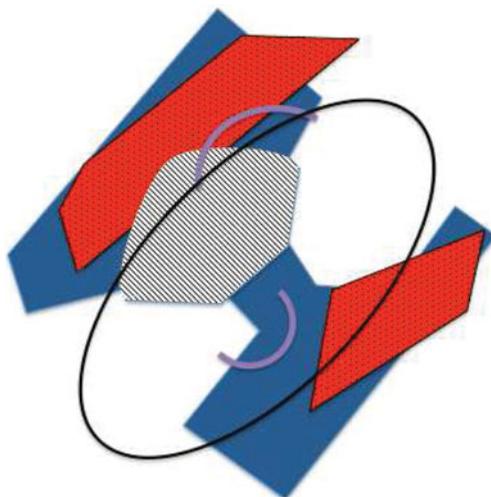


# A far-IR and optical 3D view of the starburst driven superwind in NGC 2146

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Galaxy outflows are a vital mechanism in the regulation of galaxy evolution through feedback and enrichment. NGC 2146, a nearby infrared luminous galaxy (LIRG), presents evidence for outflows along the disk minor axis in all gas phases (ionized, neutral atomic and molecular). We present new far-IR Herschel imaging and spectroscopy of this galaxy from the Key Insights on Nearby Galaxies: a Far-Infrared Survey with Herschel (KING-FISH) project, as well as new optical integral field unit spectroscopy, to map the kinematics and gas excitation in the central 5 kpc and trace the dust distribution (Kreckel *et al.* 2014). We observe an increased velocity dispersion in the [OI] 62  $\mu\text{m}$ , [OIII] 88  $\mu\text{m}$ , [NII] 122  $\mu\text{m}$  and [CII] 158  $\mu\text{m}$  fine-structure lines that is spatially coincident with shocked gas above and below the disk. Unhampered by extinction, the far-IR lines trace the outflow to the base of the superwind at the disk center, and we discuss the potential for using [CII] as a tracer of outflows such as this in high redshift systems with ALMA. The stellar kinematics are decoupled from the disk rotation seen in all gas phases, which we attribute to a merger that has not produced a fully elliptical morphology.



**Figure 1.** Diagram of outflow indicators in NGC 2146, relative to the stellar disk (black oval). Previous identification of the superwind in soft X-ray emission from hot gas (white hatched) and CO molecular outflows (purple arcs) are consistent with the far-IR [CII] emission from atomic gas in the cone walls (solid blue) and optically identified shock excitation (red dotted).

**Reference**

Kreckel, K., Armus, L., Groves, B., *et al.* 2014, *ApJ*, 790, 26