POINT VORTEX MOTION IN THE PRESENCE OF BOUNDARIES: NEW PERSPECTIVES

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This talk will present a new, and very general, analytical framework for studying the problem of point vortex motion in geometrically complicated domains involving multiple impenetrable boundaries (or walls). Analytical expressions for the Kirchhoff-Routh path functions, or Hamiltonians, governing N-vortex motion in such domains are derived by exploiting results from classical function theory [1].

The resulting theoretical framework has many applications ranging from geophysical problems [2] where the motion of oceanic eddies around topography is of interest, to problems in aerodynamics where the theory can be used to generalize the Kutta-Joukowski theorem for calculating the lift, and "interference forces", in multi-aerofoil configurations. A range of illustrative examples will be given.

References

[1] D.G. Crowdy and J.S. Marshall, Analytical formulae for the Kirchhoff-Routh path function in multiply connected domains, *Proc. Roy. Soc. A*, **461**, 2477–2501, (2005).
[2] D.G. Crowdy and J.S. Marshall, The motion of a point vortex around multiple circular islands, *Phys. Fluids*, **17**, 056602, (2005).

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