



ICTS

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SCIENCES

TATA INSTITUTE OF FUNDAMENTAL RESEARCH

## ICTS Seminar

Title : Instability of unidirectional flows for the 2D alpha Euler equations.

Speaker : Shibi Vasudevan, ICTS – TIFR, Bangalore

Date : Friday, April 5, 2019

Time : 2:00 PM

Venue : Nambu Discussion Room (Left), ICTS Campus, Bangalore

Abstract : We study instability of unidirectional flows for the linearized 2D alpha-Euler equations (which are a regularized version of the classical 2D Euler equations) on the torus. The unidirectional flows are steady states whose vorticity is given by Fourier modes corresponding to a single vector  $p$  in the integer lattice  $\mathbb{Z}^2$ . A decomposition allows us to write the linearized operator  $L_B$  as a direct sum of one-dimensional difference operators  $L_{\{B,q\}}$  parametrized by some vectors  $q$  in  $\mathbb{Z}^2$ . We consider those flows for which the set  $\{q+np: n \in \mathbb{Z}^2\}$  has exactly one point in the open disc of radius  $p$  and show that these steady states are linearly unstable. Our main result is an instability theorem that provides a necessary and sufficient condition for the existence of a positive eigenvalue to the operator  $L_{\{B,q\}}$  in terms of equations involving certain continued fractions.