FINIAL REPORT FOR THE INTERNATIONAL
SUN-EARTH EXPLORER 1 & 2 (ISEE 1 & 2)
MAGNETOSPHERIC AND INTERPLANETARY
PLASMA INSTRUMENTS

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Final Report for period 1989-1995

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INSTRUMENT REPORT

During the 1989-1995 period the plasma instruments on board ISEE 1 and 2 were operational until the reentry into the Earth's atmosphere of both spacecraft. All data from the ISEE-1 LEPEDEA instrument have been processed and submitted to NSSDC.
MAJOR ACCOMPLISHMENTS

- Two-spacecraft observation of transpolar arc and associated magnetotail source population.

- Observational determination of the equation of state for quiet-time plasma convection in the central plasma sheet.

- Statistical studies of the macroscopic properties of the plasma sheet, establishing spatial variations in plasma density, velocity, temperature and convective electric fields, with the auroral electrojet (AE) index. These studies showed that the plasma drift velocities are generally low, considerably smaller than plasma thermal speeds, and directed earthward at all levels of AE. Follow-up studies which divided up observations by phase of activity confirmed the earlier results based on AE.

- Statistical studies of the magnetic field in the neutral sheet of the magnetotail, showing that the average field strength in the neutral sheet is typically 7 nT, irrespective of level or phase of activity.

- First observation evidence of stochastic particle orbits in the neutral sheet of the magnetotail, leading to relative maxima and minima in the ion velocity distribution.
Investigation of the Tsyganenko 1989 magnetic field model, showing that portions of the model involving the plasma sheet magnetic field beyond 20 RE yield unrealistic solutions.

Study of wave-particle interactions in the earth's magnetotail, showing the existence of ULF perturbations in the plasma sheet boundary layer, confirmed by theoretical analysis.

Detailed study of ion velocity distributions in the magnetosheath, showing that low-frequency waves can be generated by a marginally unstable ion population.

Multi-instrument study of magnetic topology of the low-latitude boundary layer along the flanks, showing that the field lines are closed.

Detailed study of the central plasma sheet during substorm onset showing that the main effect of substorm activity is to increase the thermal energy of the plasma, and that this process must be nonadiabatic.
Publications


