

COMMISSION 49: THE INTERPLANETARY PLASMA & THE HELIOSPHERE

Report of Meetings, July 25 and 31, 1991

PRESIDENT : L.F. BURLAGA

ACTING PRESIDENT : B. BUTI

July 25, 1991

BUSINESS MEETING

President, Dr. Burlaga could not attend the General Assembly; B. Buti, Vice President Commission 49, convened the meeting on July 25 morning. The attendance at the meeting was poor because of the clash with the business meeting of Commission 10, which has a large number of members common with Commission 49. The members were apprised of the activities of the Working Group on Plasma Astrophysics during the last three years. The future scientific activities of the Commission were also discussed.

July 31, 1991

SCIENTIFIC MEETING

One day meeting on 'NONLINEAR AND TURBULENT PROCESSES IN SOLAR AND ASTROPHYSICAL PLASMAS' was held jointly with Commissions 10/12, 40 and 48. The meeting was organized and chaired by B. Buti. Eight invited review talks were given.

HIGHLIGHTS OF INVITED REVIEWS

Radio Emission Processes in Astrophysics (D.B. Melrose):

Coherent radio emission processes, which can account for intense observed radiations, were briefly reviewed. The electron cyclotron maser emission (ECME) process was discussed in details; positive and negative points of ECME were clearly pointed out. For pulsar radio emission, curvature emission by bunches was presented.

Reconnection Processes in Astrophysical Plasmas (T.G. Forbes):

The conversion of magnetic field energy into heat and particle acceleration is possible through magnetic reconnection. Collisional models based on MHD were discussed in details. However, it was clearly pointed out that collisionless models of reconnection are needed to determine the small scale length of the field, which is an essential ingredient for the rapid reconnection. Only the latter can explain explosive like phenomena e.g., flare stars.

Chaos in Magnetoplasmas (B. Buti):

Starting from the basic equations governing the dynamics of magnetoplasmas, the evolution of nonlinear Alfvén waves, which are observed in many astrophysical plasma, was demonstrated through Poincaré map analysis. Interesting phenomena of chaos, strange attractors and inertial stabilization due to heavy ion in multispecies plasmas were elaborated.

Strong Langmuir Turbulence in Lower Solar Corona  
and other Magnetized Plasmas (M.V. Goldman):

Lower solar corona and other plasmas with moderate magnetic fields provide an environment for radio emissions associated with strong Langmuir fields observed in a variety of space plasmas. Theoretical as well as numerical results for the evolution of nonlinear Langmuir waves were presented. Potential problems, still to be studied, were pointed out.

Gravitational Clustering of Galaxies (S. Inagaki):

The process of gravitational clustering of galaxies was compared with electrostatic plasma turbulence by considering both the static and the expanding universe. The development of correlations, in linear instability phase of galaxy clustering, was reviewed. Beautiful results of simulation of galaxy clustering were shown on video.

Stochastic Acceleration and Diffusion in a Turbulent Plasma (J. Cary):

Beam-driven instabilities, in stellar winds, can produce turbulent fields. By means of nonlinear dynamics techniques, it was shown that such turbulent electrostatic fields can lead to stochastic acceleration and velocity diffusion. Self-consistent simulation results were presented; these results were in agreement with the author's mapping theory but did not agree with the turbulent trapping theory.

Interstellar Plasma Turbulence: Observation and Theory (S.R. Spangler):

The direct data on interstellar turbulence is difficult to obtain because of small spatial scales on which this turbulence occurs. Different mechanisms for generation of this turbulence e.g., the ones based on solar system analogs; turbulence from shock reflection at interstellar clouds etc. were reviewed. The role of scintillation observations, to constrain the above mentioned theoretical models, was discussed. In the end, anticipated observational techniques, for measuring density and magnetic field fluctuations in interstellar turbulence, were pointed out.

Cometary Plasma Waves and Turbulence: Observations (B.T. Tsurutani):

The in situ measurements of cometary plasma waves, from 1985-1986 satellite encounters with comets Giacobin-Zinner and Halley, were reviewed. Temporal and spatial evolution of steepened magnetosonic waves and their precursor large amplitude whistler waves was illustrated and discussed at length.

POSTER PAPERS

There were about 15 posters related to topics on plasma astrophysics; these were displayed on different days.