Massive open star clusters using the VVV survey II. Discovery of six clusters with Wolf-Rayet stars

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Context: The ESO Public Survey "VISTA Variables in the Vía L'actea" (VVV) provides deep multi-epoch infrared observations for an unprecedented 562 sq. degrees of the Galactic bulge, and adjacent regions of the disk. In this survey nearly 150 new open clusters and cluster candidates have been discovered.

Aims: This is the second in a series of papers about young, massive open clusters observed using the VVV survey. We present the first study of six recently discovered clusters. These clusters contain at least one newly discovered Wolf-Rayet (WR) star.

Methods: Following the methodology presented in the first paper of the series, wide-field, deep JHKs VVV observations, combined with new infrared spectroscopy, are employed to constrain fundamental parameters for a subset of clusters. Results: We affirm that the six studied stellar groups are real young (2-7 Myr) and massive (between 0.8 and 2.2 10^3 Msol) clusters. They are highly obscured (Av ~ 5-24 mag) and compact (1-2 pc). In addition to WR stars, two of the six clusters also contain at least one red supergiant star. We claim the discovery of 8 new WR stars, and 3 stars showing WR-like emission lines which could be classified WR or OIf. Preliminary analysis provides initial masses of ~30-50 Msol for the WR stars. Finally, we discuss the spiral structure of the Galaxy using as tracers the six new clusters together with the previously studied VVV clusters.

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