Gaia’s view of open clusters: a case study of R136 in the Large Magellanic Cloud

Jos de Bruijne and Guido De Marchi
Research and Scientific Support Department (RSSD), European Space Agency (ESA)

Abstract
Gaia's next space astrometric mission of the European Space Agency (ESA), building on the heritage of its predecessor Hipparcos, will survey the sky and repeatedly observe the brightest ~1,000 million objects during its 5-year lifetime, down to 20th magnitude. Gaia's science data comprises absolute astrometry, broadband photometry, and two-colour spectroscopy. Medium-resolution spectra will be obtained for the brightest ~150 million sources, down to 17th magnitude. Stellar parallaxes (distances) will be measured with standard errors below 10 microarcsecond (mas) for stars brighter than 13th magnitude, ~25 mas for stars at 15th magnitude, and ~300 mas at magnitude 20. Photometric standard errors are in the milli-magnitude regime. The spectroscopic data will allow the measurement of rotation-averaged radial velocities with errors at the level of 15 km/s at magnitude 15. Gaia’s primary science goal is to unravel the kinematical, dynamical, and chemical structure and evolution of the Milky Way. In addition, Gaia's data will touch many other areas of research, for instance stellar evolution and physics, solar-system bodies, fundamental physics, and exoplanets.

Gaia will observe thousands of open clusters in the galactic disk but will also reach clusters in the Magellanic Clouds. This poster presents a case study of the massive cluster R136 in the Large Magellanic Cloud. Through simulations using the on-board object detection software in combination with a cluster membership list based on deep HST images, we find that, even in this massively dense and crowded environment, Gaia is capable of detecting stars down to 20th magnitude. The main sequence of the cluster, as well as the field star red-clump, are representatively sampled.

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