ICTS Seminar

Title : Geometric formulation of the Cauchy invariants for incompressible Euler flow in flat and curved spaces.

Speaker : Nicolas Besse, Universite Cote d'Azur, France

Date : Wednesday, December 21, 2016

Time : 11:30 AM

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : Cauchy invariants are now viewed as a powerful tool for investigating the Lagrangian structure of three-dimensional ideal flow. Looking at such invariants with the modern tools of differential geometry and of geodesic flow on the space of volume-preserving transformations, all manners of generalisations are easily derived. Vorticity conservation holds in higher dimension provided the vorticity is interpreted as a differential 2-form and conservation Lie-transport invariance. The Cauchy invariants equation and the Cauchy formula are just two expressions of this Lie-transport invariance, which are Hodge dual of each other. Actually, this is an instance of a general result which holds for flow both in flat and curved spaces: any Lie-transport invariant p-form which is exact has an associated Cauchy invariants equation and a Cauchy formula. For p=3, this leads in particular to various generalisation of local helicity conservation laws for Euler flow and for magnetohydrodynamic flow.