

## HAO/NCAR HMI Monthly Progress Report, Feb 2007

We have upgraded the initial synthesis module and we now have a fully working Milne-Eddington inversion code. The code is fully adapted for HMI purposes (including the effect of the Lyot filter profiles). It considers a total of 12 free parameters: 10 for the magnetic atmosphere (including broadening due to macroturbulent motions) plus a filling factor and a velocity for the non-magnetic component. For test purposes the current version of the code allows any of those parameters to be fixed or free. We are in the process of quantifying which parameters are degenerate. For example, applying an SVD decomposition to the Jacobian matrix we have seen that linear combinations of the damping and macroturbulent velocities are often degenerate (singular values  $10E-6$  times smaller than the largest). By fixing those values (not considering them as free parameters) we can improve the convergence of the inversion algorithm without significantly affecting the retrieval of the most important quantities (i.e. magnetic field vector). We have also worked extensively in a program to determine a first initial atmospheric model. This program shall be upgraded later on using Neural Networks.

Finally, we have made versions of the code that compile using the most common Fortran compilers (Intel, Absoft and Portland Group) and under several different processors (Pentium IV, Xeon, Pentium M and AMD Opteron).

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