The outflows from young stellar objects provide important clues to the nature of the underlying accretion-ejection mechanism. We present unique high-resolution multi-epoch spectroimaging data of the outflows from the young stellar object DG Tauri, obtained using the Near-infrared Integral Field Spectrograph (NIFS) on Gemini North. These data reveal the presence of recollimation shocks, jet acceleration, entrainment, and bipolar outflow asymmetry, which we model to create a picture of the DG Tau system.

**Observations**

1. **Stationary recollimation shock**
   - The approaching outflow is dominated by shock-excited 'knots'. In addition, we detect the presence of a stationary knot ~ 50 AU from the central star, which we interpret to be a jet recollimation shock [1].
   - Stationary shock feature, occurs in sufficiently fast MHD winds [4,5].
   - Magnetic collimation force overcomes thermodynamic force of expanding, rotating outflow material, causing recollimation into a 'diamond shock'.
   - Analogous to Mach disks observed in jet engines.
   - X-ray [6, 7, 8] and FUV [9] observations show a stationary feature with peak temperatures > 10^5 K, followed by cooling over 100-20 AU.

2. **Jet kinematics and rotation**
   - Jet velocities inconsistent with being intrinsic variations that cause moving knots; steady-state acceleration model required.
   - Assuming constant jet total power and mass flux (as observed), we form a magnetised Bernoulli-type equation:
     \[ \frac{1}{2} v_j^2 + \frac{1}{2} B^2 + \frac{1}{2} \frac{\rho}{\rho_0} \chi \frac{\rho}{\rho_0} v_j^2 = \text{const.} \]
   - A jet is a wide-angle molecular wind that provides material for jet to entrain [13].
   - Passage through recollimation shock is likely to mask any rotation signal present.
   - Changing position of the jet centre (ridgeline) must be taken into account.

3. **Turbulent entrainment by the jet**
   - Wide-angle molecular wind provides material for jet to entrain [13].
   - Toroidal magnetic field which collimates the jet destabilizes the jet-wind interface to the Kelvin-Helmholtz instability [1, 14, 15]. Leads to the formation of a turbulent, shock-excited entrainment layer, producing shock-excited [Fe II] emission.
   - We have successfully modeled this entrainment process using an analytical two-dimensional 'slab' model and turbulent MHD - stay tuned! [3].

4. **Receding outflow bubble**
   - We have modeled this structure as a receding clumpy molecular envelope around DG Tau [16]. The jet then creates a momentum-driven bubble [2].
   - No mixed blue/redshifted emission → cannot be a bow shock.
   - The jet drives a momentum-driven bubble as it searches for an 'escape path', similar to the propagation of AGN jets [17,18].
   - We modify a previous momentum-driven bubble model [19]. We assume the DG Tau system drives symmetric jets with equal age, mass, total jet power, and velocity, and that the bubble has elongation (2-4) × 10^4 AU - 10^5 AU.

**Model**

- Approaching outflow components were separated using multi-component Gaussian fitting. This separates the jet (HVC) emission from the low-velocity component (LVC), which we interpret to be a turbulent entrainment layer.
- Magnetic field strength agrees with previous estimates of magnetic fields in protostellar outflows [1, 10].

We have modeled coupled jet expansion-acceleration [1] and entrainment [3] in the DG Tau approaching outflow. No jet rotation is observed [1]. Passage through the recollimation shock slows the jet and concentrates the magnetic field, leaving the jet susceptible to these processes [1].