Contribution ID: **73** Type: **Invited talk**

Shear flow and vortex array instabilities in annular strongly-correlated atomic superfluids

Monday 2 September 2024 09:00 (40 minutes)

At the interface between two fluid layers in relative motion, infinitesimal fluctuations can grow exponentially, generating vorticity and causing the laminar flow to break down. Here, we study this scenario by creating two counter-rotating flows in annular atomic Fermi superfluids across the BEC-BCS crossover [1]. Due to the continuity of the superfluid wavefunction and the quantisation of circulation, the superfluids cannot maintain a continuous vortex sheet. Instead, we observe the formation of a regular array of quantised vortices forming along the shear layer. This vortex array is unstable. We connect its dynamics to the instability of the counter-propagating flows, establishing a clear link between shear flow and vortex instabilities. Our work opens the prospects for exploring out-of-equilibrium phenomena such as vortex matter phase transitions and the spontaneous emergence and decay of two-dimensional quantum turbulence in strongly-correlated superfluids.

[1] D. Hernández-Rajkov et al., Nature Physics 20, 939 (2024)

References

Short bio (50 words) or link to website

My scientific interests regard quantum simulation with strongly-correlated atomic Fermi systems. As Research Director, I have however the ambition of fostering the cooperation of the different scientific areas of CNR-INO, supporting and conducting cross-fertilisation actions and projects.

Relevant publications (optional)

Career stage

Professor

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Track Classification: FINESS