Subject: Re: constraining parameters in multi-Gaussian 1D fitting
Posted by Jess on Tue, 06 Sep 2005 00:02:31 GMT
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Hi Craig (and everyone else),

Thanks for clarifying the use of "tied". In that case I will have to use limits. Perhaps I can re-fit a velocity profile altering my parinfo limits, if the first multi-Gaussian fit of that profile doesnt yield the right relationship between the peak fluxes of each Gaussian.

Unfortunately I can't sequentially fit single Gaussians, as the velcoity profile is a sum of overlapping Gaussians. Each profile comprises emission from a line-of-sight through a edge-on galaxy disk in cylindrical rotation V(R), with gas distribution assumed to be azimuthally symmetric, monotonicly decreasing radial flux profile, isothermal and with isotropic velocity dispersion.

Thus I assume to know the following constraints:
- number of gaussians in any profile
- "good" parameter estimates of all but one gaussian in any profile.
- The centroid of the unknown gaussian must be higher than all the others.
- The peak flux of the unknown gaussian should be equal or higher than all the others.
- For the other Gaussians in a profile, each comprising flux from a radial bin higher than R at the line of nodes, the parameters held fixed or strongly limited from having already fitted flux at those radii when analysing velocity profile of sightlines further out. I start at the outermost sightline, where I am only fittin gas at Rmax, then fit the next innermost using the kinematics at the higher R sightline as parameter estimates.
- In practise, the centroids of higher R gaussians can be projected to the new sightline and held fixed as they are found accurately in the outer sightline, while the peak flux and velocity dispersion are vulnerable to noise and biased by the telescope spatial beam at the outermost sightlines, so must be bounded for the multi-gaussian fit of the next few sightlines, until they stabilise.

I will try to generate reasonable bounding limits to supply for these high R gaussians, such that the output obeys reasonable assumptions of the input galaxy:
- that radial flux profile is flat or decreasing,
- the centroids of the gaussians at lower radii in line-of-sight profile is always higher than the Gaussian centroids from gas at higher radii projected onto the line of sight.

If this works I should find that the 3 parameter fits of higher radius

Gaussian gas components in a sightline profile should stabilise after a few sightline profiles, as I fit that gas component in successive sightlines. Thus the multi-gaussian fit to each profile should have few unknowns, 3 due to the unknown gaussian at the line-of-nodes radius, the dispersion and peak flux of the next couple of gaussians, say 3-4. So I never have more than 8-11 unknowns, though less in the outermost profiles with fewer gaussians. One advantage of an exponential decreasing radial flux profile is that the poor fits to the highest r components, while they affect the velocity profile fit of the next innermost sightline, they become unimportant, providing its fitting the line-of-node gaussian well.

What do you think Craig? Is the solution too degenerate to be solved with curvefit algorithms like mpfit, despite the heavy constraints I am trying to place on most of the parameters in the multi-gaussian curve fit?

Thanks for your advice,
Jess
