S0s - Formation and Mass

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Introduction

Several mechanisms may lead to the formation of an S0 galaxy including mergers or star formation truncation in Spirals. In order to study the relative importance of such mechanisms and to allow the accurate determination of the mass function of S0s we have undertaken two studies of S0 stellar populations and dynamics. The first study makes use of extremely deep (~2 hours integration) Gemini/GMOS longslit spectroscopy along the major and minor axes of 20 local edge-on S0s (Fig. 1.). These data are of sufficient quality to probe stellar populations and kinematics from stellar absorption lines beyond 2R_e. The primary aim of this study is to examine gradients in stellar population parameters (age, metallicity and α-element enhancement) in S0 disks and bulges to place constraints on the possible formation mechanisms.

Results - Gemini/GMOS

Applying the previously mentioned corrections for asymmetric drift etc. it is possible to construct an S0 Tully-Fisher relation for the S0s examined as part of our Gemini study (Fig. 2). It is found that the S0s are systematically offset from the Spiral TFR in the sense expected if these S0s represent faded Spirals. The best fitting Single Stellar Population (SSP) models were determined for the central (bulge) and disk to determine age, [Z/H] and [α/Fe]. The S0 sample spans a wide range in both age and metallicity, but most interestingly the age of the bulge and disk components is found to correlate with the individual S0 offsets from the Spiral TFR relation (Fig. 3.).

Results - SOAR/Goodman

Examination of the first 10 S0s observed as part of our SOAR/Goodman study has demonstrated that all 10 display measurable gas emission in their inner regions. 5 of the sample display gaseous rotation curves which extend to the flat portion of the rotation curve [See Fig. 5.], including one which is counter-rotating. Application of more sophisticated methods of analysing spectroscopy containing weak emission (i.e the GANDALF code [Sorzi et al. 2006]) will likely increase the fraction of galaxies for which gas and stellar rotation curves extend to sufficient radii to allow direct comparison in the region where the rotation curve becomes flat.

Abstract

We present first results from a pair of complementary studies which aim to illuminate the formation and evolution of S0 galaxies. These studies examine the stellar populations, kinematics and masses of S0 galaxies in the nearby Universe.

Based on observations obtained at the Gemini and SOAR observatories.