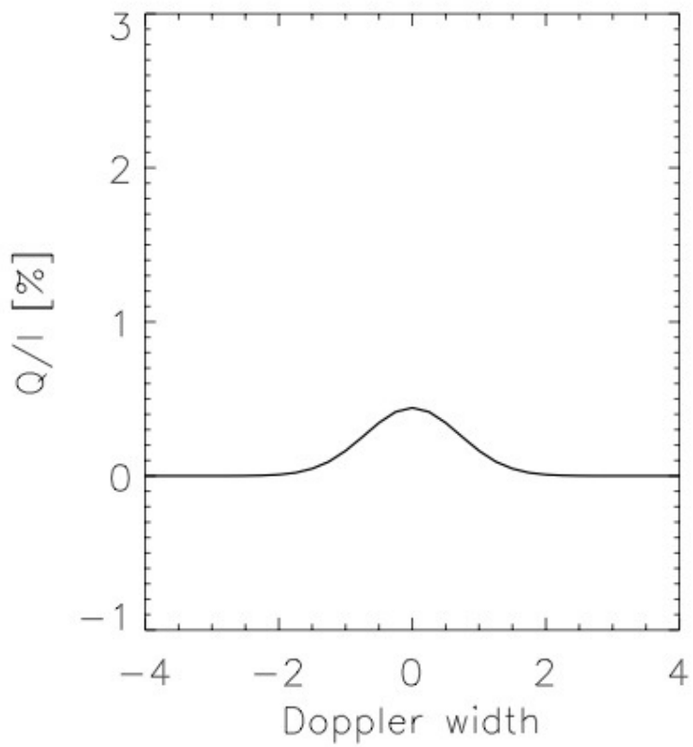
Simplest case – single scattering

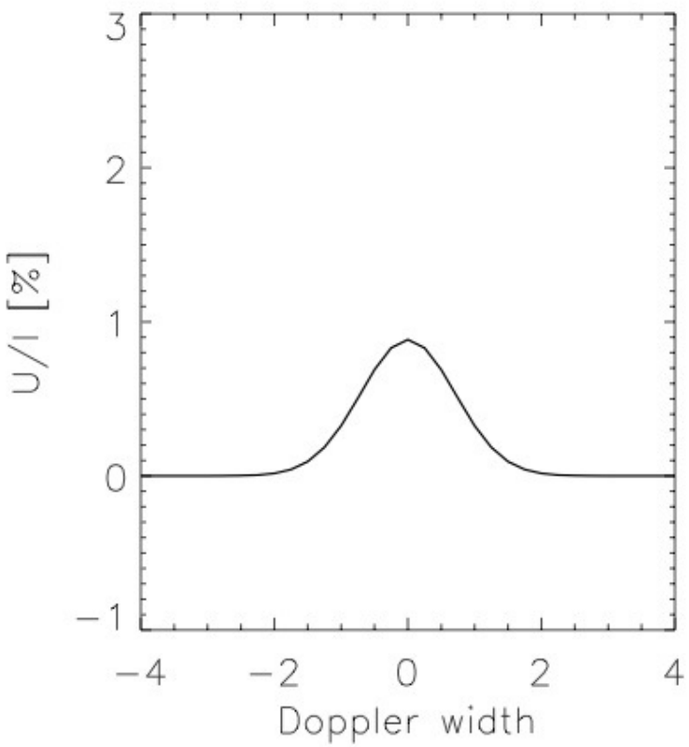




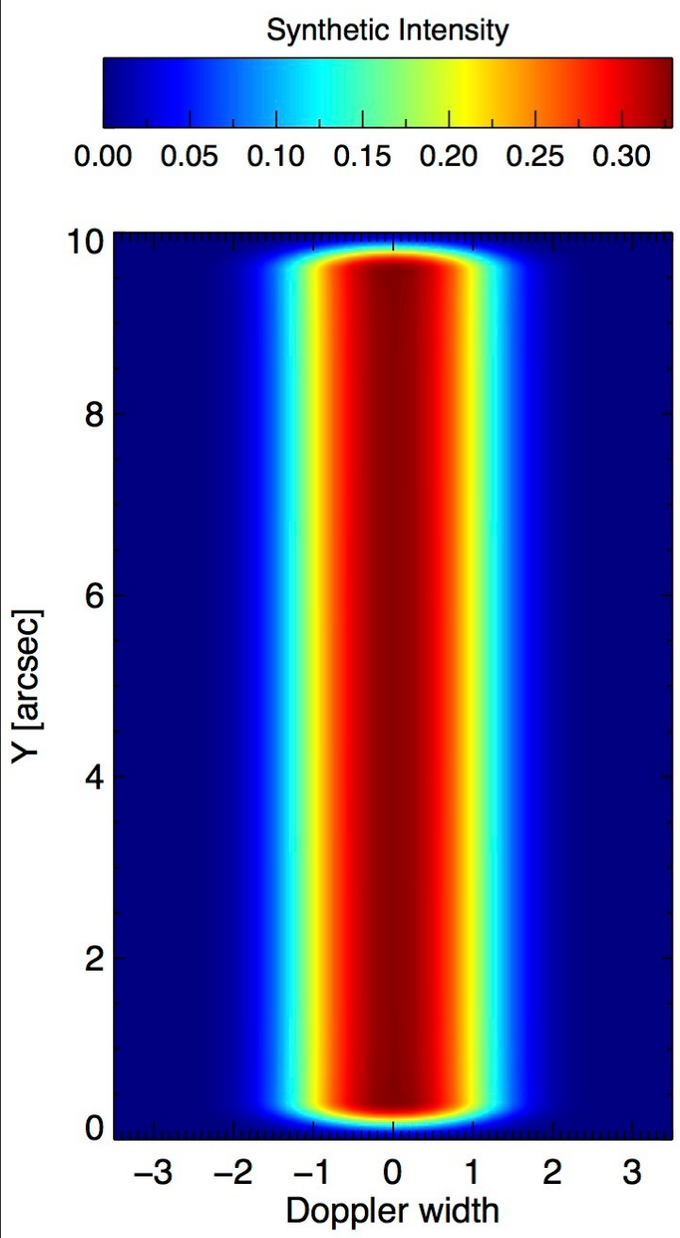


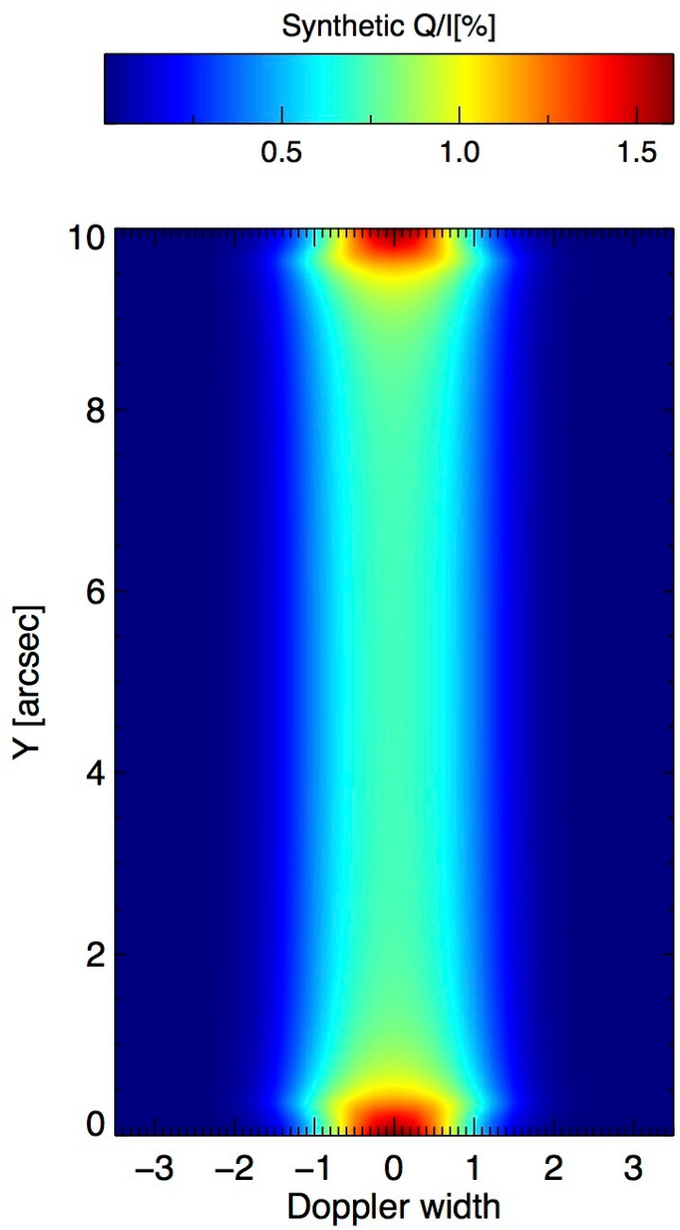


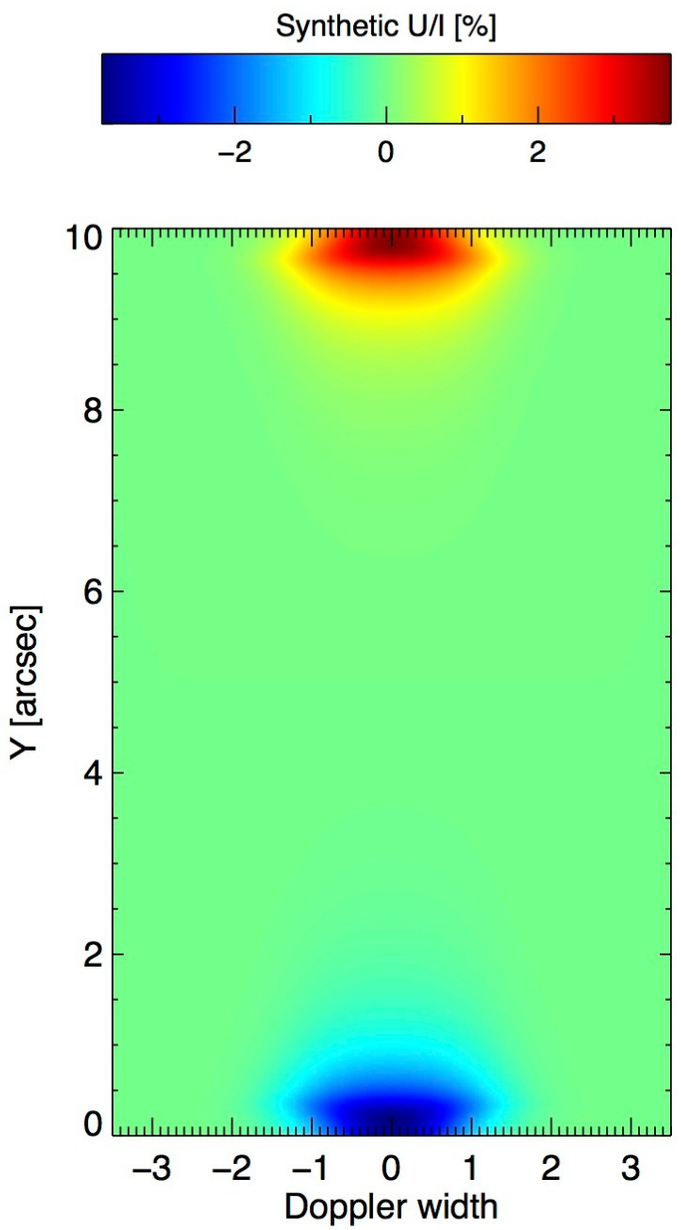




A simple 2D homogeneous slab

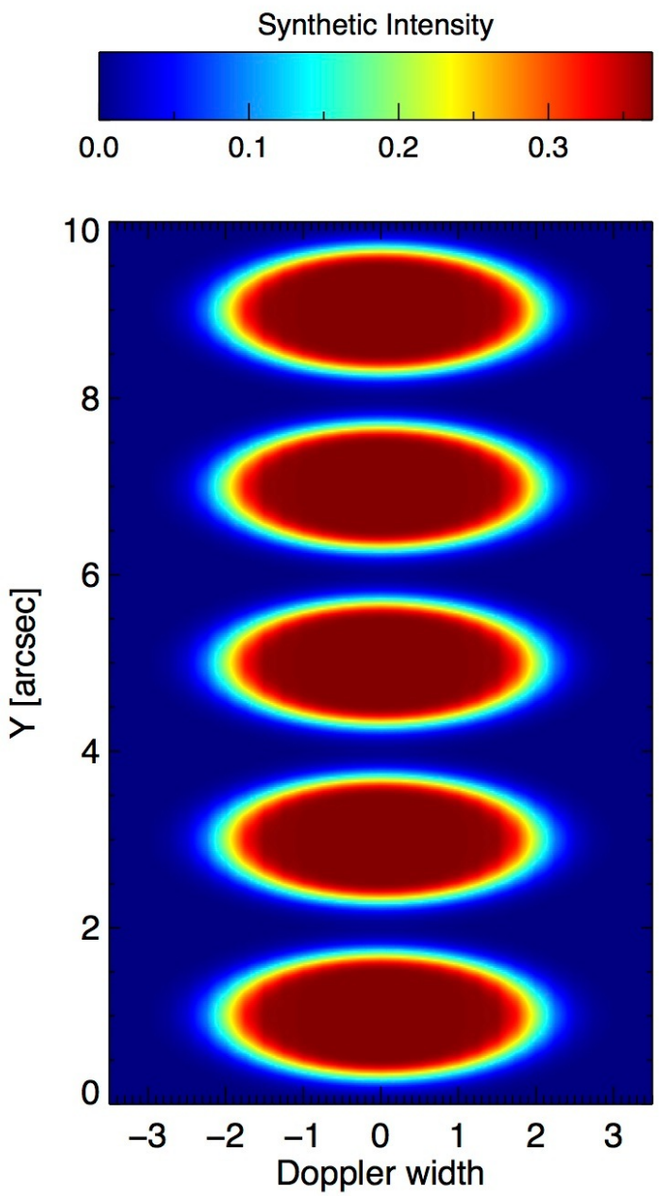


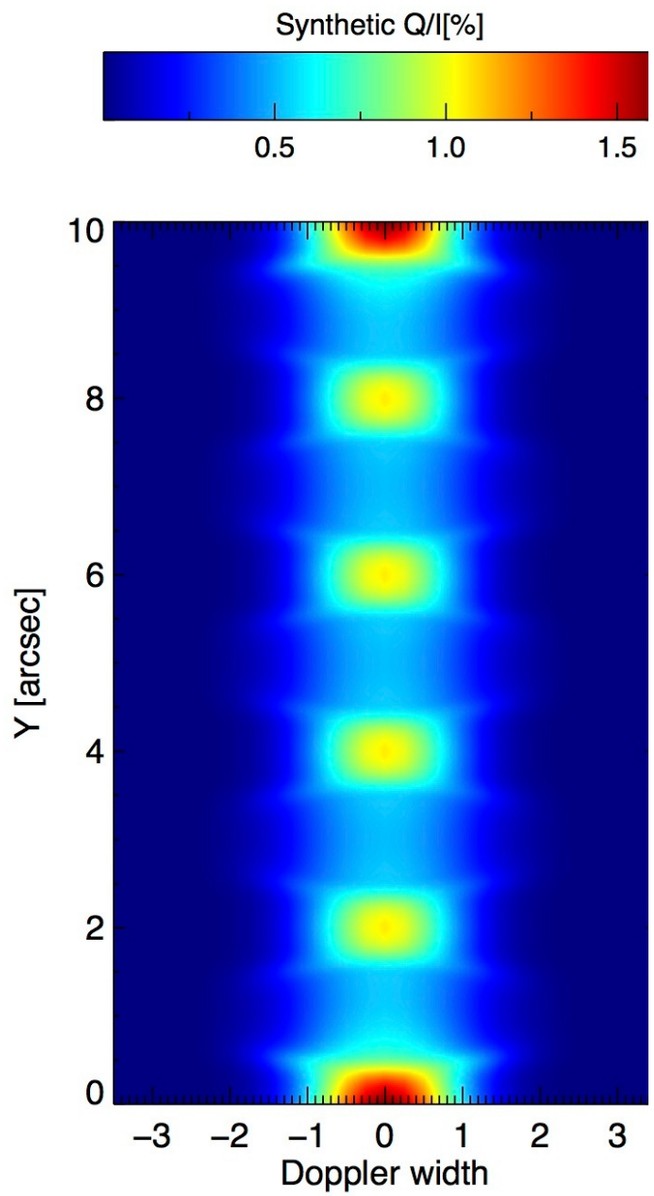


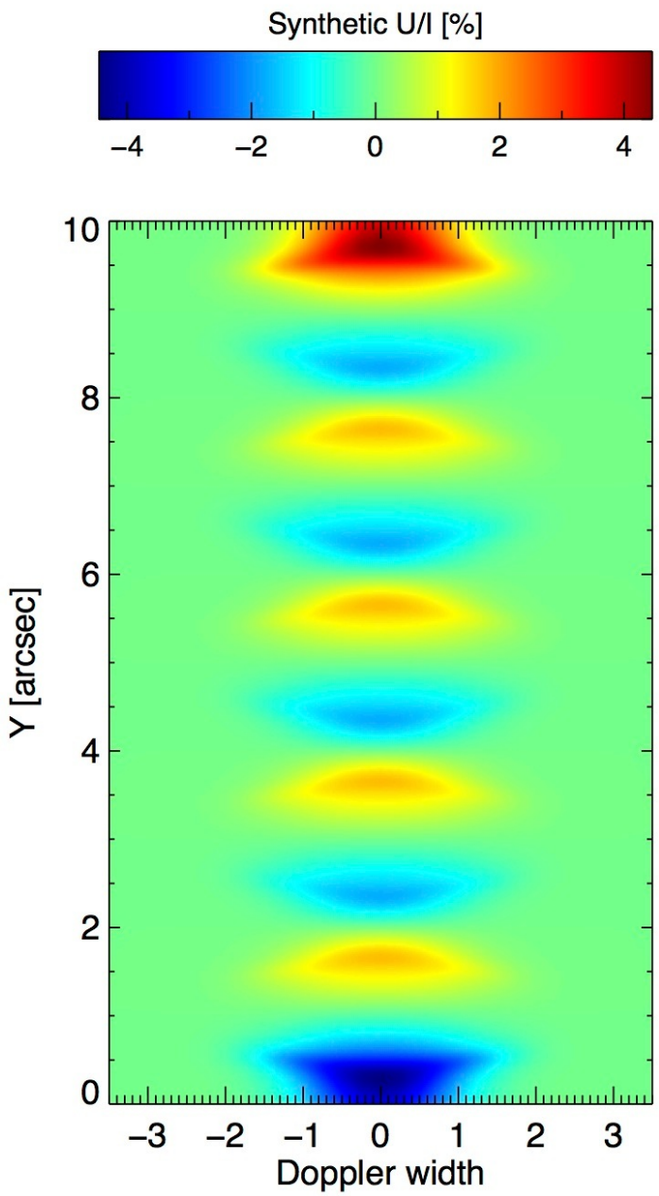


More complicated structure?

- Let us make vertical threads within this slab…



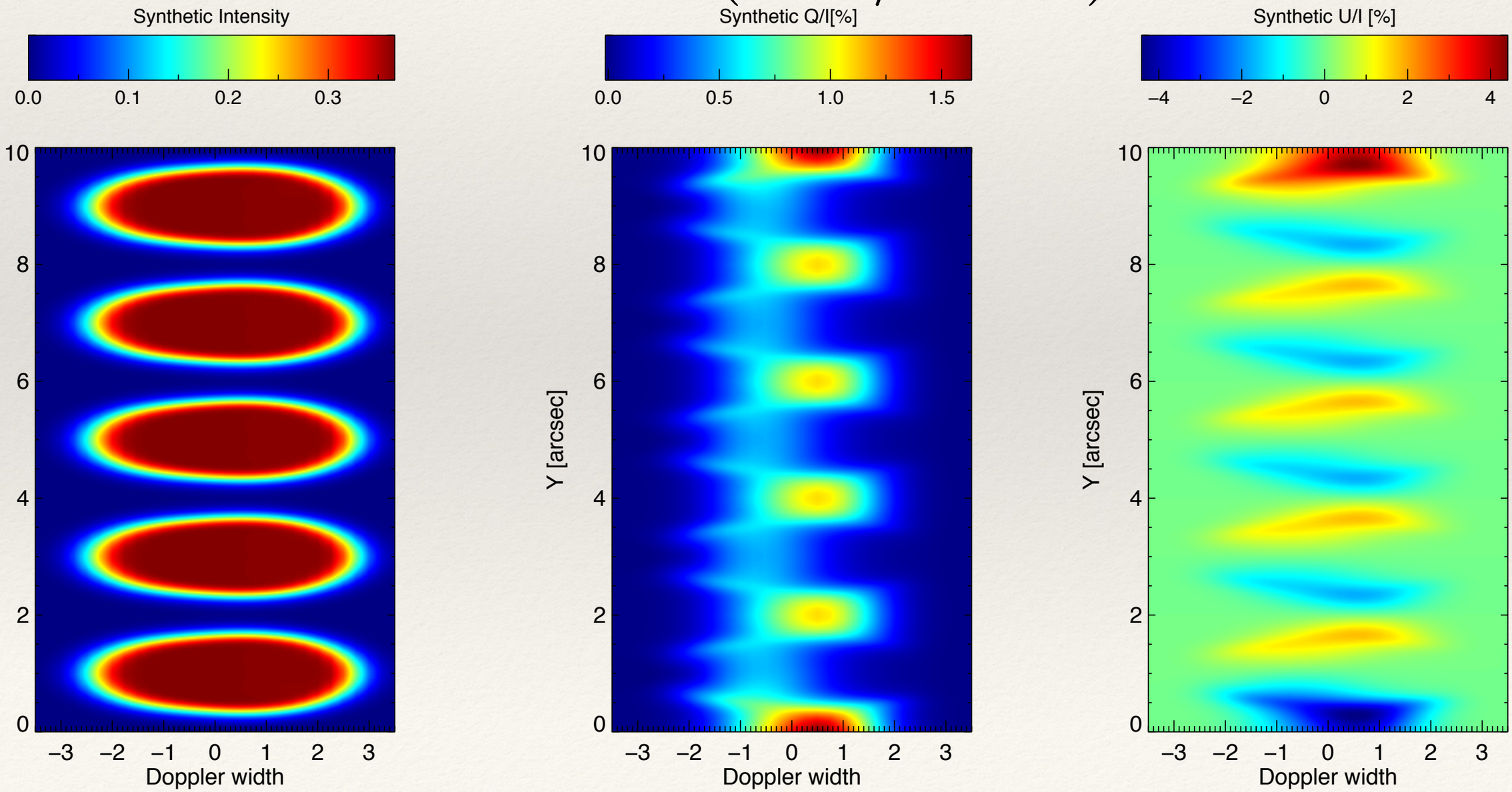




We can also add some velocity fields…

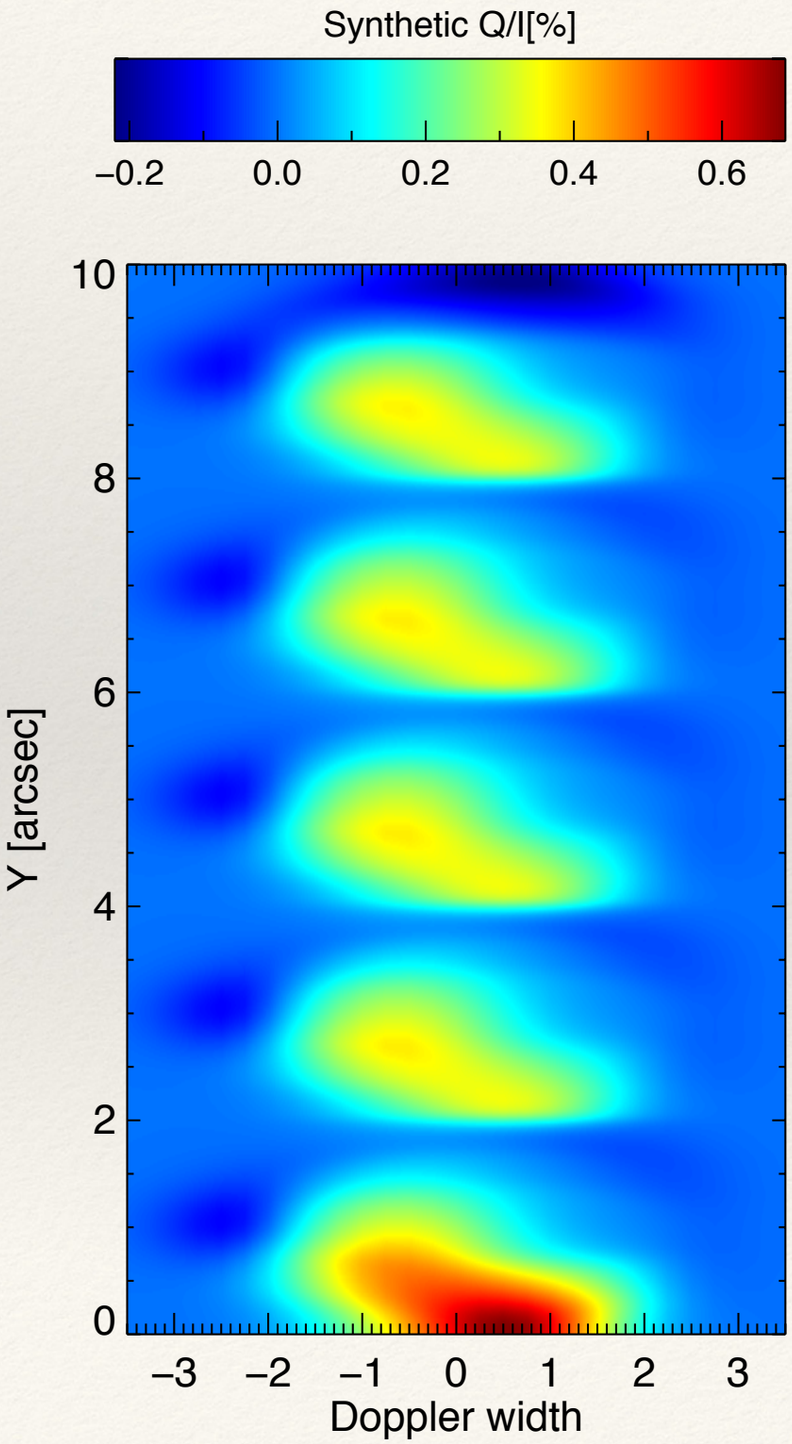
- It is well known now that prominences exhibit oscillations. So let us add a longitudinal standing way which looks like this:

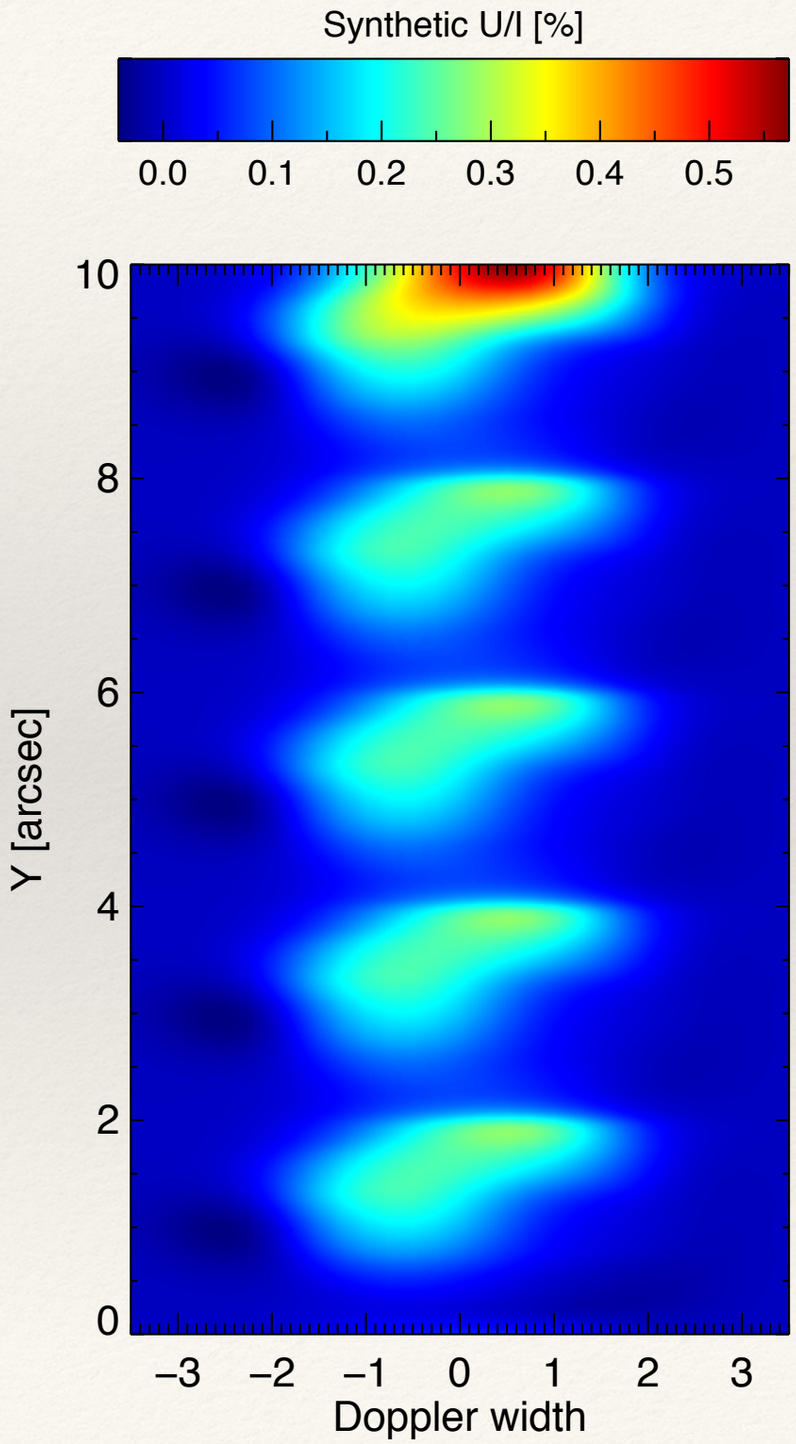
$$v_x = \cos(4\pi x / x_{\mathrm{total}})$$

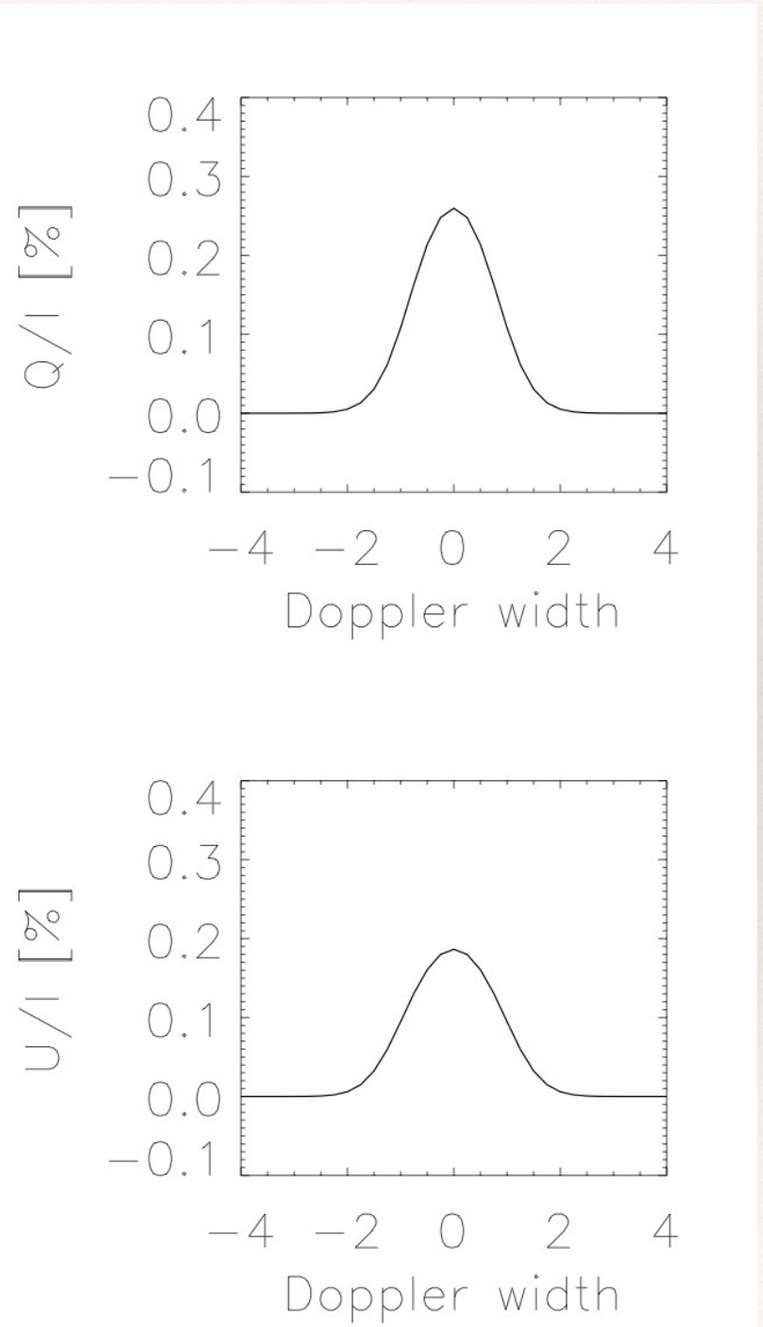


And, of course, the magnetic field!

$$\Gamma_H = 3;\ \theta_B = 80^o;\ \chi_B = 30^o$$







What can we conclude from these very simple examples?

- Inhomogeneity changes scattering polarization and its distribution
- In principle, modification of Q and U due to **non-magnetic effects** could lead to mis-diagnosis of the magnetic field (*set-up inversion and try!*)
- Could this be important for “real” lines?
- Next steps?