IRS 46 was originally classified as an embedded class I young stellar object based on its near- and mid-IR colors. Its complete Spitzer IRS spectrum showing consistent with a circumstellar in luminosity. On short timescale (up to tens of years) the change in spectral energy distribution is consistent with the observed H$_2$O emission increase). These provided the first observational test of chemical models in the planet-forming zone of a circumstellar disk as well as a direct measure of the temperature and density. Subsequently, the same molecules have been observed in absorption toward the young star GV Tau and toward a number of T Tauri stars.

However, follow-up Spitzer-IRS observations of IRS 46 at 5 epochs taken during 2008 and 2009 show dramatic changes of the mid-IR properties. The mid-IR continuum and the strength of hot water emission lines (previously not identified) have increased while the absorption features have strongly decreased in strength. At the same time no significant changes are observed in the molecular spectrum of GV Tau. Starting with the parameters of the SED model as presented by Lahuis et al., we use the protoplanetary disk model ProDiMo to model the chemical composition of the inner few AU of the IRS 46 disk. In addition ProDiMo is used to investigate the nature of the changes observed in the mid-IR spectra of IRS 46 and to test if an outburst event (akin EX Lupi) can explain the observed changes.

**The Past**

- Multi epoch observations (2006/2008/2009)
- Increased mid-IR continuum (up to a x2)
- Increased H$_2$O emission
- Decreased C$_2$H$_2$, HCN and CO$_2$ absorption (up to x5)

**The 'present'**

- No evidence of periodicity \( \rightarrow \) state change \( \rightarrow \) outburst / episodic accretion
- Mutual increase in continuum and H$_2$O emission
- H$_2$O increase through rapid surface chemistry and increased irradiation
- Reduced strength of C$_2$H$_2$, HCN and CO$_2$ absorption features
- No evidence for a strong change in the embedded chemistry
- Strong similarities with EX lupi outburst event
- Reduced organics evidence for mixing as proposed by Juhász
  - or ...

- Non-ss disk structure, higher optical depth and obscured organics?
- Limits in the understanding of and the ability to model the full time dependent behavior of the inner disk physics, dynamics and chemistry

**Future research**

- Steady-state pre outburst
- Steady-state post outburst?
- PPVII for all the answers??

**Target molecules for JWST-MIR**

**Literature**

- Lahuis et al. 2006