#### High-resolution, Mid-IR Spectroscopy on the Gemini North 8m: Implications for TMT

Matt Richter UC Davis

### What is TEXES?

High spectral and spatial resolution, Mid-IR grating spectrograph (PI: John Lacy at UT Austin)

- Operates between 4.5 and 20 microns
- R = 80,000 (4 km/s) at 10 microns
- 0.5% spectral coverage
- R = 10,000 single order mode with same spectral coverage
- pipeline data reduction program



# TEXES on Gemini

Offered on Gemini North in 2013 and 2014.

- 0.25" spatial resolution at 10 microns
- Slit length 2" to 5" depending on cross dispersion
- Observing modes:
  - Nodding (no chopping)
  - Stepped scans

Has been on IRTF since 2000





#### Figure 1 from Irons et al. 2012



### TEXES compared to MICHI

- High resolution arm of MICHI
  - Imaging arm provide view of slit
- both preserve spatial resolution of telescope
  - MIRAO provide very high Strehl for MICHI
- MICHI will give larger spectral coverage in single setting
  - larger detector
  - ultimate wavelength coverage for MICHI still TBD
  - TEXES has observed from 4.5 microns to 25 microns



# TEXES proposals on Gemini

- around 40 proposals (14 granted time)
  - 10 solar system (2)
  - 2 stars (0)
  - 6 ISM/Galactic Center (1)
  - 2 extragalactic (0)
  - 20 star formation (11)
    - occasionally challenging to find guide stars
- Vast majority are related to star formation

#### Spitzer IRS Spectrum of a Typical T Tauri Star



S/N ~ 250 [NeII], other atomic lines and molecular bands

#### Continuum-subtracted T Tauri Star Spectrum



Lines of water throughout



Spectra of several H2O emission lines from 5 T Tauri disks. All lines are resolved (Salyk et al, in prep)



First measurement of the line profile of mid-IR HCN emission from a T Tauri disk (red). The line profile is similar to that of the mid-IR H2O emission from the same source (blue), indicating both HCN and H2O emission arise from similar disk radii (Najita et al., in prep) 





#### Conclusion

- TEXES on Gemini emphasizes disk science
  - ability to do CO 1-0 with Si:As detector important given history of NIRES within TMT
- Spatial resolution important
  - MIRAO better than TEXES/Gemini system
- New questions