We present the distribution and kinematics of the molecular gas in the circumnuclear disk (CND, 400 pc × 200 pc) of Centaurus A with resolutions of ~5 pc (0. ″3) and shed light onto the mechanism feeding the Active Galactic Nucleus (AGN) using CO(3–2), HCO⁺(4–3), HCN(4–3), and CO(6–5) observations obtained with ALMA [2]. Multiple filaments or streamers of tens to a hundred parsec scale exist within the CND, which form a ring-like structure with an unprojected diameter of 162 pc × 108 pc and a position angle $\text{PA} \approx 155^\circ$. Inside the nuclear ring, there are two leading and straight filamentary structures with lengths of about 30–60 pc at $\text{PA} \approx 120^\circ$ on opposite sides of the AGN, with a rotational symmetry of 180° and steeper position-velocity diagrams, which are interpreted as nuclear shocks due to non-circular motions. Along the filaments, and unlike other nearby AGNs, several dense molecular clumps present low HCN/HCO⁺(4–3) ratios (< 0.5). The filaments abruptly end in the probed transitions at $r \approx 20$ pc from the AGN, but previous near-IR H$_2$(J=1–0)S(1) maps show that they continue in an even warmer gas phase ($T \approx 1000$ K), winding up in the form of nuclear spirals, and forming an inner ring structure with another set of symmetric filaments along the N–S direction and within $r \approx 10$ pc. The molecular gas is governed primarily by non-circular motions, being the successive shock fronts at different scales where loss of angular momentum occurs, a mechanism which may feed efficiently powerful radio galaxies down to parsec scales.

References


Figure 1: Kiloparsec to parsec scale view of the molecular disk of Cen A (NGC 5128): a) Integrated CO(2–1) emission map (green) observed using the Submillimeter Array (SMA, [1]). The circumnuclear disk is just perpendicular to the X-ray/radio jet (red, Chandra). A more extended molecular gas component in form of spiral arms [3] is seen. b) Composite image of the CND of Cen A including the ALMA CO(3–2) (green) and CO(6–5) (blue) integrated intensity maps, as presented in [2]. The distribution of molecular hydrogen as traced by the H$_2$ line (red) is mostly contained within a field of view of 54 pc. The cross sign in the center of the image shows the AGN position.