MAP2D Use Case

Story

I have used EM2D and have located a lot of emission lines in my observations and can see that they are sometimes distributed within the object and often not simply an unresolved region at the center of the galaxy. I have used EM2D and see that some objects have large, resolved regions causing the observed emission line to appear broad and washed out in the 1D extraction. I want to use my current knowledge of the host galaxy, and the fact that using EM2D I now know the redshift of this galaxy well and with an estimate of the error in that redshift estimate. I want to see if I can, starting from no assumption about the morphology of the emission line region, reproduce all of my observations by adding 2D emission at specific wavelength. I know about LINEAR and how this can be done in a forward modeling manner that will allow me to be careful with error propagation and let me deal with small systematic error in my background subtraction, as well as handle any small uncertainties in the assumed redshift of the source.

Inputs

- A set of N FLT files
- A set of N continuum simulations of the FLT files
- A reference mosaic of the objects (to compute RA and DEC of each pixel, etc)
- A good estimate of what emission lines we want to look at and at what observed wavelengths they are (from EM2D)

Outputs

- 2D maps of the object, which is pixel matched to the original mosaic, and where flux unit are in FLAM

Computations

- Generate N continuum subtracted 2D stamps of my sources from my FLT files
- Build a W matrix (in LINEAR parlance of W . x = obs) which would allow me to compute all N observations (obs) given a set of 2D models x (x is essentially a flattened, concatenated, list of all the pixels of our 2D stamps)
- Invert the equation and solve for x, using LSQR
- Take x and extract its elements to build things back into 2D stamps.

Drawbacks

- Need a way to compute W quickly, using something like GRISMCONF
- Requires good estimates of the dispersed continuum of each sources (to remove contamination and continuum in each 2D stamp)
- The previous trade-off only stems from me wanting to use as much a-priori information as possible. Since I have deep imaging and a good idea of the continuum level of these sources and use it to remove contamination, I also use it to remove the continuum level in the source of interest. What remains is therefore just the footprint of the various emission lines. However, it is possible to generalize MAP2D into MAP3D, where we do not subtract the contamination and solve for as many discrete wavelengths as we have bins in the resulting images (i.e. 25A bins from 8000 to 11500A for G102). The issue with the later is that we still have to identify the lines in the 3D IFU cube and solving for everything increases the computation time and artifact creation (think of it as spaxel leakage as flux is distributed in adjacents spaxels and still allows the observations to be reproduced).