IRAS 16342–3814

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- OH outflow $v_{\rm exp} = 70\,{\rm km\,s^{-1}}$
- H_2O outflow $v_{\rm exp} = 160\,{\rm km\,s^{-1}}$
- Low-mass progenitor star (Not in the plane; high forbidden velocity)
- Post-AGB star; spectral type M–B
- distance 0.7–2 kpc

- highest circumstellar obscuration of any known OH/IR star
- highest wind velocity of any known OH/IR star

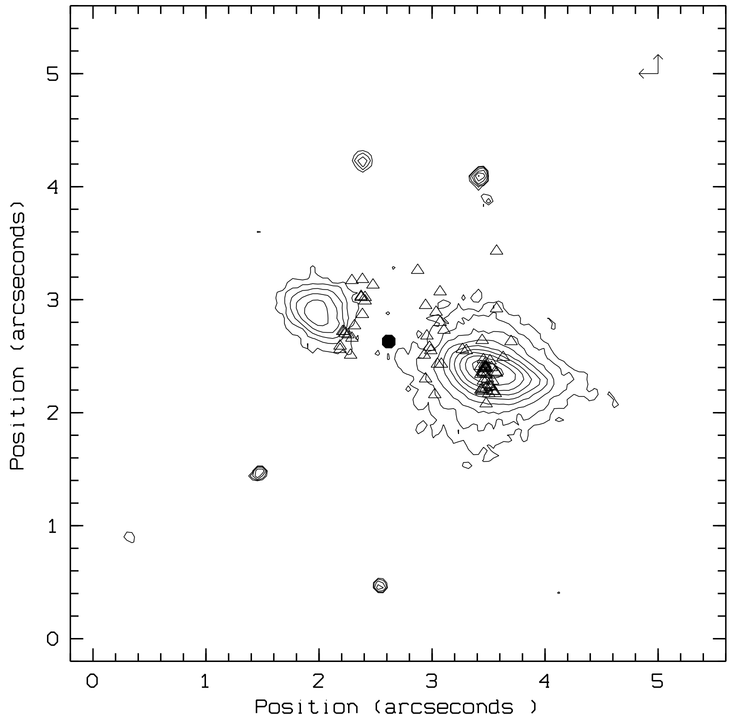

Figure 1: HST V-band image (contours), with the 1612MHz OH maser positions (triangles). The masers avoid the dark lane (high-density suppression) and cluster on the centre of a lobe where a continuum source is likely present. Modeling gives inner and outer radius of the disk of 1 and 1.5 arcsec, and a density of 10^8. From Zijlstra et al., 2001, MNRAS, 322, 280

Morphology

- Observed
  - HST V,I and VLT L images: bipolar reflection lobes with dark lane
  - TIMMI Q-band: spherical halo
  - Silicate 18-μm absorption from the dark lane
  - OH masers avoid the dark lane
  - OH and H_2O masers show Hubble-type velocity law (Zijlstra, MNRAS 322, 280)
- Inferred
  - Disk with $n \sim 10^8\,\mathrm{cm}^{-3}$, $M = 0.1\,\mathrm{M}_\odot$
  - Hot star or missing absorption
  - Shock ionization within the reflection lobes

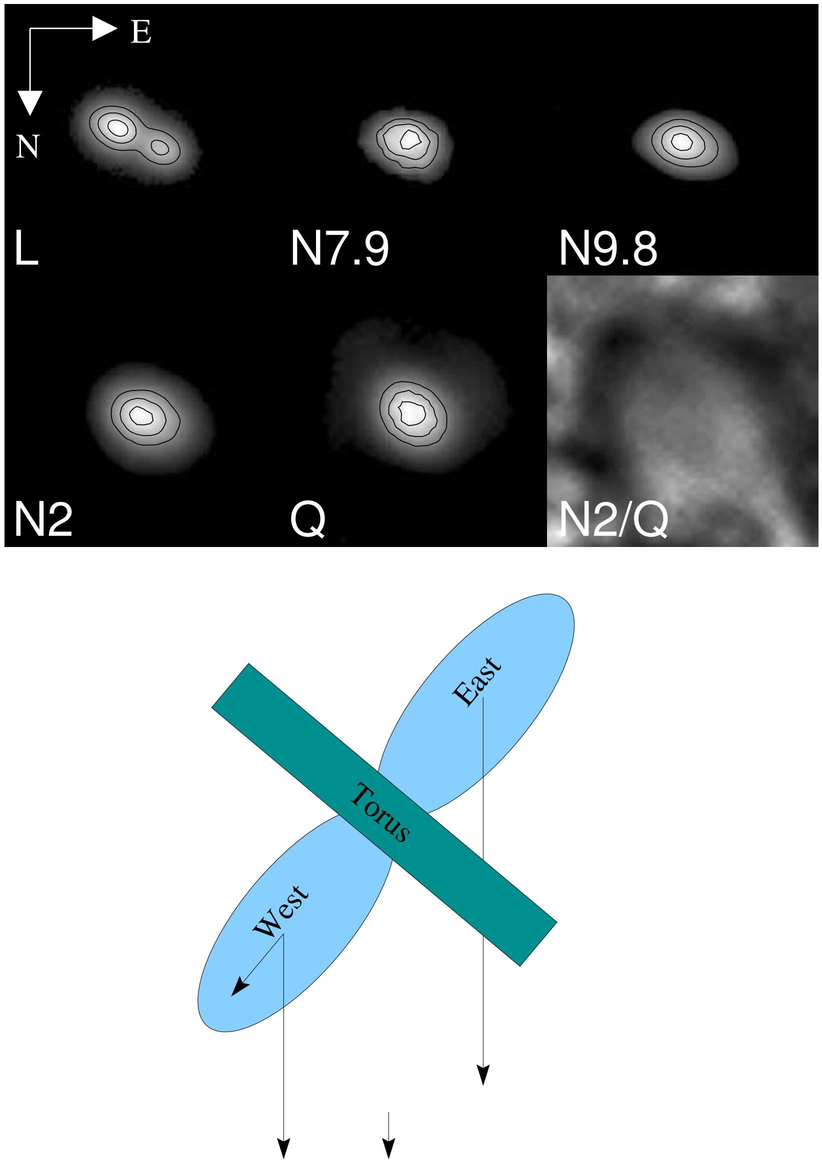

Figure 2: Infrared images and basic structur of IRAS 16342-3814, taken with ISAAC on the VLT (L) and TIMMI2 on the ESO/3.6m (N,Q). The OH and H_2O masers are located on the lobes. From Dijkstra et al., 2003, A&A, 399, 1037

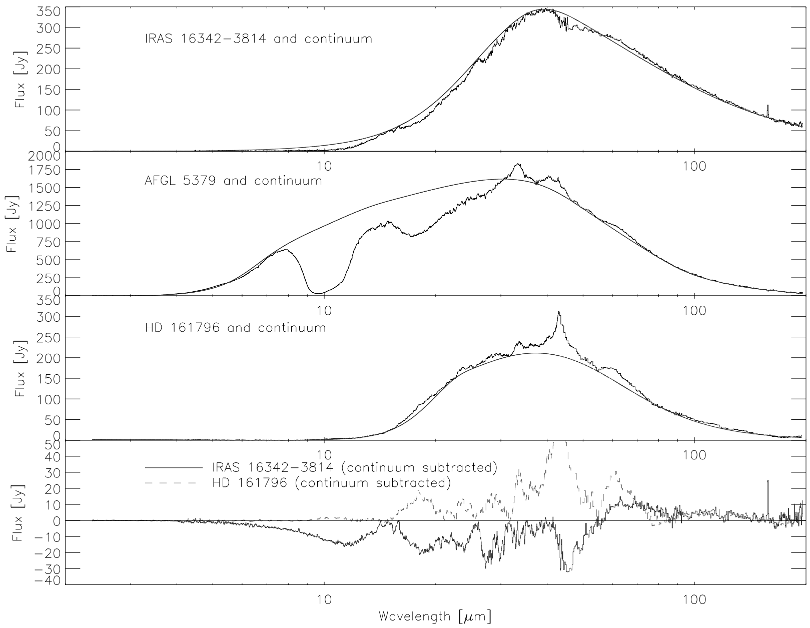

Figure 3: ISO spectrum showing crystaline features in absorption up to 45 micron From Dijkstra et al., 2003, A&A, 399, 1037

Crystalline silicates

- ISO spectrum shows crystalline silicate and ice bands
- in absorption up to 45μm
- Forsterite, diopside, crystalline ice, clinoenstatite
- Grain size in disk 1μm; in lobes 0.1μm

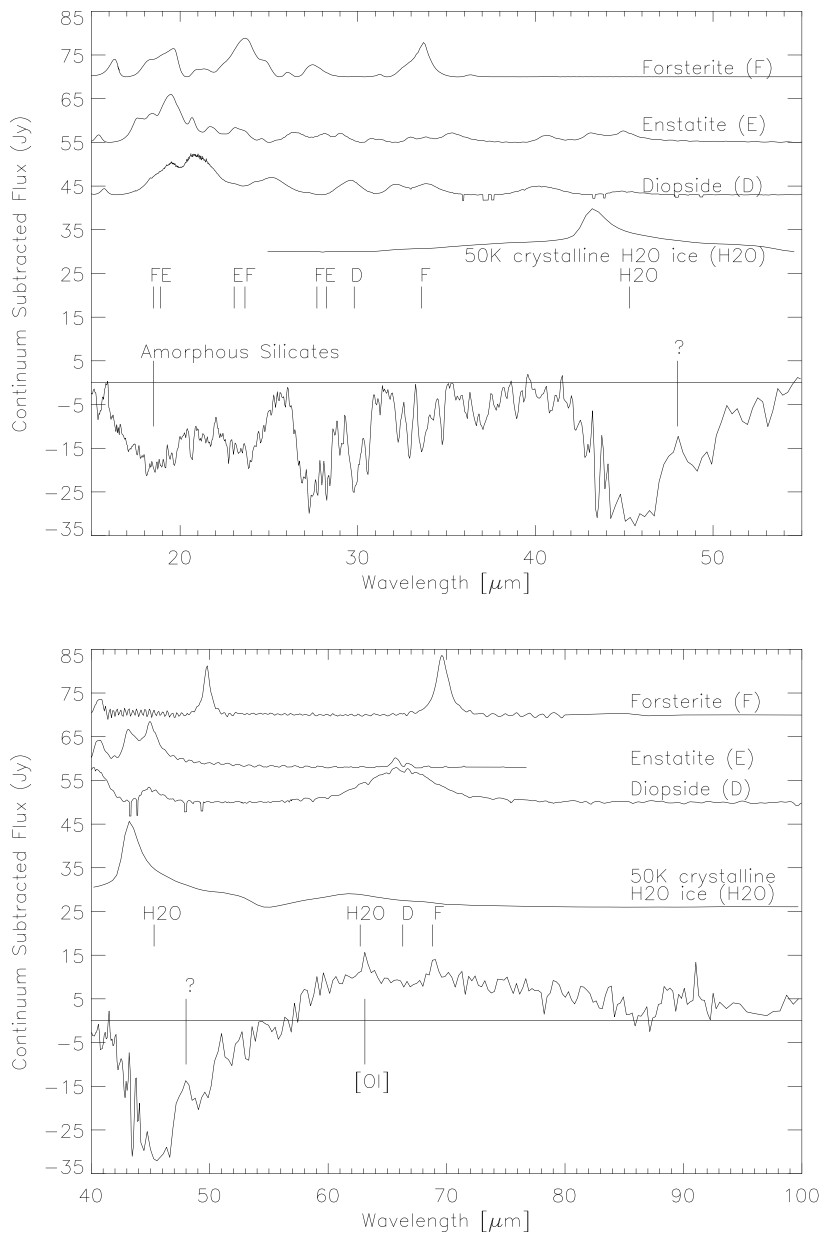

Figure 4: Identifications. From Dijkstra et al., 2003, A&A, 399, 1037

Evolution

- 'normal evolution' (Dijkstra et al. 2003)

  Youngest post-AGB star known:
  $t = 100\,\mathrm{yr}$

  $\dot{M}_{\mathrm{AGB}} = 10^{-3}\,\mathrm{M}_{\odot}\,\mathrm{yr}^{-1}$

  Crystallines form in dense wind

  K–M central star

  Problems

  Extremely short-lived phase

  Unlikely combination of rare characteristics

  OH/H_2O velocities much higher than escape velocity of star

- 'delayed evolution' (Zijlstra et al. 2001)

  Disk near-stationary $t = 1000\,\mathrm{yr}$

  Crystallines form in dense disk

  Molecular gas swept out of the disk

  F–A post-AGB star

  Problems

  Origin of the extreme torus unknown

  What links the extremely dense torus and very fast wind?

- link between dense torus and fast wind is common in post-AGB stars

- binary star required?

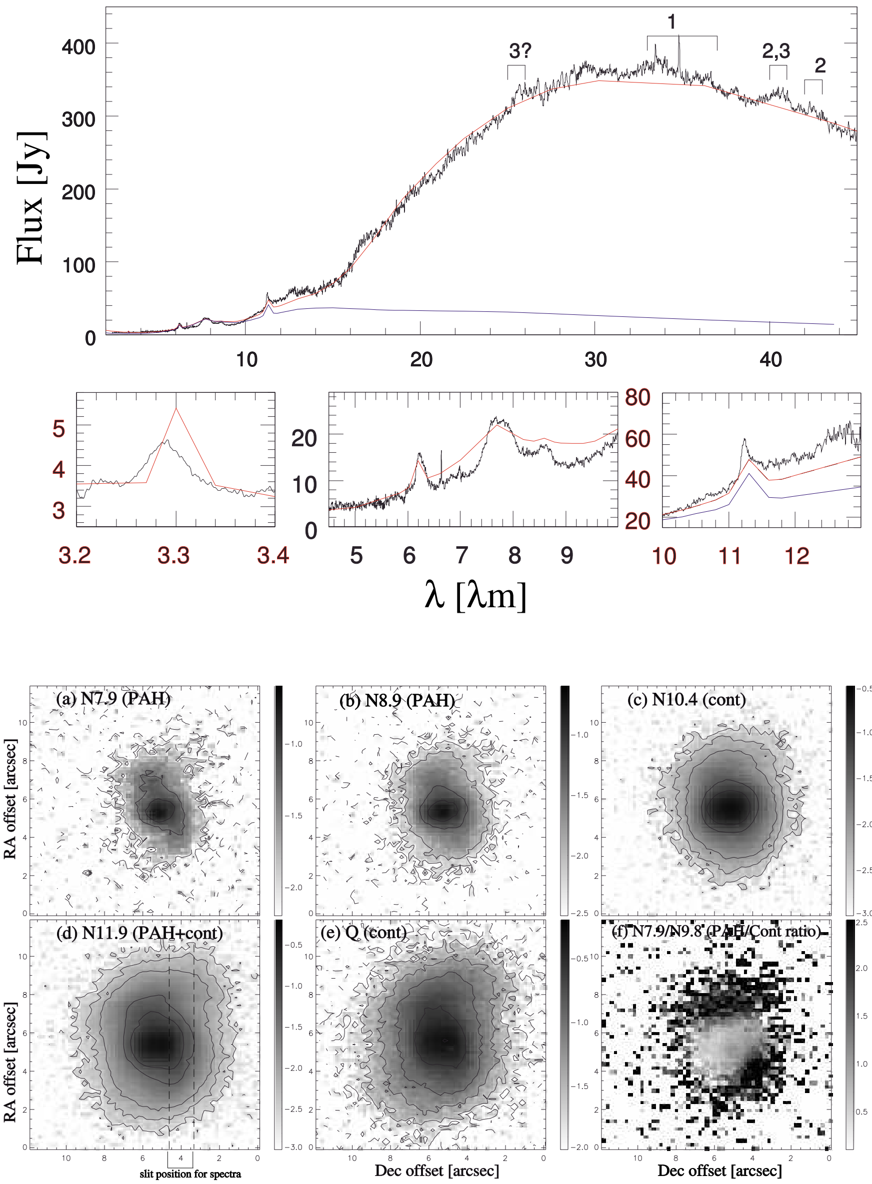

Figure 5: ISO spectrum and TIMMI2 images of IRAS 16279−4757 showing silicates in the torus but PAHs bands in the lobes. From Matsuura et al., 2003, in preparation

The absent PAH

- A number of post-AGB stars show both crystalline silicates and PAHs: mixed chemistry
- IRAS 16279-4757: PAH located in lobes, silicates in torus (Fig. 5)
- PAH origin unclear
  - carbon-rich stellar wind
  - in-situ formation in lobes (e.g. as in novae)
  - X-ray processing in disk (via HCO^+)
  - pre-existing in oxygen-rich disk
- A PAH-type grain component in IRAS 16342-3814 would fit
  - the extinction properties
  - the derived grain sizes.