The Spectra of Bright Near-IR Clusters in M82

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Abstract. Based on new spectra spanning wavelengths from 0.8 to 2.4 μm,
we study the properties of bright near-IR clusters in M82. We focus on age and
extinction, which are critical parameters when one uses dynamical masses to
constrain the stellar IMF. The modelling of red supergiant evolution by various
authors leads to very significant differences in synthetic cluster spectra. Near-
IR fluxes alone therefore do not rule out a normal IMF for cluster F, previously
found to be deficient in low mass stars. Combined optical and near-IR studies
are being undertaken.

The spectra of four bright near-IR clusters and of the nucleus of M82 were
obtained with SpeX on IRTF (NASA/Hawaii). Synthetic spectra of cluster pop-
ulations were constructed using the evolutionary tracks of the Padova group, a
standard IMF, and the BaSeL library of stellar spectra, into which new SpeX
supergiant spectra were inserted. Note that at solar metallicity the T_{eff} distri-
bution of the red supergiants populating the Padova isochrones peaks around
3900 K (M stars contribute relatively little), while the predominant T_{eff} is cooler
with the tracks of the Geneva group (at least for a range of ages). Tracks in-
cluding rotation are different again.

We built χ^2-maps in age-extinction space for all targets and find that:
(1) all targets are dominated by red supergiants, including cluster F and the
previously overlooked cluster observed in the Eastern "fossil starburst" region;
(2) with the Padova tracks, age discrimination is strong between 5 and 10 Myr,
but weak between 12 and 60 Myr; for cluster F, our best fit is at 10 Myr with
A_V=1.9, which would make the dynamical mass of Smith & Gallagher (2001,
MNRAS 326, 1027) consistent with a normal IMF; their age of $\sim$60 Myr is how-
ever not excluded;
(3) estimated ages depend strongly on the assumed metallicity and stellar rota-
tion; work with a variety of tracks is necessary.
More robust constraints on age, intrinsic luminosity and thus the IMF will be
obtained by using optical and near-IR spectra jointly. This will also constrain
red supergiant evolution models.