

Exercise 9

Inversion of Gas Pressure (simulated data)

We have selected the spectral region 614.7 – 615.1 containing Fe I, Fe II, Ti & V lines, because they show different sensitivity to T & Pg

- 1) I have perturbed the VALC model introducing a 10% perturbation in T & Pg, and synthesized the profiles. Try to recover T and Pg perturbations by inverting the simulated profiles.
- 2) I have included a velocity perturbation. Try to recover T, Pg and v_{LOS} perturbations.
- 3) Determine the region of maximum sensitivity (the logtau range) to relative perturbation of Pg using the Response Functions of T and Pe. Which is the minimum S/N ratio we would need in order to recover a Pg perturbation of around a 10%?

- For the case 2) use several cycles, first inverting T & Pe in Hydrostatic Equilibrium and later allow also for Pe perturbations.
- Evaluate the RF to T & Pe. You can read it using:
`IDL> read_RF_nomag, 'guess_4.rpe', rpe, ntau, nlam`
To evaluate RF to Pg apply the chain rule. You can calculate dPg/dPe and dPg/dT by using
`IDL> Pgderivatives, T, Pe, Pg, dlogPgdT, dlogPgPe`
This program calls to the fortran program Pgderivatives_i.x. To compile this program (in the SIR folder):
make fc=gfortran Pgderivatives_i.x or make Pgderivatives_i.x (if you use the ifort compiler)
To get the RF to relative perturbation multiply the RF by the parameter.
- Evaluate, for each optical depth, the maximum response (RF at the wavelength at which $|RF|$ is max).