The Long Term Post-Explosion Evolution of a Symbiotic Nova

Ravi Sankrit (STScI)

Steven Goldman (STScI)

Carlo Gualdoni (AAVSO), Simone Bolzoni (AAVSO) (2022 RNAAS 6, 159)

Edward Montiel, Nathan Wolthuis, Sean Garner, Nicole Karnath (SOFIA) (2024 ApJ 961, 14)

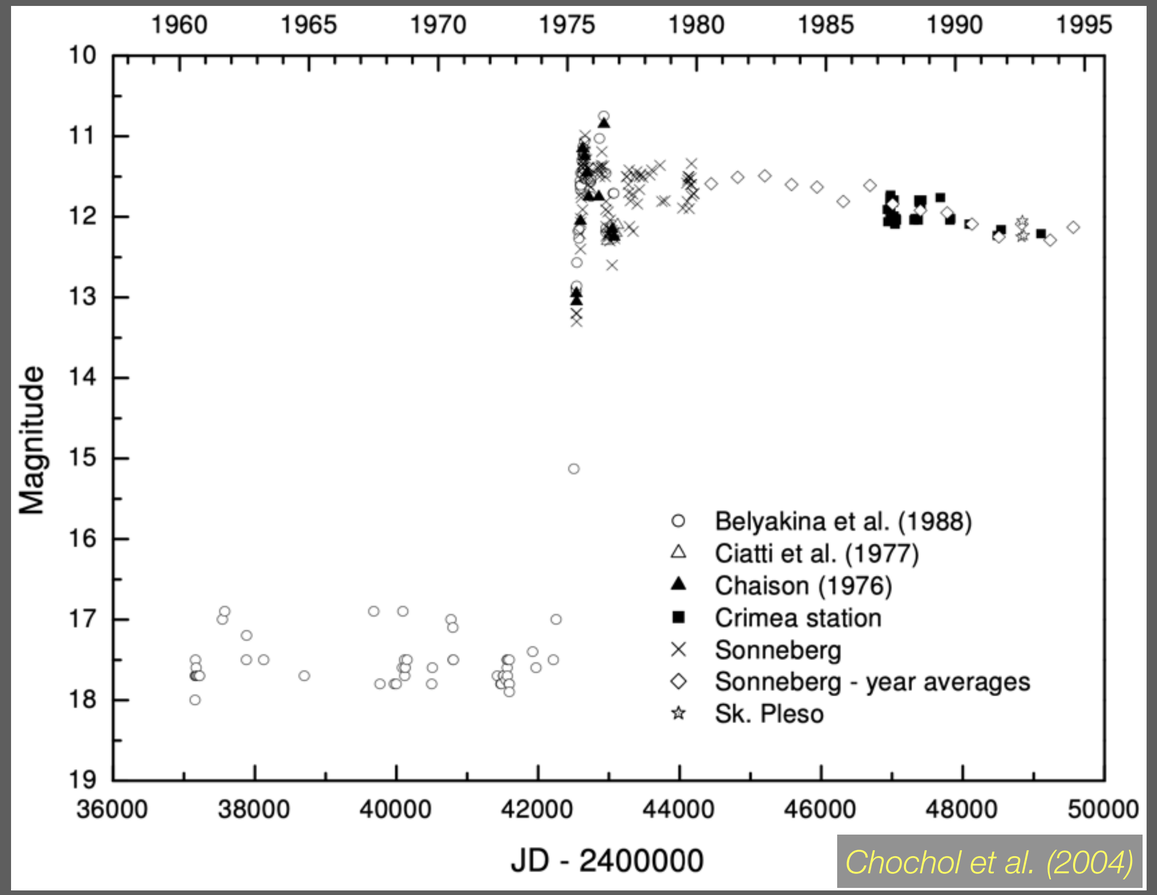
Thomas Ake (STScI), Manuel Bautista (Western Michigan Univ.) (2024 AAS 244, 319.01)

Support from grants HST-GO-16492.002 and SOFIA 08-0192 to the Space Telescope Science Institute are acknowledged.

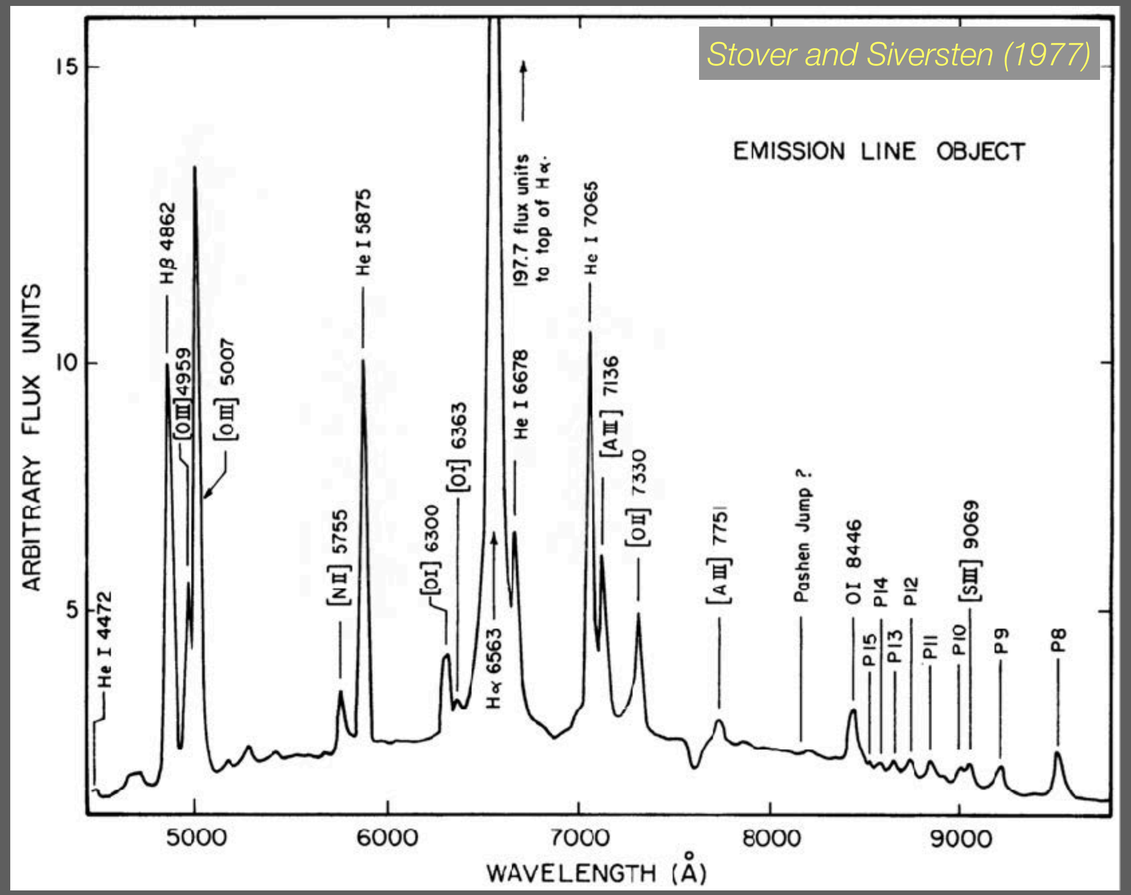
Monday, June 10, 2024 ; AAS 244th Meeting, Madison, WI. Press Conference: “Stars and Their Antics”

The Symbiotic Nova HM Sagittae

The Nova-Like Outburst of HM Sge

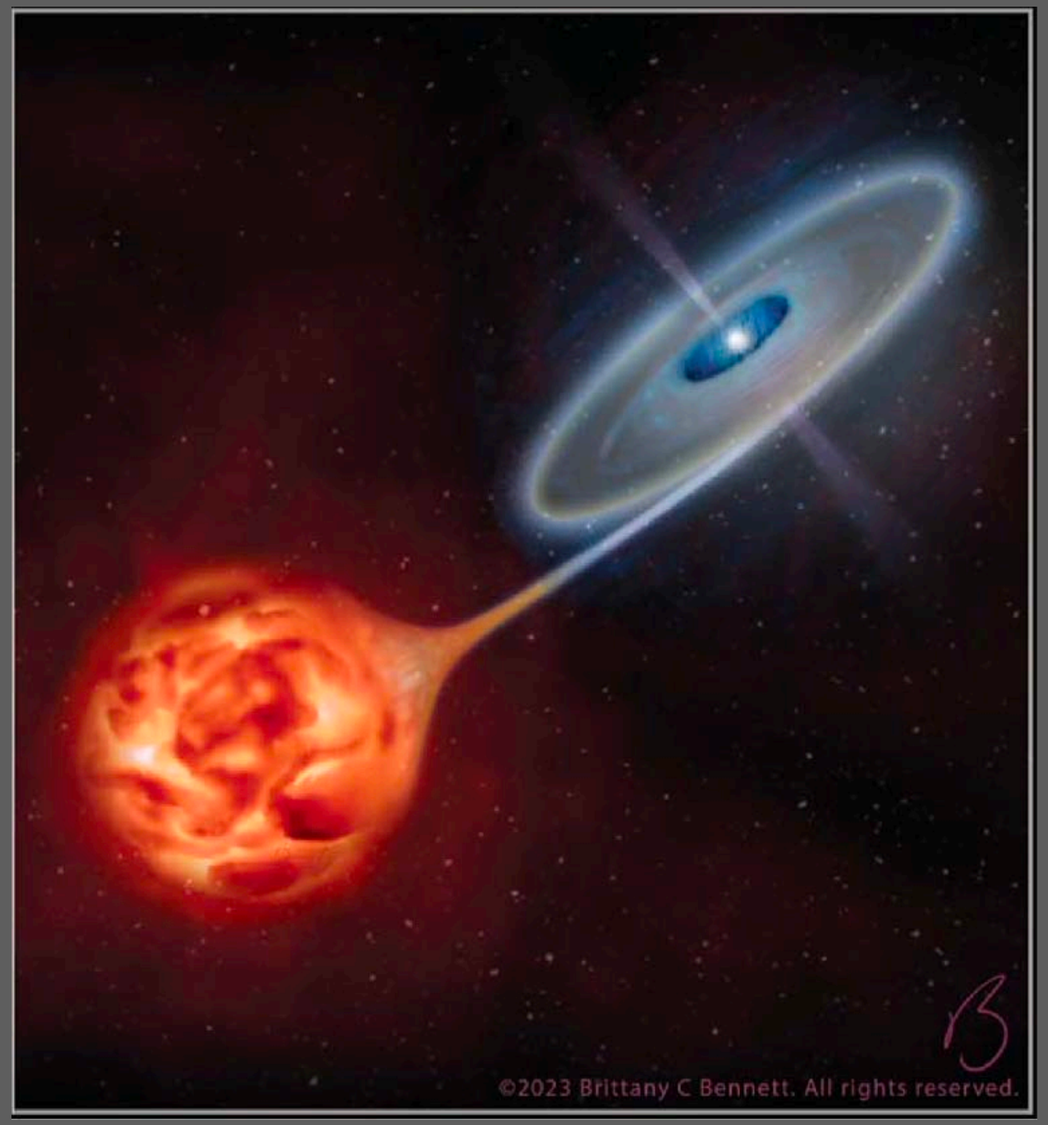


In 1975, within a few months period, HM Sge increased in brightness, from V = 17 to V = 11.



An optical spectrum taken in 1976, dominated by emission lines.

What is a Symbiotic Nova?



Artist's impression of HM Sge

A binary star consisting of a cool red giant (usually a Mira variable) and a hot white dwarf (WD)

Components separated by ~10 — 50 AU

Accretion is due to Wind Roche Lobe Overflow

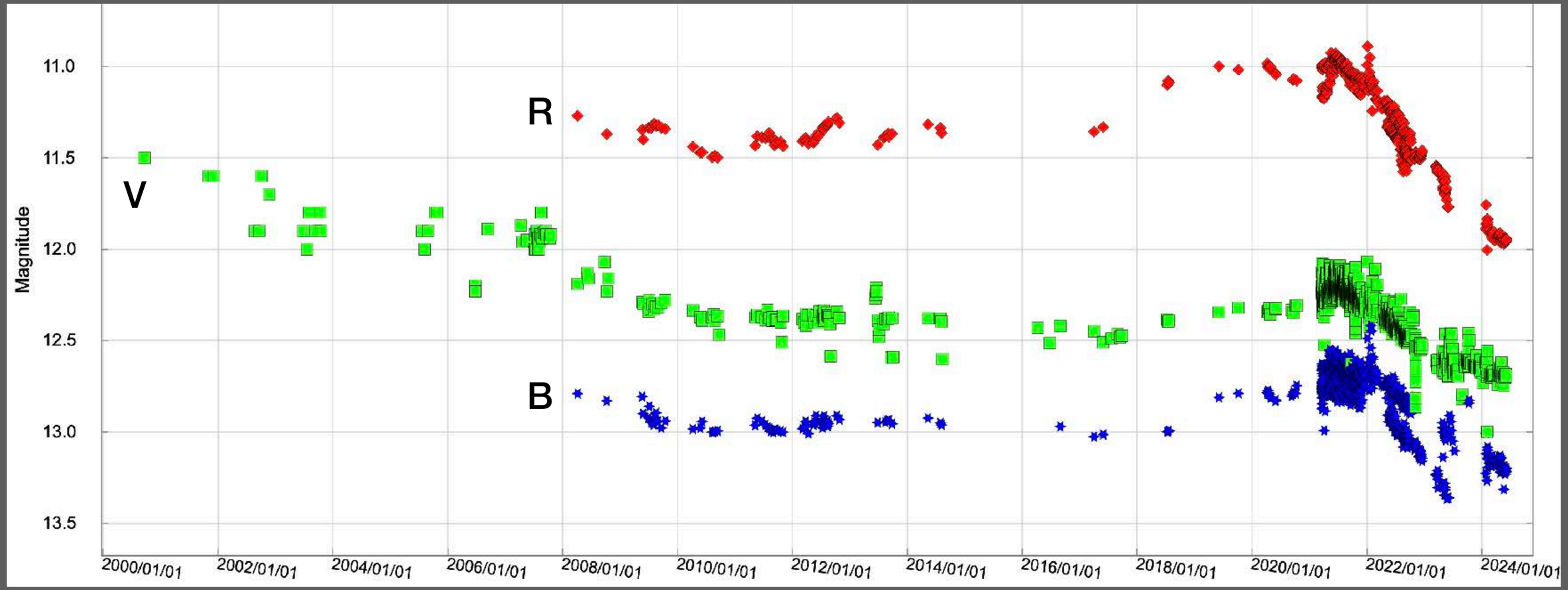
Build-up of accreted material leads to a thermonuclear outburst on the surface of the WD

The outbursting WD heats up and ionizes the surrounding region

Winds from the WD and the Mira variable collide and create shocks which heat the gas

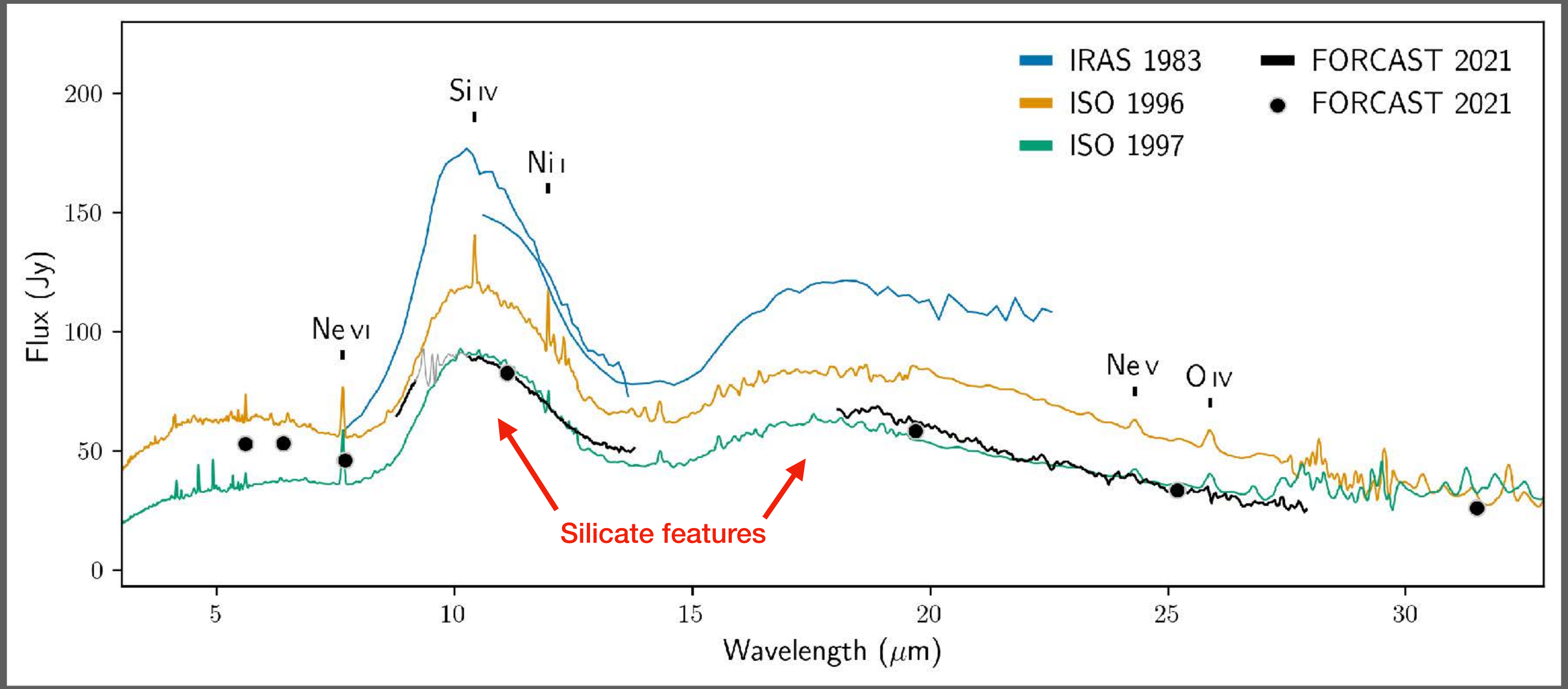
The system remains more or less in this state for many years, or even decades

Evolution of HM Sge - Light Curves

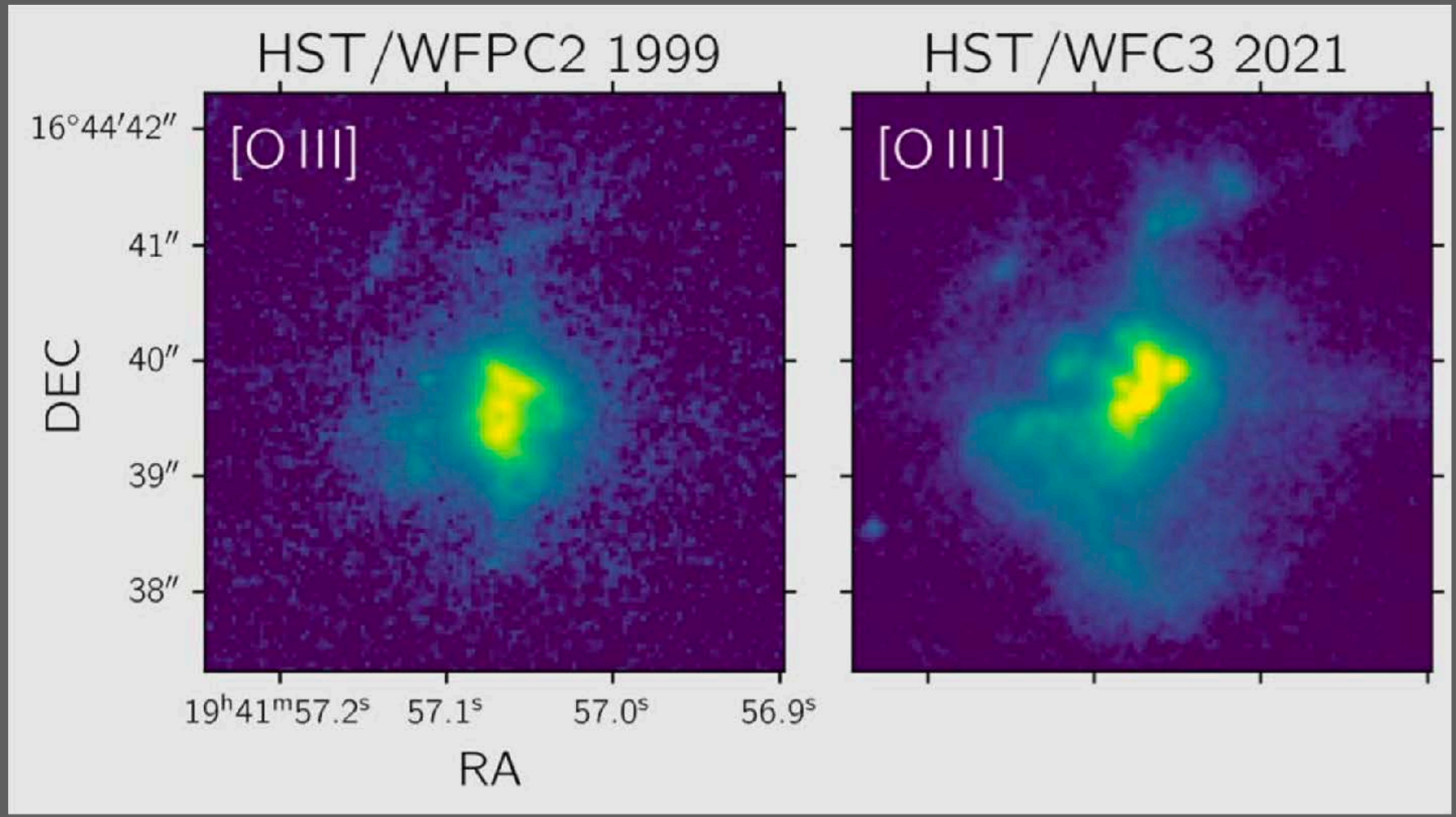


Data and plots from AAVSO

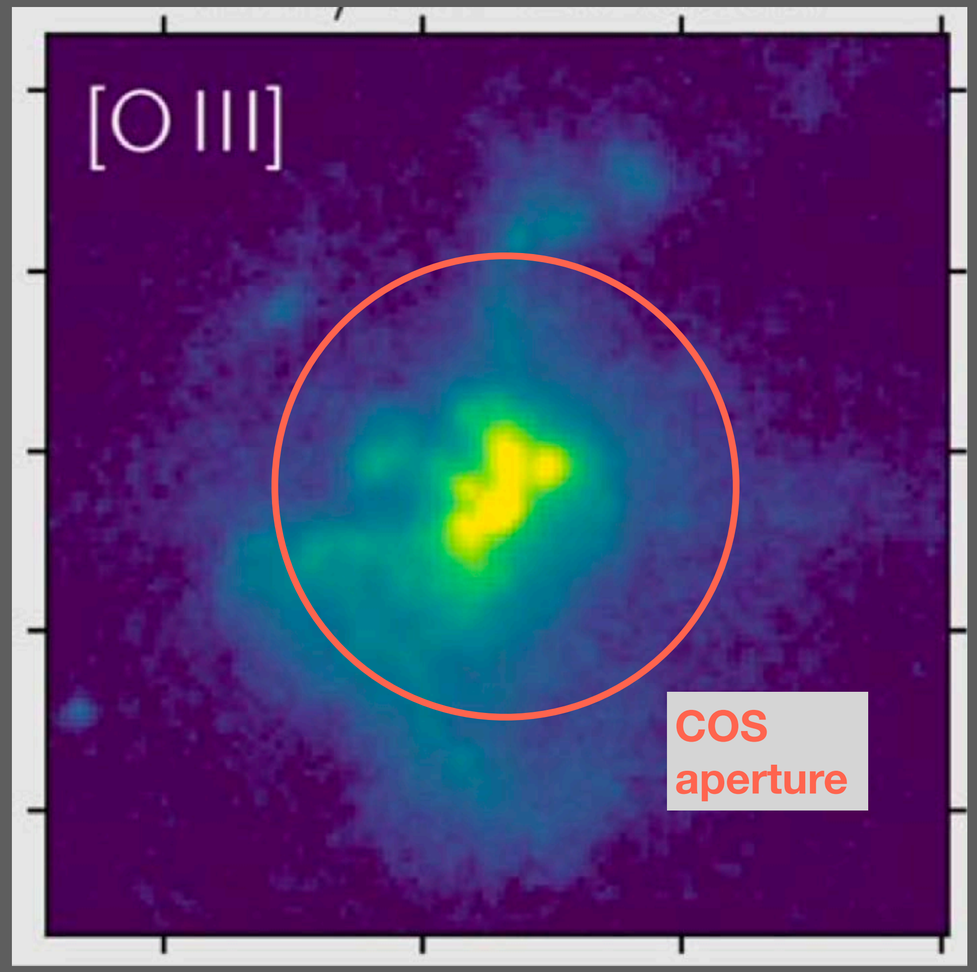
Evolution of HM Sge - Dust Emission in the Infrared



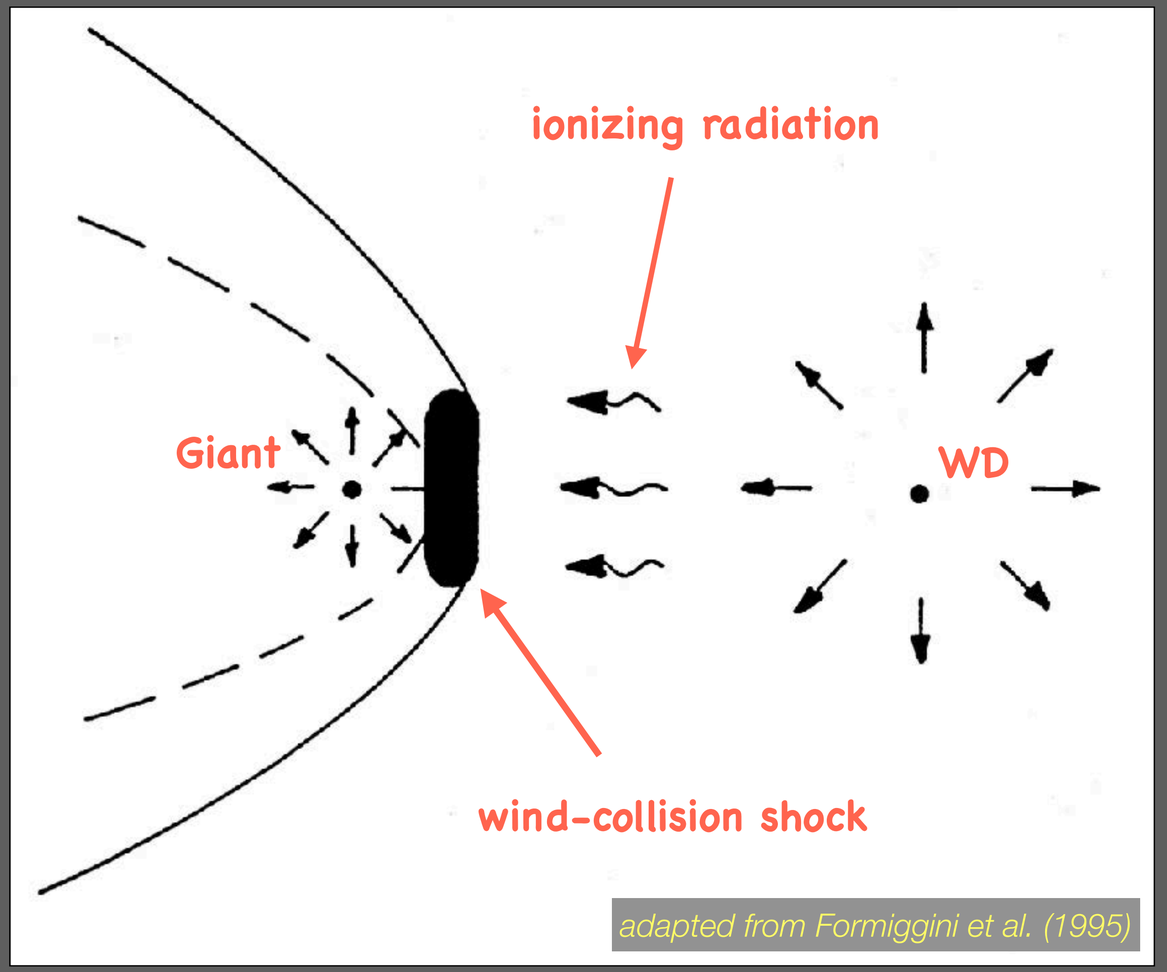
Evolution of HM Sge - Optical Nebula



Where is the ultraviolet emission coming from?

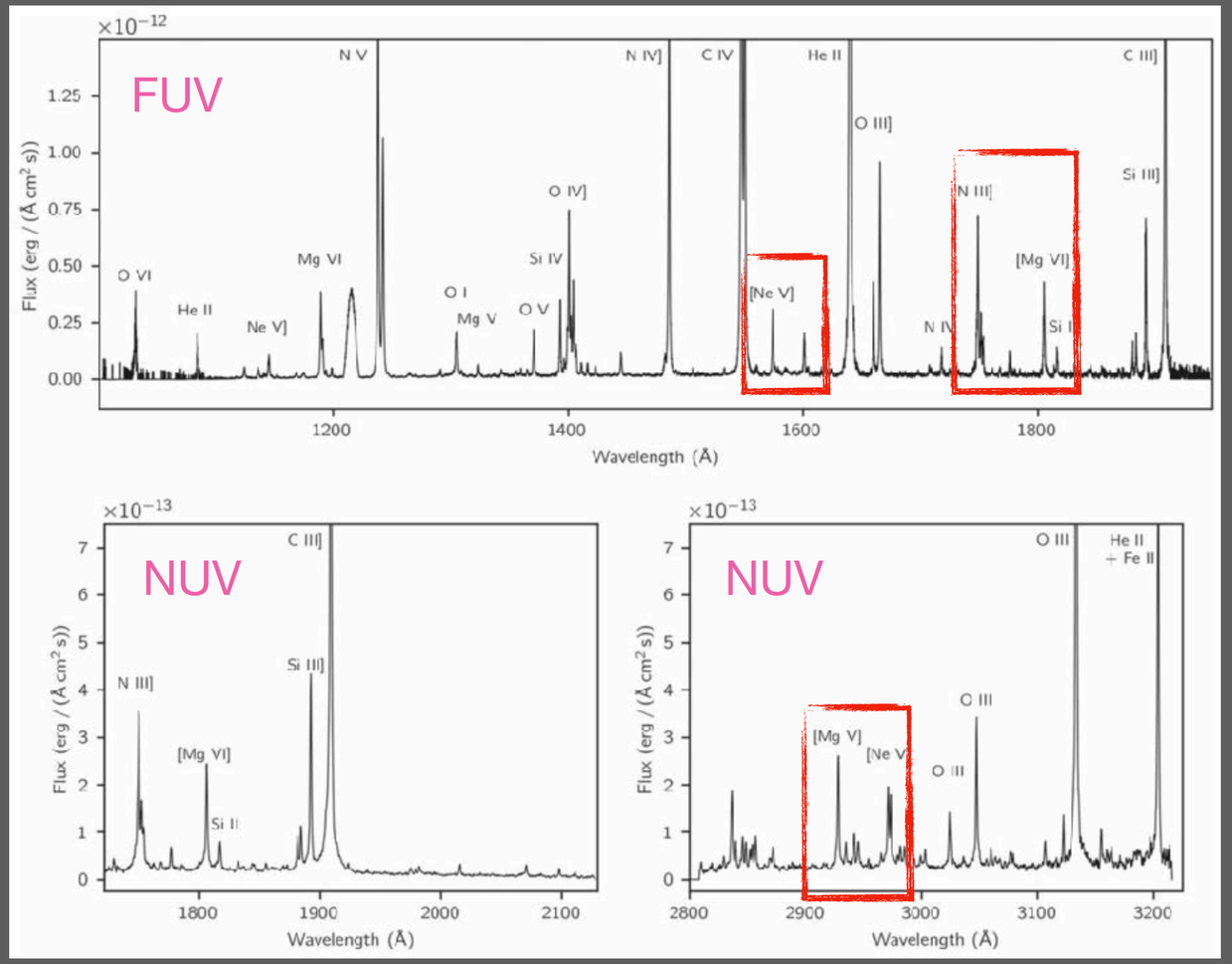


HM Sge is about 1 kpc away; the COS aperture projects about 2500 AU in diameter

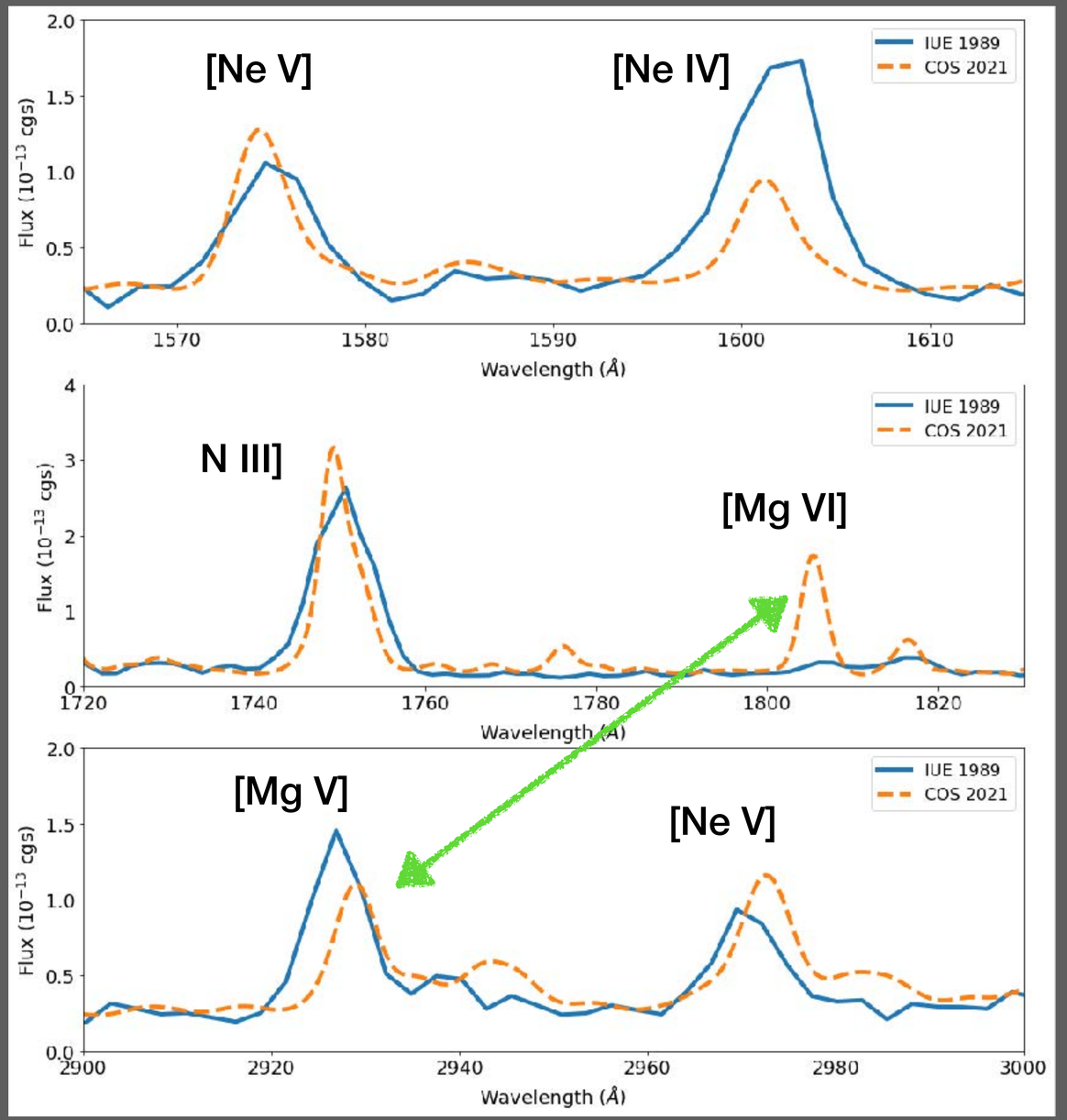


The binary separation is about 50 AU.

Evolution of HM Sge - UV Emission



COS Spectra



Summary and Future Directions

HM Sge has evolved in interesting ways in the last 20 — 30 years

The IR, Optical and UV probe different components of the symbiotic nova

- *the cool dust-producing Mira variable appears to have relaxed*
- *the extended nebula has expanded and its morphology has changed*
- *the ionizing source has become hotter; the shocked region persists*

The next step - build up a unified picture of how HM Sge has evolved

Outline ways in which we can identify symbiotic nova explosions in current and future time-domain studies and follow their evolution