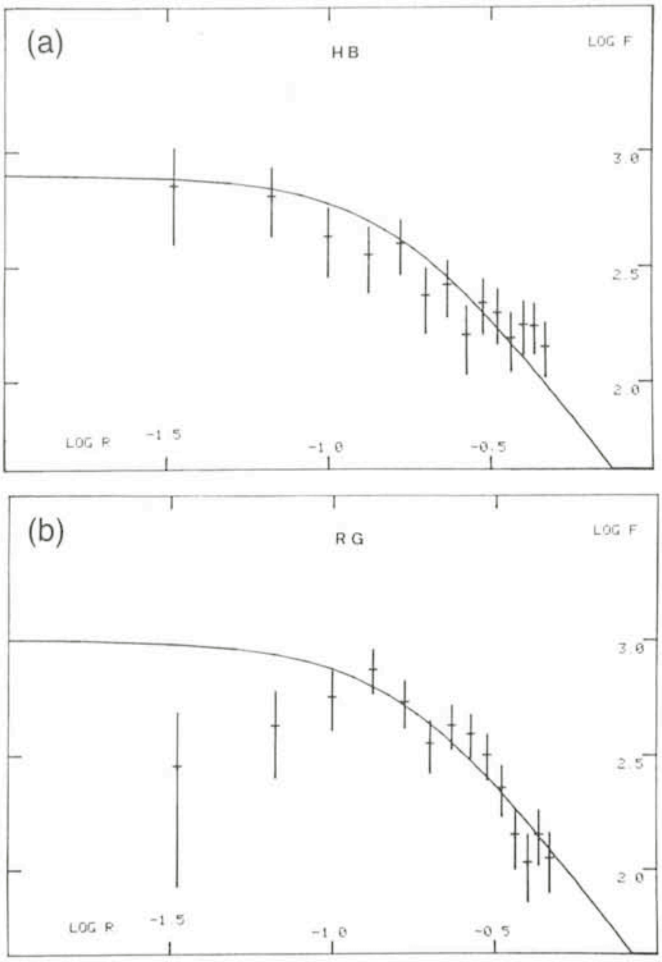

Fig. 3: (a) *(log, log) diagram of the projected density (crosses) for the horizontal branch stars located in the central part of M 15. Crosses are fitted by King's model curves. F: star number by square arcmin. R: distance to cluster in arcmin.* (b) *Same as* (a) *for red giants.*

Pictures with resolution near 0.5″ (taken with the 1 m and 2 m telescopes at Pic-du-Midi Observatory) have enabled us to resolve the central condensation of M 15 into 5 rather faint stellar objects of B-V compatible with common stars of M 15. Spectroscopic observations (Newell B. et al., 1976, *Astrophys. J.*, **208**, L 55; Leroy J.-L., unpublished) confirm that the central condensation in M 15 may not be necessarily composed of exotic objects. As a last observational argument, Einstein X-ray observatory observations have not supported the massive black-hole hypothesis. X-ray sources associated with globular clusters have been found in the cores of these objects but not at their very centre (Grindlay 1980 – Preprint No. 1434 – Center for Astrophysics). In the case of M 15 for which a catalogue of 734 star positions has been obtained (Aurière and Cordoni, 1981, *Astron. Astrophys.* in press) we have been able to locate exactly the X-ray source from Grindlay's position (± 2″). It falls at about 6.5″ from the central condensation in a place without resolved stars. The nearest resolved stars at 1.5″ are two close red giants.

Our photometric data concerning the central part of globular clusters were also used to obtain the B and V magnitudes of individual stars. This is done thanks to a special computing procedure described elsewhere. It enables us to plot the colour-magnitude diagram for stars which are spatially different from those which are generally studied. In the case of M 15 (Fig. 2) we were able to confirm the gaps found by Sandage et al. in the red giant branch (1968, *Astrophys. J.*, **152**, L 129) and to suggest a different slope for this branch. We also used this diagram and the known positions of the corresponding stars to study relative distributions of stars at different stages of evolution and to approach the problem of mass segregation. Dynamical models predict different radial distributions for stars of different masses. Mass loss between red giant and horizontal branches (about 20 % of the initial mass) may give an opportunity to observe the phenomenon. However, this would be observable only in clusters where the relaxation time is less than, or of the order of, the life-time on the horizontal branch. If we suppose this life-time to be about 10^8 years for the stars involved (Caputo et al., 1978, *Monthly Notices of the Royal Astronomical Society*, **184**, 377), the only objects concerned are the central part of concentrated globular clusters. For example, the central relaxation time of M 15 is about 10^8 years, that of NGC 6397 about $2 \cdot 10^7$ years. Fig. 3 illustrates a problem which is encountered when counting the number of evolving stars in a globular cluster core. Their number is small so that statistical fluctuations may mask a possible mass segregation. To elude this problem, we are gathering data for several comparable clusters and will add them.

ESO COUNCIL DECISION

At its last meeting on June 4, 1981, the ESO Council has decided that the title of Dr. A. Ardeberg will be changed from "Astronomical director at La Silla" to "Director at La Silla".

Observations at La Silla

The observing run at La Silla for this programme fell in June 1980. I was not lucky enough to catch excellent seeing in this winter period. The very performant 1.5 m Danish telescope and the adapted instrumentation enabled us to secure several tens of exposures in two nights of effective observation. The spatial resolution of the best short exposures is of about one arc second, which is enough to solve some problems as we will see next. I will present observations made on 3 particular clusters.

The first is 47 Tuc, one of the most famous globular clusters. Fig. 1 shows its core almost completely resolved in its bright stars although it is very concentrated. Fig. 1 is a good complement to classical images showing the whole object but with the central part completely unresolved. The run was only exploratory for this object which was observed far from the meridian. This young cluster (about 10^{10} years) is rather close (at about 5 kpc); it is puzzling because it presents a well-established radial colour variation. Furthermore, from Grindlay's observations with the Einstein Observatory, its core is known to be associated with an X-ray source. We hope that our observations will explain the radial colour variations (in term of variations of the luminosity function of the red giant branch?)

NGC 6397 was one of the main targets of the run: it is one of the two nearest globular clusters, at 2.4 kpc, that is four times nearer than the classical M 3, M 15 . . . famous in the northern sky. This means that observations with 0″.5 seeing, already encountered at La Silla, would place one in a position very near to observing M 3, M 15 . . . with the Space Telescope! Moreover, NGC 6397 has two very important characteristics from the dynamical point of view: it is very old ($17 \cdot 10^9$ years according to Alcaíno and Liller, in Star Cluster, IAU Symposium No. 85, p. 423) and its central relaxation time is small ($2 \cdot 10^7$ years). So