Collage 2020 : Homework 2

March 2, 2020

To respect your other out-of-class commitments, a flexible deadline for this homework is 03/28/2020. However, the sooner you get to it, the easier it will be.

Problem 1: In this problem we want to test "the other" modulation scheme, that uses the linear polarizer and a rotating wave-plate. Going back and following Valentin's slides (Lecture 10, slides 64+), calculate the modulation matrix for this approach and show that the numbers he quotes in the lecture are indeed correct. (E.g. polarimetric efficiencies). Illustrate the modulation/demodulation approach in a similar way we did in class. (I.e. the modulation, followed by an appropriate de-modulation).

Problem 2: Using the Stokes cube and the approach we used in the class, assuming that Q, U, and V in the original cube are zero, illustrate the effect of seeing-induced polarization by plotting wavelength dependent de-modulated Stokes profiles. How do these spurious Stokes profiles look like?

Problem 3: Choose an arbitrary HINODE spectropolarimetric data set, download the data and assemble the spectra into a cube (you can use routines I linked in the class description). Then, using the approach from the hands-on, calculate line of sight velocities from one of the spectral lines. Can you find a way to estimate measurement uncertainties?

Notes: You do not have to submit the code, but it is certainly easier to grade if you submit it as a jupyter notebook or something similar.