Search for substellar companions around young stars with the HST

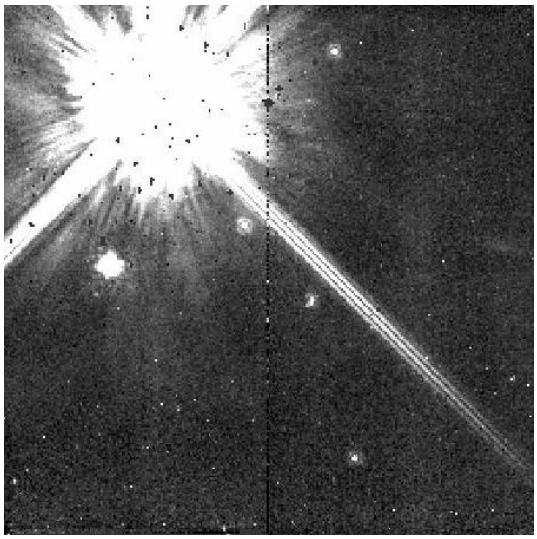
Christian Ginski, Markus Mugrauer, Ralph Neuhäuser

In the HST data archive a lot of data can be found which is not yet analyzed homogeneously. In addition, with the HST NICMOS (Near Infrared Camera and Multi Object Spektrograph) a perfect instrument for the search for faint red objects in the J, H and K bands is available. The goal of this project is to analyze available data of several fields of young stars to find nearby faint objects around these stars, which have not been noticed previously.
When we find some suspicious objects in those data the next important step will be to search for a second epoch of the same target star. With a second epoch we would be able to decide if the star and the faint object have the same proper motion and are therefore gravitationally bound to each other.
PSF (Point Spread Function) subtraction will be used to eliminate the target stars radiant flux from the images, so that possible faint objects become detectable. At the moment three different methods for this are under study:

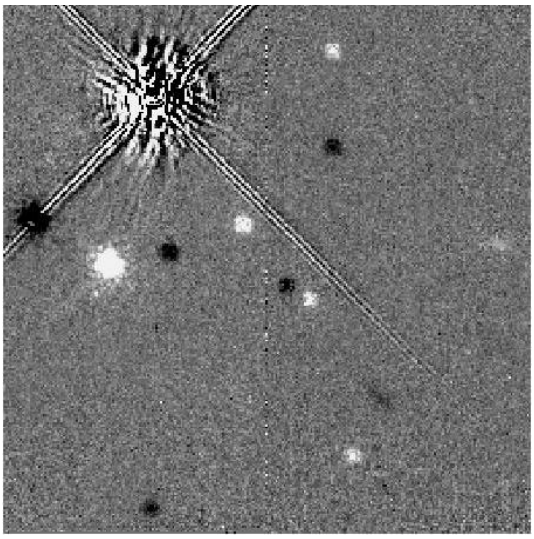
1. "Role Subtraction" of two images rotated against each other
2. "Simulated Role Subtraction" of a single image to remove radial symmetric parts of the target stars PSF
3. Subtraction of a simulated PSF with the program "TinyTim"

All those methods will be optimized in the next weeks and dynamic range diagrams will be plotted to quantify the quality of the different methods.

Our current target region is the TW-Hydrae Association. For 15 out of 25 stars there is HST NICMOS data available. Additionally, for four stars there is also WFPC2 (Wide Field and Planetary Camera 2) data available.



NICMOS 2 picture of TWA 12. The field size is 19.2 x 19.2 arc sec. The exposure time is 192 sec with the F160W filter. Some faint objects can be seen which are possible companions of TWA 12.



The same picture of TWA 12, but this time a second picture, which was taken with a different telescope oriantation, has been subtracted.