

# Warm and hot circumstellar gas in V1647 Ori during the 2008-2009 outburst

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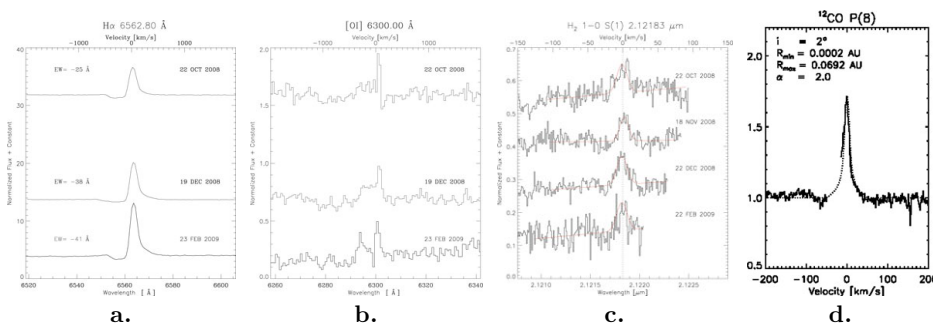
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\*M.A and A.C acknowledge support from a Swiss National Science Foundation grant (PP002-110504). Based on observations at the ESO-VLT (program ID: DDT 281C-5056).

**Abstract.** The pre-main sequence star V1647 Ori started a new outburst in August 2008. From October 2008 to February 2009 we monitored V1647 Ori, obtaining quasi-simultaneous VLT-CRIRES near-IR spectroscopy, VLT-VISIR mid-IR spectroscopy and VLT-FORS2 optical spectroscopy. We studied the evolution of H<sub>2</sub> and CO emission from hot and warm gas and H $\alpha$  and forbidden line-emission during the initial outburst phase of V1647 Ori. H $\alpha$  is observed in emission displaying P-Cygni profiles with blue-shifted absorption up to  $-700$  km/s, suggesting the presence of a high velocity wind (Fig. 1a). [OI] emission at 6300 Å is observed displaying a blue-shifted emission shoulder, indicating the presence of material moving away from the star (Fig. 1b). We detect H<sub>2</sub> 1-0 S(1) and CO (P4 to P14 and P30-P38) ro-vibrational lines centered at the velocity of the star at all epochs (Fig. 1c & d). This strongly suggests that the H<sub>2</sub> and CO emission originates from a disk and not from a warm outflow. The H<sub>2</sub> 1-0 S(0) and 2-1 S(1) ro-vibrational lines at 2.22 and 2.24  $\mu$ m and the pure-rotational H<sub>2</sub> 0-0 S(1) and 0-0 S(2) lines at 17 and 12  $\mu$ m were not detected in our spectra. Changes in the H $\alpha$  and [OI] profiles and the H<sub>2</sub> and CO emission observed do not correlate. We modeled the H<sub>2</sub> and CO line profiles assuming emission from a flat disk in keplerian rotation with line intensity decreasing with radius ( $I \sim I_0(R/R_{\min})^{-\alpha}$ ). We found that the disk of V1647 Ori is observed nearly face-on and that the line emission is produced within a fraction of an AU of the star (Fig. 1d).

**Keywords.** stars: pre-main-sequence, circumstellar matter, individual (V1647 Ori)



**Figure 1.** Panels a, b & c: H $\alpha$ , [OI] and H<sub>2</sub> 1-0 S(1) spectra observed. Panel d: Keplerian flat disk model of the CO P(8) line (Carmona *et al.* in preparation).