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Bulge-driven quenching in KILOGAS: separating classical bulges, pseudobulges and disks with SPADE

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Bulges are implicated in quenching, but which bulges, and how they quench galaxies (gas-driven or efficiency-driven), remain open questions. We present SPADE (Spectro-Photometric Analytic Decomposition Engine), a new method that fits imaging, integral-field stellar kinematics and stellar-population spectra of a galaxy simultaneously under one likelihood to separate a bulge from a disk, and uses the joint evidence to distinguish classical bulges from pseudobulges. We apply SPADE to 450 galaxies from KILOGAS, an ALMA CO(2-1) survey at kiloparsec resolution of MaNGA and SAMI galaxies, assigning every star-forming, green-valley and quiescent galaxy a bulge type and every spaxel a bulge or disk membership. Combining this with the resolved star-forming main sequence, molecular gas main sequence and Kennicutt-Schmidt relation, we measure how far classical bulge, pseudobulge and disk regions deviate from these resolved scaling relations as a function of radius. We then decompose the specific star-formation-rate deficit into a gas-fraction term and a star-formation-efficiency term. Classical bulges in green-valley galaxies fall well below their own disks in star formation, and most of that deficit is a loss of efficiency rather than of gas, driven by a growing fraction of regions that have stopped forming stars. Pseudobulges show no such suppression, and the gas deficit that does exist is concentrated in regions where CO is undetected. These results favour quenching that begins inside classical bulges as a failure to convert gas into stars, with gas loss following rather than leading.

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Yes

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Galaxies

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