Festival de Théorie 2009

Rotation and Momentum Transport in Magnetised Plasmas

Programme

This document contains 2 parts.

Part I is a tentative list of topics. Names of leaders are attached to it. These leaders are expected to **organize the round table discussions, working sessions**, **the reporting and discussion sessions.** Feel free to add new topics, related to the festival theme.

Part II is a draft of agenda. **Participants should check their availability and send a title back to the organizers**.

Tutorial talks are there to introduce the various aspects of the Festival main topics. A substantial fraction of a tutorial should be pedagogical. In particular they should be accessible to the various scientific communities present in the audience. Jargon should be avoided as much as possible.

Invited talks are more focused and should highlight results related to the festival theme.

Lectures are intended to students and young physicists, to clarify some of the concepts and results presented (or to be presented) in tutorials. Blackboard style is expected. **Senior physicists are not expected to attend lectures**. They were much appreciated by most students during the previous festivals. As a consequence, their number has been increased. Moreover it is intended to publish these lectures. **Participants whose names appear in the provisional agenda should mention whether they accept to present and write a lecture.**

Sessions for young physicists are an opportunity for students to present their results. **Talks should not exceed 10 minutes**. Candidates should contact the organizers to get a slot (please send a title and a short abstract).

I) Proposed topics for the 2009 Festival

The list of topics remains open. It is the choice of each individual to participate to any of these topics or to initiate a new topic. At any rate, active participation to the scientific life of some of these topics is expected. The leaders are in charge of this scientific life. **Contributions to round table discussions should be very short**: typically 5 to 10 minutes (**2 slides max**). In other words, round table discussions are not meant to mini-talks, but rather to present new ideas and/or comments. Attendance to round table discussions is not mandatory. Jargon should be avoided.

Topic 1. Physics and structure of turbulent momentum flux and the origins of intrinsic rotation.
Leaders: T.S. Hahm, C. Bourdelle, G. Falchetto

Topic 2.Boundary and SOL effects and edge-core coupling's role in rotation
Leaders: C.S. Chang, R. Singh, P. Ghendrih

Topic 3. Momentum transport and flow structure formation in lab plasmas and astrophysical objects.
Leaders: P.H. Diamond, S. Tobias, O. Gürcan

Topic 4 Relation between Momentum Tranport, Shear Formation and the Dynamo.
Leaders: D. Hughes, F. Cattaneo, M. Proctor

Topic 5. Coupling of particle and momentum transport
Leaders: X. Garbet, O. Mishchenko

Topic 6. MHD instabilities and momentum flux
Leaders: H. Wilson, A. Sen, W.C. Müller, J. Ramos

Topic 7. Momentum transport, rotation and non-locality in transport
Leaders: Y. Sarazin, C.J. McDevitt, D. Escande.

Topic 8. Relation between GAM physics, confinement and momentum transport
Leaders: A. Smolyakov, K. Miki, G. Dif-Pradalier, M. Ottaviani

Topic 9. Momentum Tranport and Rotation in Burning Plasmas.
Leaders: X. Garbet, C. Nguyen, M. Lesur, F. Zonca,

II) Tutorial talks, lectures and agenda of the 2009 Festival

Please check your availability in the agenda, and send a title back to the organizers. Please make sure that part of your presentation is related to the festival main theme. If not possible, please contact the chairman and vice-chairman.

TUTORIALS

Speaker	Title
M. McIntyre	Stratospheric vortex dynamics and momentum transport:a wave-turbulence jigsaw.
H. Wilson	The influence of flow shear on ideal MHD ballooning modes
D. Hugues	Small and large-scale dynamos in rotating sheared convection
P. H. Diamond	Potential Vorticity Dynamics, Zonal Momentum Theorems,and Turbulent Entrainment for Fluid and Vlasov Plasmas.
M. Proctor	Achievements and problems of mean-field dynamo theory
F. Busse	Convection in Rotating Spherical Fluid Shells and its Dynamos
M. Farge	How to model turbulent dissipation?
S. Tobias	Mean flows and turbulence in stably stratified (and possibly magnetised) domains
T.S. Hahm	Recent Progress in Theoretical Understanding of Momentum Transport and Intrinsic Rotation in Tokamaks
F. Cattaneo	On the generation of large scale magnetic fields
C.S. Chang	Nonlocal and multiscale simulation of the neoclassical and ITG turbulence dynamics, and the rotation generation in the core-edge integrated full-f simulation.
A. Pouquet	The role of helicity in the dynamics of rotating turbulent flows: direct numerical simulations and modeling
F. Zonca	Relationship of low frequency shear Alfvén spectrum to MHD and microturbulence
D. Escande	Momentum transport: a key element of self-organization in the reversed field pinch
A. Smolyakov	Rotation in toroidal plasmas

INVITED

Speaker	Title
S. Brun	Towards an integrated 3-D MHD model of the Sun from its nuclear core up to its photosphere
N. Brummell	Magnetic field transport in the solar tachocline: shear-driven magnetic buoyancy instabilities
G. Tynan	Studies of nonlinear flow generation in basic plasma experiments
Y. Sarazin	Interplay between transport and rotation in fusion plasmas
S. Boldyrev	Unbalanced MHD turbulence
N. Miyato	A drift-kinetic formulation with strong ExB flow.
Y. Idomura	Properties of avalanches and momentum transport in driven ITG turbulence
O. Mishchenko	Zonal-flow oscillations in non-axisymmetric geometry
W.C. Mueller	MHD turbulence: some theoretical ideas and possible trouble ahead
R. Singh	Synergy of Zonal Flows and Edge Turbulence in Greenwald Density Limit
E.J. Kim	Multi-scale modelling of momentum transport
A. Sen	Reconnection in the presence of sheared plasma flows: a mini-overview of experiments and theory
J. Ramos	Equilibrium flows in a fluid and drift-kinetic description of low-collisionality plasmas
X. Garbet	Momentum transport and entropy production rate in magnetized turbulent plasmas.

LECTURES

Speaker	Title
M. McIntyre	Stratospheric vortex dynamics and momentum transport:a wave-turbulence jigsaw.
H. Wilson	An introduction to the influence of flow shear on ideal MHD ballooning modes
D. Hugues	Elements of fast dynamo theory

P. H. Diamond	Dynamics of Granulations in GFD and Vlasov Plasmas
S. Tobias	Turbulent dynamos
T.S. Hahm	Introduction to Nonlinear Gyrokinetic Theory
F. Cattaneo	Introduction to On the generation of large scale magnetic fields
C.S. Chang	Simulation of rotation, turbulence, neoclassical, and atomic physics in realistic diverted tokamak geometry
A. Pouquet	The role of helicity in the dynamics of rotating turbulent flows: direct numerical simulations and modeling
F. Zonca	The general fishbone-like dispersion relation
D. Escande	Momentum transport and self-organization
A. Smolyakov	Rotation in toroidal plasmas

Young scientist short talks (10'):

V. Duez TBD
L. Jouve TBD
G. Dif-Pradalier
N. Tronko "Hamiltonian gyrokinetics approach for particle dynamics in a nonuniform external magnetic field."
M. Janvier: "Study of the dynamics of the Double Tearing Mode in the fast growth regime"
M. Lesur "Fully nonlinear features of the energetic beam-driven instability".
C. Nguyen TBD
C. McDevitt TBD
K. Miki TBD
S. Sugita " Ballistic Radial Transport in SoL dominated by Meso- scale Structure using 2D Model"
J. Anderson
E. Tassi "Hamiltonian derivation of the Hasegawa-Mima equation″

Schedule

Typical organisation of 1 day = 1 tutorial in the morning (55 minutes) + 1 invited (30 minutes including or not time for questions depending on the slot) or tutorial (55 minutes) in the afternoon + "organised" round table discussion (with 5 to 15 minutes contributions) + informal working groups in the afternoon + 4/5 lectures per week (for students).

Colour code: **Tutorial** **Invited** **Lecture** **Round table or Working session.**

Week 1

	9:00-10:30	11:00-12:00	14:30-15:30	16:00-17:30
Monday 6	Opening 8h45 Rosenbluth lecture McINTYRE	**Round table :** Perspectives on Vorticity Dynamics,Flow Formation and Momentum Transport	BRUN	Work plan 1st week Lecture : McINTYRE
Tuesday 7	HUGHES	**Round table :** Physics and structure of turbulent momentum flux and the origins of intrinsic rotation.	FARGE	Lecture DIAMOND
Wednesday 8	DIAMOND	**Round table** Relation between Momentum Tranport,Shear Formation and the Dynamo	BRUMMELL TYNAN	Lecture HUGHES
Thursday 9	PROCTOR	**Round table** : Boundary and SOL effects and edge-core coupling's role in rotation	SARAZIN	Lecture WILSON
Friday 10	WILSON	**Young scientist session** L. Jouve V. Duez G. Dif-Pradalier N. Tronko	BOLDYREV	

Week 2

	9:00-10:30	11:00-12:00	14:30-15:30	16:00-17:30
Monday 13	TOBIAS	**Round table** MHD instabilities and momentum flux Lecture TOBIAS	SEN MISHCHENKO	Work plan 2nd week Lecture HAHM
Tuesday 14	Bastille day	Bastille day	Bastille day	Bastille day
Wednesday 15	HAHM	**Round table** Coupling of particle and momentum transport	BUSSE	Lecture CATTANEO
Thursday 16	CATTANEO	**Young scientist session** M. Lesur M. Janvier C. Nguyen C. McDevitt	RAMOS MIYATO	Lecture CHANG **Round table** Momentum transport and flow structure formation in lab plasmas and astrophysical objects.
Friday 17	CHANG	**ITER Round table :** Momentum in ITER	MULLER IDOMURA	

Banquet on Thursday 16 evening.

Week 3

	9:00-10:30	11:00-12:00	14:30-15:30	16:00-17:30
Monday 20	POUQUET	Lecture POUQUET	KIM	Work plan 3rd week Lecture ZONCA
Tuesday 21	ZONCA	**Round table** Momentum Tranport and Rotation in Burning Plasmas	SINGH	Lecture ESCANDE
Wednesday 22	ESCANDE	**Young scientist session** K. Miki S. Sugita J. Anderson E. Tassi	GARBET	Lecture SMOLYAKOV
Thursday 23	SMOLYAKOV	**Round table** Momentum transport,rotation and non-locality in transport	**Round table** Relation between GAM physics,confinement and momentum transport	
Friday 24	Summary		closing	