Decreasing accretion and outflow in the peculiar eruptive young star V899 Mon

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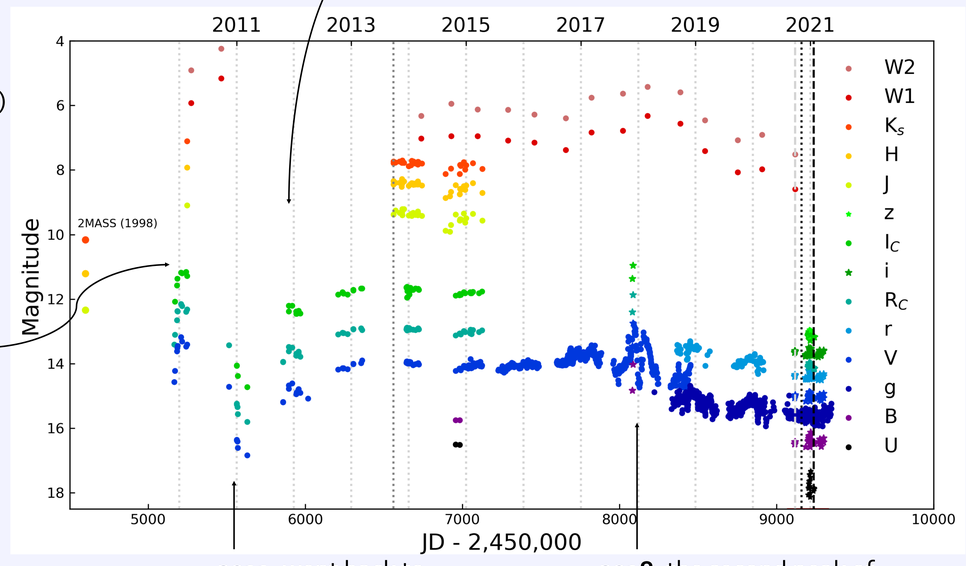
V899 Mon

- One of the eruptive YSOs which **shows photometric and spectroscopic characteristics of both FUors and EXors** (Ninan et al. 2015 and this work)
- The spectroscopic monitoring observations show **a number of emission lines** and **several P Cygni profiles** (Ninan et al. 2015)
- V899 Mon will provide an important opportunity to investigate how an eruptive YSO evolves after an outburst

2012: the second brightening started (Ninan+2015)

2009: the outburst was first noticed (Wils 2009)

2010: the brightness peak of the first outburst (Ninan+2015)



2011: went back to quiescent (Ninan+2015)

2018: the second peak of the outburst was reached

Fig 1. Light curve of V899 Mon including archival data and our observations. Black dotted and dashed lines indicate our spectroscopic observation date of NIR (IGRINS) and optical (MUSE) spectra. The dark gray dotted line indicates the observation date of Ninan et al. (2015).

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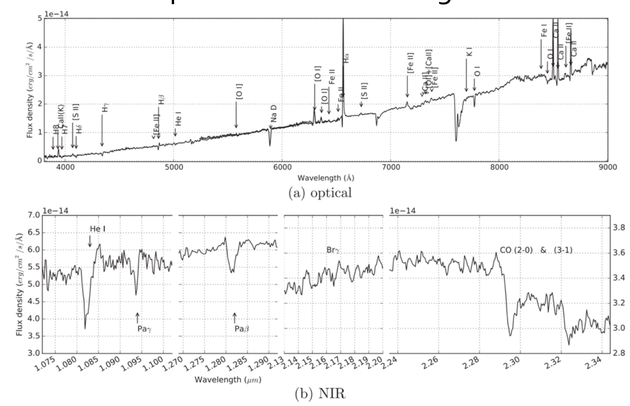
Accretion & Ejection

Absorption dominant during outburst



Emission dominant during fading

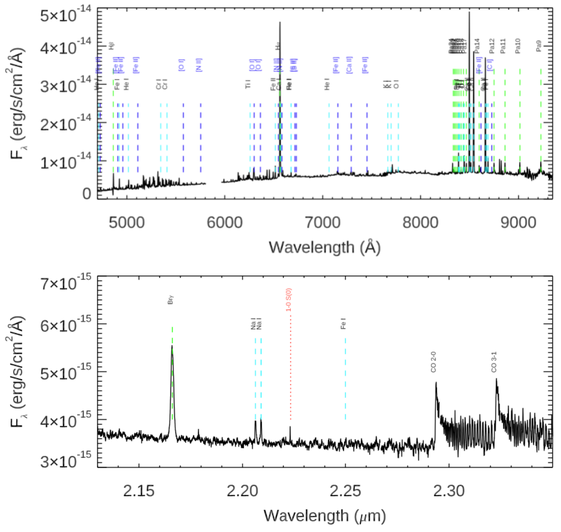


Fig 2. Optical and NIR spectra observed during the second outburst (left; Ninan et al. 2015) and during a relatively quiescent phase (right; this work).

- **Mass accretion rate ($\dot{M}_{acc}$)** during fading: **~ 2 x 10^{-7} $M_\odot$ yr^{-1}**
  → about one order of magnitude lower than those of outbursting stage (Ninan et al. 2015)
  ⇒ implying the weakening outburst, similar to those of CTTS and EX Lup (2 x 10^{-7} $M_\odot$ yr^{-1}; Aspin et al. 2010)
- **Mass loss rate ($\dot{M}_{loss}$)** during fading: **~ 2 x 10^{-8} $M_\odot$ yr^{-1}**
  → $\dot{M}_{loss}$ is lower than those of FUors, while similar to those of CTTS (Hartmann & Kenyon 1996, and references therein)
  → **$\dot{M}_{loss}$ is about 10% of $\dot{M}_{acc}$**, which is consistent with those of CTTS (Hartmann & Kenyon 1996; Hartmann 2009; Ellerbroek et al. 2013; Bally 2016)

- There are **significant changes in the spectral properties between the outburst (Ninan et al. 2015) and the fading (this work)**. Some of these changes are due to the weakening outburst, i.e., decreasing accretion and ejection rates.
- Our latest photometric and spectroscopic data show that **V899 Mon has almost completed its second outburst and is well on its way to returning to quiescence**.
- It now shows many characteristics similar to **T Tauri stars** and **EXors**.