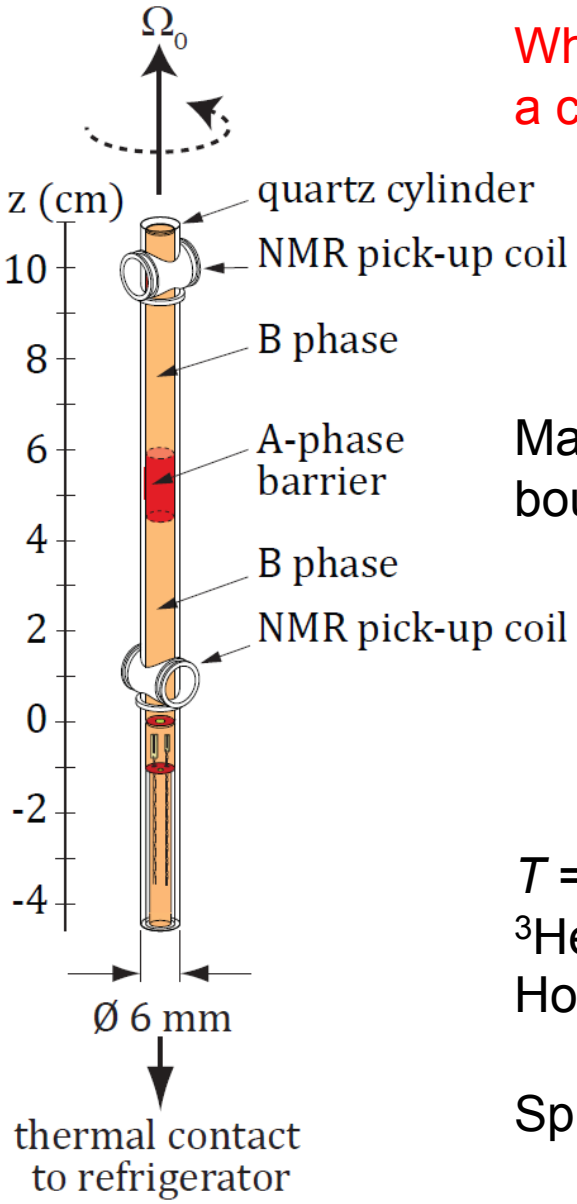
Turbulence in a Two-Phase Sample of Rotating Superfluid ^{3}He

V.B. Eltsov[1], R. De Graaf[1], P. J. Heikkinen[1], J. J. Hosio[1], R. Hänninen[1], M. Krusius[1] and P. M. Walmsley[2]
1) Aalto University, Finland, 2) University of Manchester, UK



What happens when a layer of ^{3}He-A in inserted into a cylindrical column of ^{3}He-B?

Magnetically stabilised A-phase layer – effectively allows boundary condition to be changed in situ.

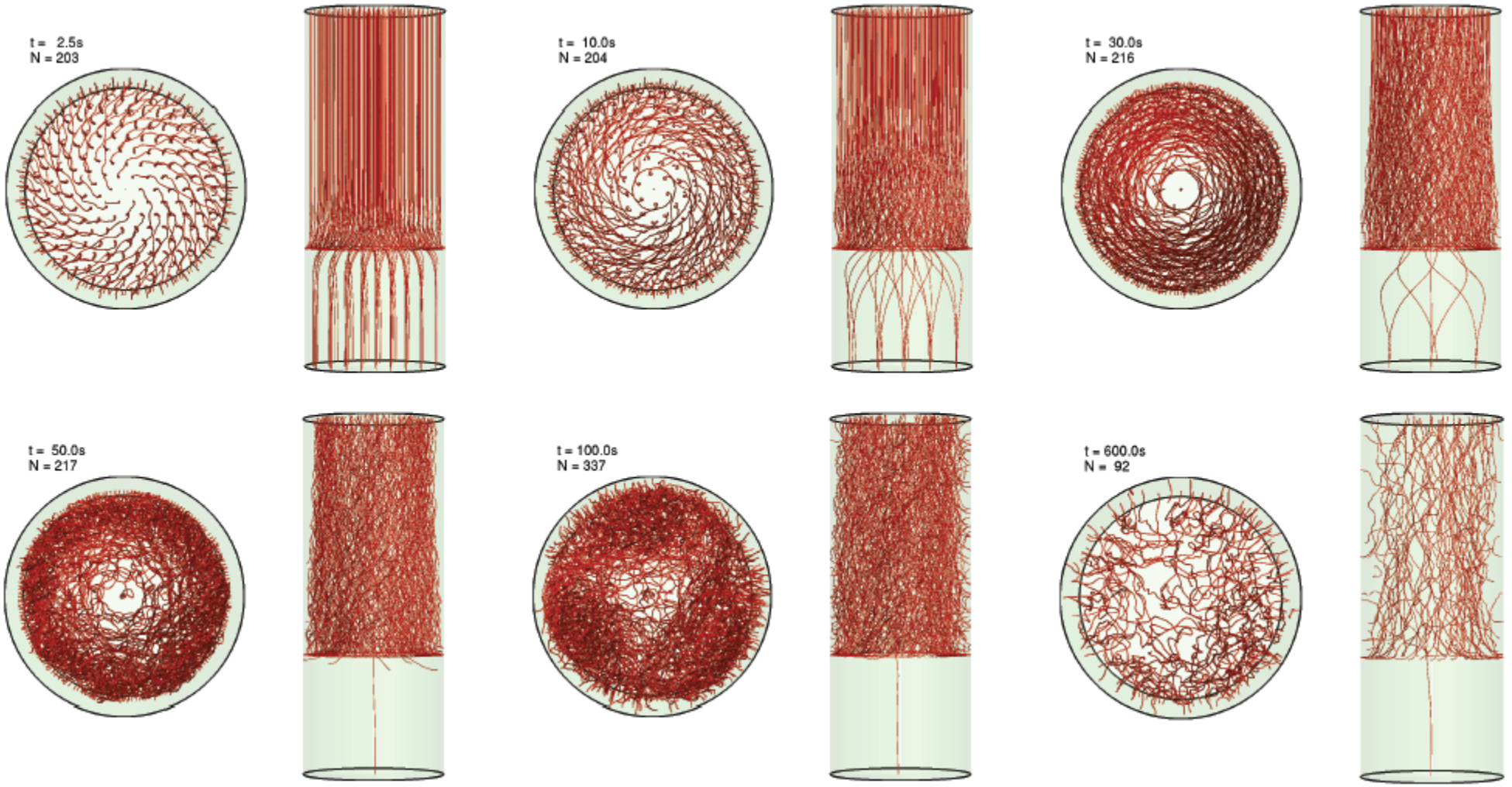
$T = 0.2\ T_c$

^{3}He-B has much lower mutual friction than ^{3}He-A

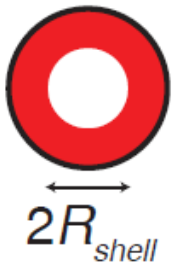
How does this change vortex dynamics after a spin-down?

Spin-down with no A-phase: laminar vortex flow.

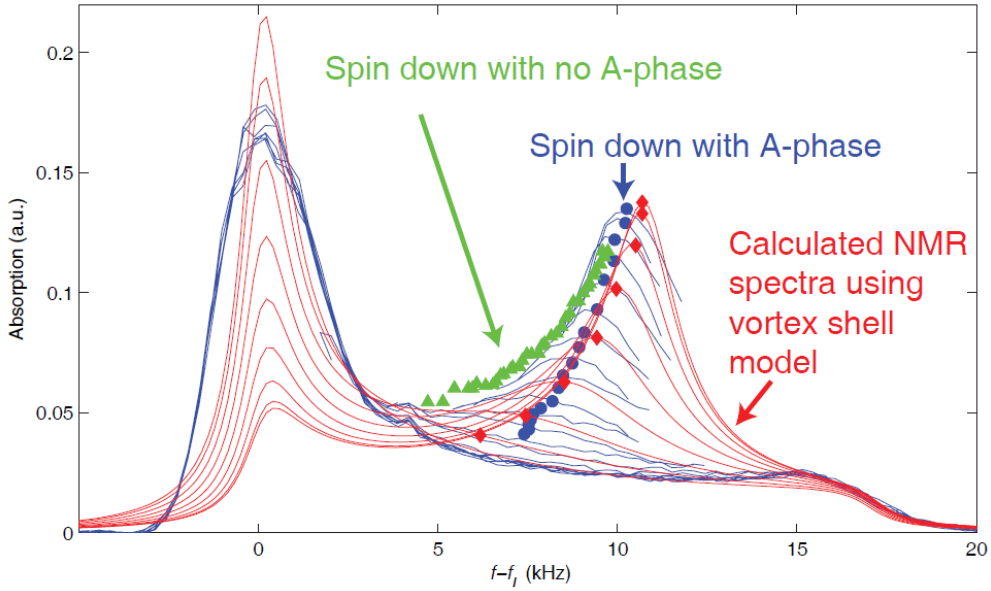
Numerical Simulations

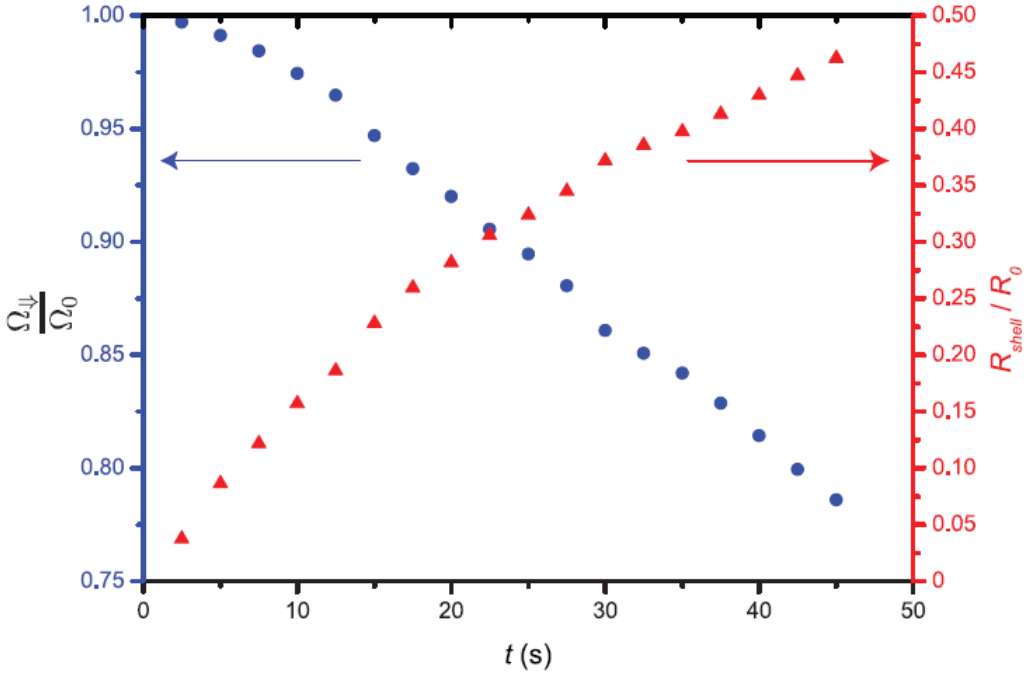


Experiment

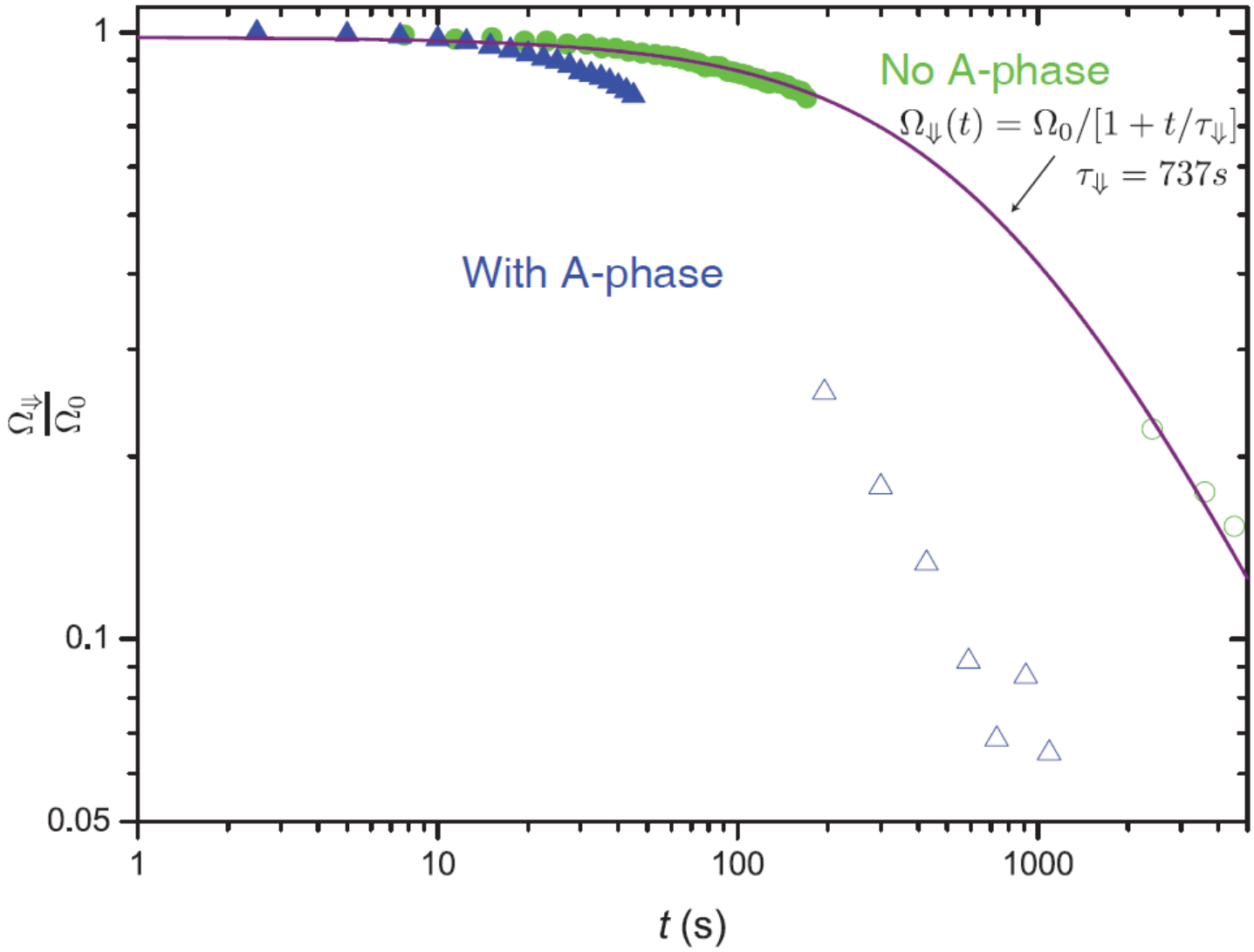


A simple model where there is a vortex-free region in the centre and a constant density of vortices at the perimeter agrees well with the measured NMR response.





Comparison of Spin Downs



Key Result: Spin down is faster, due to turbulence, when A-phase is present.