THE EDUCATION UNIVERSITY OF HONG KONG

FACULTY OF LIBERAL ARTS AND SOCIAL SCIENCES

Research Output Prize

for the Dean's Research Fund 2021/22

Brief Introduction of Awardee's

Research Output/Publication and Future Research Development

Awardee (Dept):	Dr Suen Chun Kit Anthony, Assistant Professor (MIT)
Publication/Research Output Title/project:	Vanishing Diffusion Limits and Long Time Behaviour of a Class of Forced Active Scalar Equations

A. *Briefly introduce your research output/publication for which you have received the prize.*

In this study, we investigate the properties of an abstract family of advection diffusion equations in the context of the fractional Laplacian. Two independent diffusion parameters enter the system, one via the constitutive law for the drift velocity and one as the prefactor of the fractional Laplacian. We obtain existence and convergence results in certain parameter regimes and limits. We study the long-time behaviour of solutions to the general problem and prove the existence of a unique global attractor. We apply the results to two particular active scalar equations arising in geophysical fluid dynamics, namely the surface quasigeostrophic equation and the magnetogeostrophic equation.

B. *How you used/will use your prize and perhaps its usefulness to your research development?*

The funding will be used for further investigation of other mathematical problems in the area of partial differential equations which can be applied to understand the long-time behaviour of solutions to some physical models in fluid dynamics.

C. *Expected research outcomes/outputs/impacts arising from this prize.*

New mathematical results on the illposedness/wellposedness of some active scalar equations will be obtained from the funding support.