

Evolution of the anti-truncated stellar profiles of S0 galaxies since $z=0.6$ in the SHARDS survey

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Abstract. Lenticular galaxies (S0s) are more likely to host anti-truncated (Type III) stellar discs than galaxies of later Hubble types. Previous work on Type-III S0s at $z = 0$ revealed that the characteristic parameters of the breaks obey tight scaling relations (Borlaff *et al.* 2014). These relations are similar in both S0s and spirals, in optical and NIR, and for barred and non-barred galaxies (Eliche-Moral *et al.* 2015). We have analysed 3DHST images (Brammer *et al.* 2012) of S0 galaxies from the SHARDS survey (Pérez-González *et al.* 2013) in order to investigate if E/S0 and S0 galaxies with anti-truncated stellar profiles up to $z \sim 0.6$ follow similar scaling relations compared to the local sample. We find that the characteristic photometric parameters of Type-III S0s at $0.4 < z < 0.6$ obey analogous scaling relations to those observed in their local counterparts, lying on top of the extrapolations of the local trends towards brighter magnitudes in several photometric diagrams and sharing similar trends and values in the $h_i - R_{\text{brkIII}}$, $h_o - R_{\text{brkIII}}$ and $h_i - h_o$ diagrams. We have measured the offsets in magnitudes between two subsets of the $z \sim 0.5$ and $z = 0$ samples with similar masses ($\log_{10} M/M_{\odot} \sim 10.7$). The median offsets are: $\Delta\mu_{\text{brkIII}} = -2.23_{-0.62}^{+0.46}$, $\Delta\mu_{0,i} = -2.61_{-0.26}^{+0.31}$ and $\Delta\mu_{0,o} = -2.31_{-0.78}^{+0.57}$ mag arcsec⁻². We find that PSF corrections in our images do not significantly affect the scaling relations obtained in our $0.2 < z < 0.6$ sample. In conclusion, the existence of similar scaling relations in Type-III S0 discs since $z \sim 0.6$ implies that the structures of the inner and outer discs in anti-truncated S0s have been similarly linked in the last ~ 6 Gyr, posing strong constraints to the processes proposed to explain their formation.

Keywords. Galaxies: evolution – galaxies: fundamental parameters – galaxies: structure

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