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

A. Carmona^{1,*}, M. Audard¹, M. van den Ancker², G. van der $Plas^{2,3}$, M. Goto⁴ and D. Fedele⁴

¹ISDC & Geneva Observatory, ch. d'Ecogia 16, 1290 Versoix, Switzerland email: andres.carmona@unige.ch

²European Southern Observatory, Karl Schwarzschild Str 2, D-85748 Garching, Germany ³University of Amsterdam, Kruislaan 403, NL-1098 SJ Amsterdam, The Netherlands ⁴Max-Planck Institute for Astronomy, Königstuhl 17, D-69117 Heidelberg, Germany

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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_2 and CO emission from hot and warm gas and $H\alpha$ and forbidden line-emission during the initial outburst phase of V1647 Ori. H α 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 H₂ 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_2 and CO emission originates from a disk and not from a warm outflow. The H_2 1–0 S(0) and 2-1 S(1) ro-vibrational lines at 2.22 and 2.24 μm and the pure-rotational H₂ 0–0 S(1) and 0–0 S(2) lines at 17 and 12 μ m were not detected in our spectra. Changes in the H α and [OI] profiles and the H_2 and CO emission observed do not correlate. We modeled the H_2 and CO line profiles assuming emission from a flat disk in keplerian rotation with line intensity decreasing with radius $(I \sim I_0 (R/R_{\rm min})^{-\alpha})$. 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)

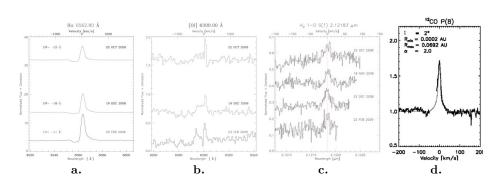


Figure 1. Panels a, b & c: $H\alpha$, [OI] and H_2 1-0 S(1) spectra observed. Panel d: Keplerian flat disk model of the CO P(8) line (Carmona *et al.* in preparation).