Photometry of Astronomical Sources: A Search for New Members of the Eta Chamaeleontis Open Cluster and the Case for a Light Echo for Type Ia SN 1995E

Abstract

by

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Several photometric studies are presented of a few star clusters and a supernovae light echo search. Globular clusters NGC 6791 and NGC 5053 and open cluster NGC 6791 are reduced in a homogeneous fashion yielding estimates of the distance moduli and extinctions and a possible color-gradient detection. A six-band optical/infrared survey of the recently-discovered nearby (97 ± 4 pc) open cluster Eta Chamaeleontis is undertaken resulting in the identification of 11 new candidate members. A light echo candidate from Hubble Space Telescope imaging of NGC 2441 is identified in the host galaxy of the Type Ia supernova 1995E. From the echo’s angular size and the estimated distance to the host galaxy, we find a distance of 207 ± 35 pc between the dust and the site of the supernova. If confirmed, this echo brings the total number of observed non-historical Type Ia light echoes to three — the others being SN 1991T and SN 1998bu — suggesting they are not uncommon. We compare the properties of the known Type Ia supernova echoes and test various models of light echoes. HST photometry of the SN 1991T echo shows a fading which is consistent with scattering by dust distributed in a sphere or shell around the supernova.