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The early dynamical evolution of massive clusters and the production of runaway O stars

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Young massive clusters provide an ideal place to study the outcome of the star-formation process and the early dynamics of star clusters. With Gaia (E)DR3, we have studied the young massive clusters NGC 6611 in the Eagle Nebula (M16) and NGC 6618 in the Omega Nebula (M17). We determine membership and age of the cluster and search for stars that may have originated in the cluster. For NGC 6611, we identify two stellar populations: the younger population has an age = 1.3 ± 0.2 Myr, while the older population has an age = 7.5 ± 0.4 Myr and is more spatially extended than the younger population. NGC 6618 is heavily extincted (A_V ~ 5 to 15 mag) and is likely younger than 1 Myr.

We find that both NGC 6611 and NGC 6618 have ejected a significant fraction (~ 33%) of their original O star members within the first Myr through dynamical interactions. These O runaways can be traced back to the centre of their parent cluster, with kinematic ages consistent with the isochrone age of the cluster. This provides evidence that the kinematic ages of dynamically ejected runaways can be used as an indicator for the age of a cluster.

These results indicate that dynamical interactions play an important role in the early evolution of young massive clusters. On their way, the stellar winds, ionising radiation and supernovae of these O-type runaways will have a strong impact on the ambient medium, affecting the evolution of our Milky Way.

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