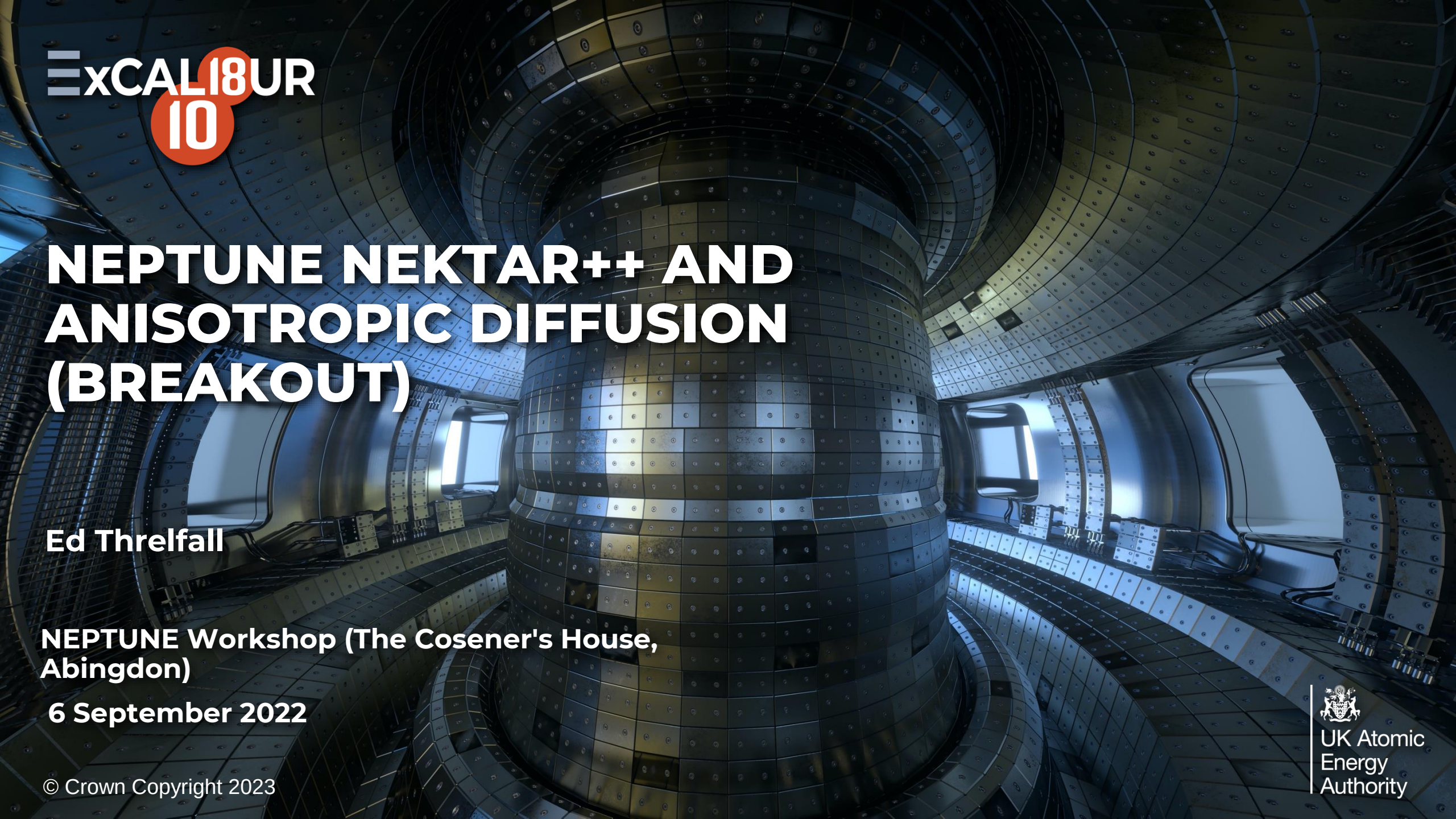


NEPTUNE NEKTAR++ AND ANISOTROPIC DIFFUSION (BREAKOUT)

Ed Threlfall

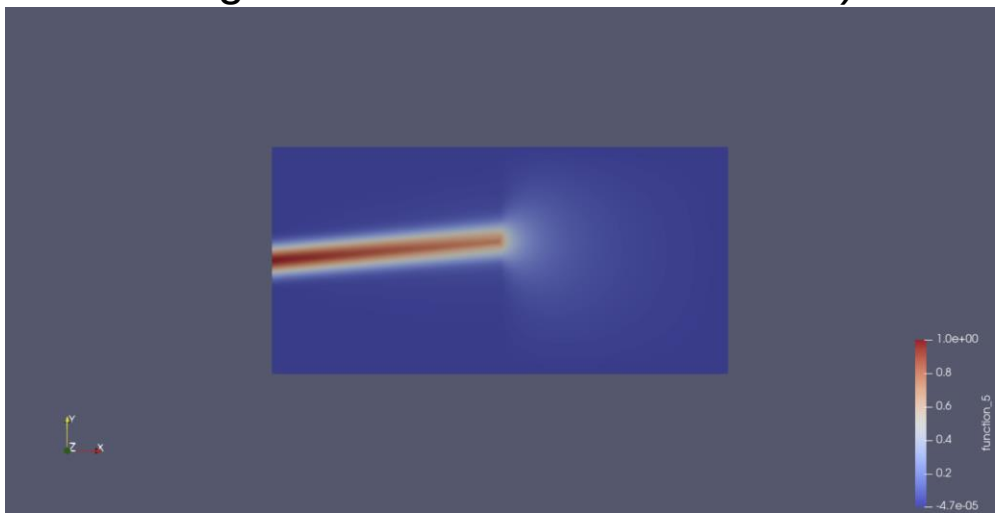
NEPTUNE Workshop (The Cosener's House, Abingdon)

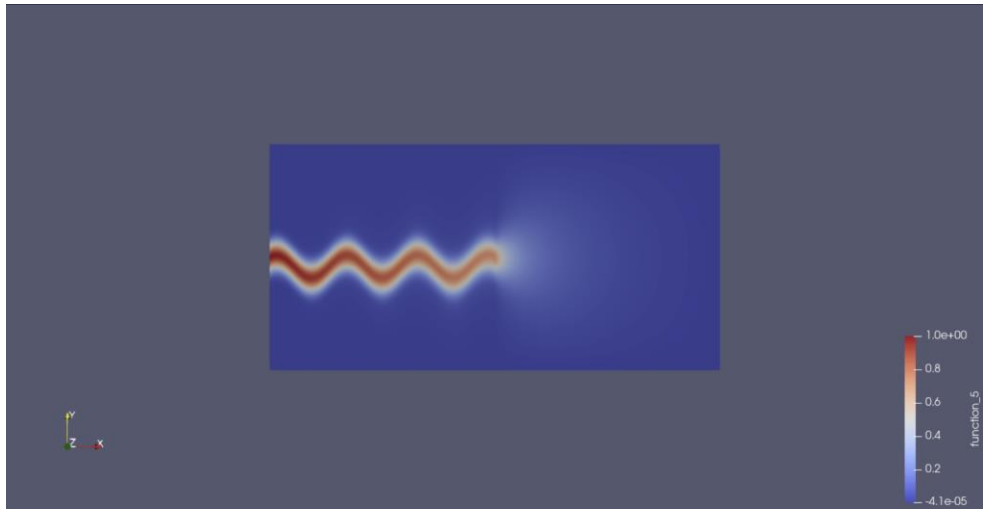
6 September 2022

UK Atomic Energy Authority

0.1 Heat transfer proxyapp (Nektar++ / Firedrake)

- Heat transfer with arbitrary diffusion tensor – examples (Dirichlet on uprights e.g. Frankenstein, homogeneous Neumann otherwise):



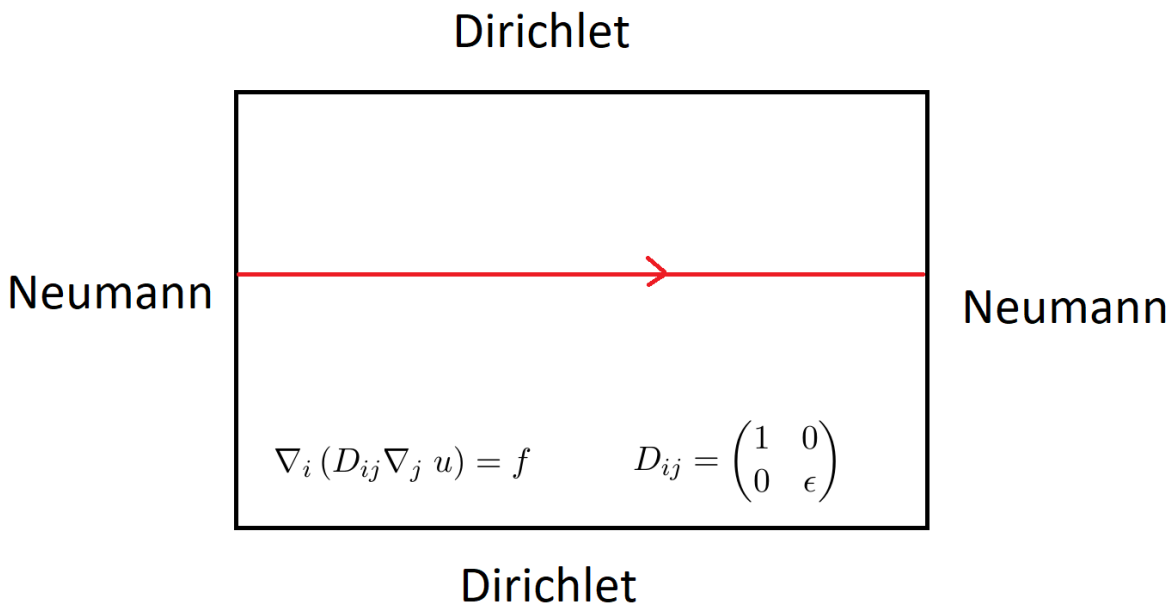


- See readme / code at https://github.com/ethrelfall/Heat-transport
- N.B. UKAEA are most interested in shallow angles of incidence (not like these examples!).
- Issue: numerical noise swamps small transverse diffusion.

0.2 Deluzet-Narski

Fabrice Deluzet, Jacek Narski. A two field iterated Asymptotic-Preserving method for highly anisotropic elliptic equations. Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal, Society for Industrial and Applied Mathematics, 2019, 17 (1), pp.434-459. 10.1137/17M115205X . hal-01977920

- Example where totally-anisotropic case is singular (called singular perturbation problem)



- Problem becomes degenerate in limit $\epsilon \to 0$ as functions with no gradient along B are automatically solutions.
- Absolutely clear why condition number blows up …

- Compare proxyapps.