GYRO simulations of angular momentum transport

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- **Motivation: Momentum transport important to understand and predict rotation, especially when the external torque is small, as anticipated for fusion reactors**

- **The GYRO gyrokinetic code simulates angular momentum diffusion**

- $\Rightarrow$ **Approximate agreement with measurements in some plasmas**

- **Modifications to GYRO should improve the accuracy**
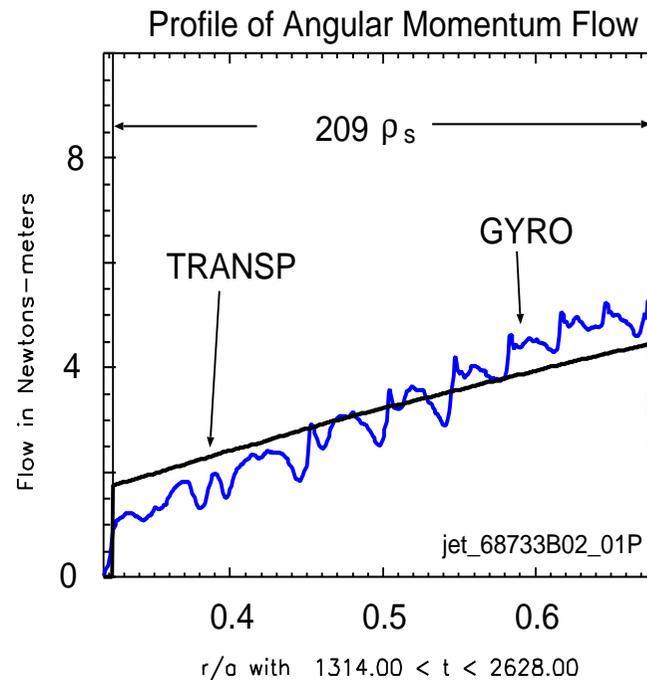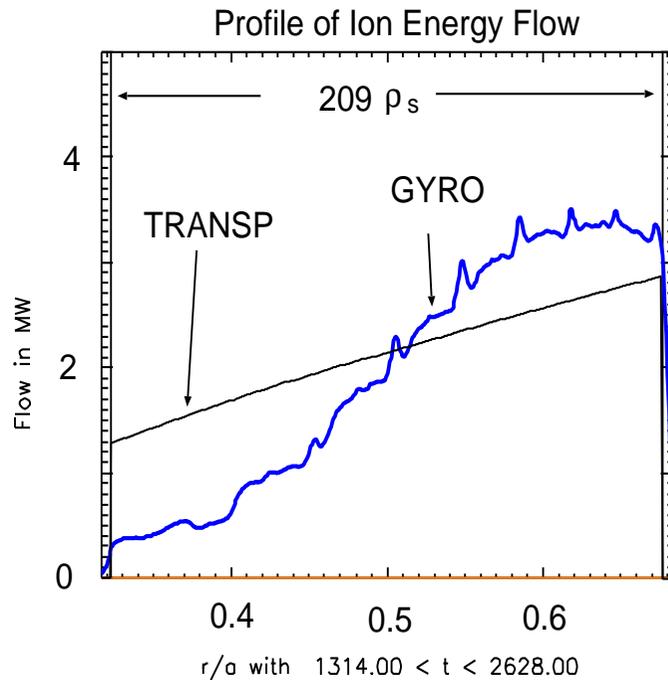
Angular momentum simulations from GYRO

- **Input plasma profiles to compute drive terms**
- **Compute time-evolution of distribution functions**
- **Compute angular momentum by integrating over phase space**
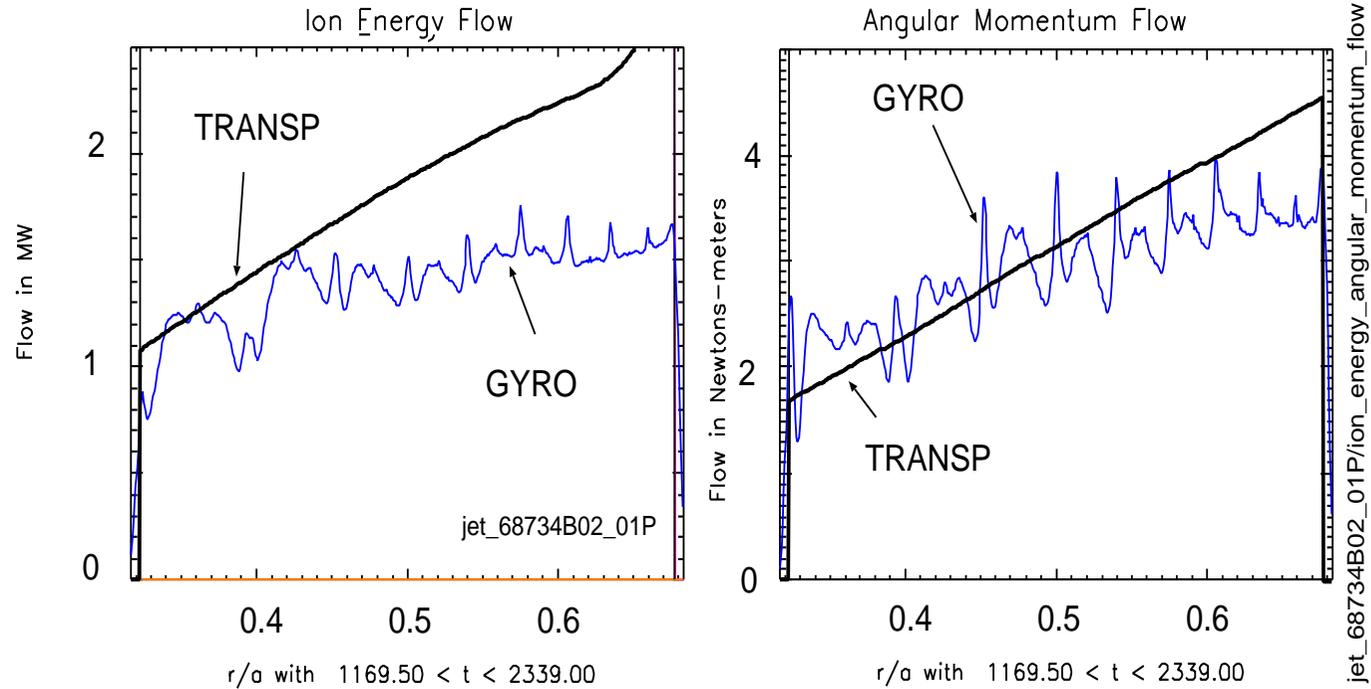
Agreement with Energy and Angular Momentum Flows

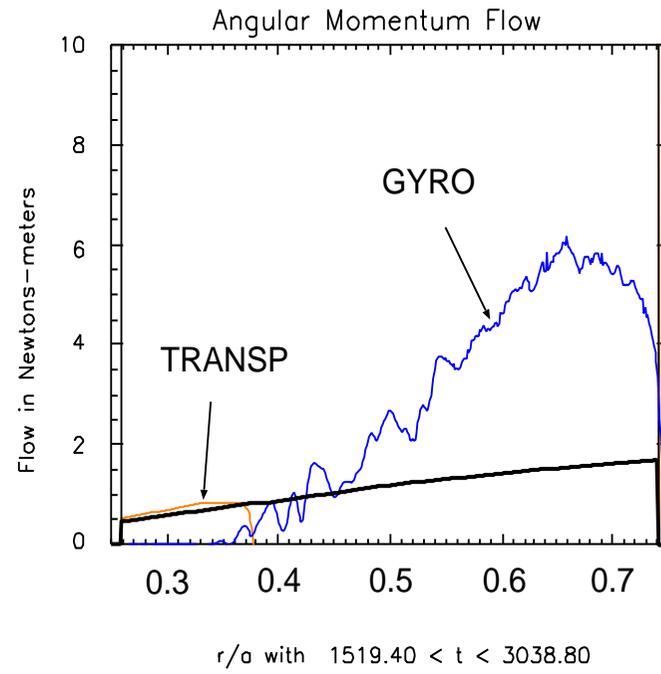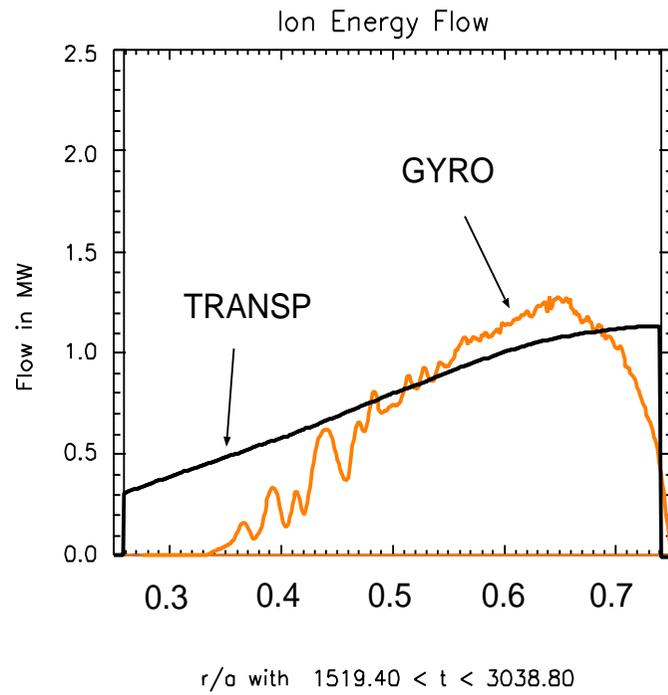- (B_T = 3.5T case shown yesterday)

- GYRO: same ion distribution but different moments
- TRANSP: plasma profiles and heating, charge-exchange loss profiles

Comparison from another case

- B_T = 3.7T companion to previous

Comparisons for an ELMy H-mode

Ion Energy Flow

GYRO

TRANSP

Flow in MW

r/a with   1519.40 < t < 3038.80

Angular Momentum Flow

GYRO

TRANSP

Flow in Newtons−meters

r/a with   1519.40 < t < 3038.80

Improvements to angular momentum simulations in GYRO

- **Status:**

  1. use v'_{tor} (for ang mom flow and Kelvin-Helmholtz instab) but ignore v_{tor}

  2. single ion species

- **Being added:**

  1. include v_{tor}

  2. $v_{tor,s}$ for up to 5 kinetic ion species

  3. write $\Gamma_{pol} + \Gamma_{tor}$

  4. separate convective and conductive

  5. write turbulent-driven momentum sources (torques)