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Chemical abundances in the protoplanetary disk LV2 (Orion) - II: High dispersion VLT observations and microjet properties

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Integral field spectroscopy of the LV2 proplyd is presented taken with the VLT/FLAMES Argus array at an angular resolution of 0.31x0.31 arcsec^2 and velocity resolutions down to 2 km/s per pixel. Following subtraction of the local M42 emission, the spectrum of LV2 is isolated from the surrounding nebula. We measured the heliocentric velocities and widths of a number of lines detected in the intrinsic spectrum of the proplyd, as well as in the adjacent Orion nebula within a 6.6 x 4.2 arcsec^2 FoV. It is found that far-UV to optical collisional lines with critical densities, Ncrit, ranging from 10^3 to 10^9 /cm^3 suffer collisional de-excitation near the rest velocity of the proplyd correlating tightly with their critical densities. Lines of low Ncrit are suppressed the most. The bipolar jet arising from LV2 is spectrally and spatially well-detected in several emission lines. We compute the [O III] electron temperature profile across LV2 in velocity space and measure steep temperature variations associated with the red-shifted lobe of the jet, possibly being due to a shock discontinuity. From the velocity-resolved analysis the ionized gas near the rest frame of LV2 has Te = 9200 +/- 800 K and Ne ~ 10^6 /cm^3, while the red-shifted jet lobe has Te ~ 9000 - 10^4 K and Ne ~ 10^6 - 10^7 /cm^3. The jet flow is highly ionized but contains dense semi-neutral clumps emitting neutral oxygen lines. The abundances of N+, O++, Ne++, Fe++, S+, and S++ are measured for the strong red-shifted jet lobe. Iron in the core of LV2 is depleted by 2.54 dex with respect to solar as a result of sedimentation on dust, whereas the efficient destruction of dust grains in the fast microjet raises its Fe abundance to at least 30 per cent solar. Sulphur does not show evidence of significant depletion on dust, but its abundance both in the core and the jet is only about half solar.

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