

Put a ring on it: the origin of star-forming rings in S0 galaxies.

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Abstract

The examination of the spatially resolved IFS maps in a sample of more than 500 lenticular (S0) galaxies drawn from the MaNGA survey has unveiled the existence of transient inner annular structures ($\langle R \rangle \sim 1 R_e$) betraying ongoing star formation in a good number of these objects. Activity gradients in these galaxies have been measured through a novel methodology based on the principal component analysis of their optical spectra averaged over bins of galactocentric radius. We find that the sign of these gradients is closely linked to the presence of rings in the spectral maps, which are specially conspicuous in the equivalent width of H α -emission, EW(H α), with a fractional abundance —22–37% depending on the strictness of ring identification— larger than that inferred from optical imaging. While the numbers of S0s with globally positive, negative, and flat activity gradients are comparable, star-forming rings are found almost exclusively in objects with a positive slope for which quenching proceeds inside-out, in good agreement with predictions from cosmological simulations studying S0 buildup. The assessment of these structures and the properties of the galaxies harboring them also indicates that the frequency of such rings increases with the mass of their hosts, that they feed mainly on the gas from the disks, that are more short-lived in galaxies with ongoing star formation, and that the local environment does not play a relevant role in their formation. From the present analysis, we conclude that the presence of rings in the EW of the H α emission line is a common phenomenon among fully formed S0s, possibly associated with annular disk resonances driven by weakly disruptive mergers preferentially involving the more massive representatives of these galaxies and their smaller and closer satellites.

My poster is available at <https://zenodo.org/record/7043398#.Y24MEtLMJhE>