16.08.03 Evolutionary Trends in the Development of Coronal Holes and Their Relationship to the Subphotospheric Magnetic Field. J. M. Davis & L. Golub, AS&G. - X-ray bright points are known to be sites of emerging magnetic flux, to possess little latitudinal dependence and to have short lifetimes. These properties uniquely qualify them as test parameters for the study of evolutionary trends of large-scale coronal features. In particular the dependence on the age of coronal holes, of the number of bright points per unit area, within the boundaries of the hole, has been determined. Examples were selected from the S-054 Skylab data under the criterion that the coronal hole was observed for more than three rotations. In all cases the bright point density increases as the coronal hole evolves. By remembering that coronal holes rotate rigidly, the result has been interpreted in terms of development of the sub-surface field source postulated by Bumba and Howard to explain long lived, rigid rotating features in the photospheric magnetic field.

16.09.03 Open Magnetic Structures on the Sun. R. H. Levine, P. A., M. W. Altshuler, HAO/NCAR, and J. W. Harvey, KNO - Use of high resolution harmonic analysis of the solar magnetic field has enabled accurate extrapolation of the current-free magnetic field in the solar atmosphere that corresponds to the measured line of sight field at the surface. By selecting for study only those field lines which are open we are able to study the surface sources of open field configurations and of the solar wind. An initial analysis of two solar rotations shows excellent correspondence between calculated open field lines and observed coronal holes. All calculated open field lines can be associated with either coronal holes (including holes not yet dark X-ray features), or magnetic separatrix between closed active region loop systems. Those open field lines which end up in the equatorial plane of the Sun and hence guide the solar wind observed at Earth come from a series of compact sources at various positions on the solar surface. Some of these sources can be at high solar latitudes. The divergence of the magnetic field plays an apparently crucial role in the acceleration of solar wind plasma. Magnetic field lines diverge most near the edges and least near the center of open solar structures. Positions of minimum field divergence are associated with observed high speed solar wind streams. The work of R.H. Levine is sponsored by NASA contract NAS 4-3949. NCAR is sponsored by NSF, as is KNO.

16.10.03 Changes in Coronal Holes and The Accompanying Magnetic Fields. R. M. Brossard, J. A. Vorpahl, The Aerospace Corporation. Characteristics of coronal holes at x-ray wavelengths have been discussed by various authors (cf., Timothy, A., Krieger, A., Vialna, G.; 1975, Solar Phys., 42, 135). Analysis of the measured x-ray intensities show the density scale height within the structure to be typically a factor of two less than that in the surrounding large scale regions. These authors note that the photospheric magnetic field underlying the hole region is quite weak and suggest that the coronal field is primarily radial. Previous publications have not examined these properties on a quantitative basis however, but have dealt primarily with qualitative comparisons with photospheric magnetograms and soft x-ray pictures. Here x-ray filtergrams taken by the S-056 Aerospace Corporation/Marshall Space Flight Center experiment on Skylab on 31 May - 3 June 1973 are used to quantitatively illustrate, for the first time, changes in a coronal hole occurring near a developing active region. Temporal variations in physical parameters such as temperature, density and emission measure of the x-ray source are given. The magnetic field structure in the coronal hole is calculated using force-free approximations and photospheric values as boundary conditions. The observations indicate that a significant reduction in soft x-ray emission and in temperature occurred over a region undergoing a significant magnetic field weakened correspondingly, with field lines essentially avoiding the region of decreased x-ray emission. Our analysis show on a quantitative basis that the existence of x-ray sources depends intimately on the confining nature of the magnetic field and on field strength.

WEDNESDAY, 23 JUNE

Session 17: Bryn Mawr Room, 0930-1200

17.01.09 Long-term Intensity Variations of Pulsars. D. J. Rankin, Univ. of Massachusetts, G. R. Hughen, Univ. of Massachusetts, and J. T. Kohlman, Smith College. - The intensity of pulser radio emission has been observed to fluctuate over all timescales that have been investigated - from several microseconds to several years. We present observations made at the Five College Radio Astronomy Observatory over a period of four years for several of the strong northern pulsar. Autocorrelation analysis of this data yields characteristic fluctuation timescales ranging from 20 to 80 days, although several of the sources exhibit a monotonic change in average flux over the entire time span. In addition, occasional periodic variations have been observed in some sources with periods on the order of a few months. This behavior may be indicative of a precession of the rotation axis of the neutron star with a period of several tens of days, an amplitude of a few degrees, and a damping time of a few hundred days. Correlation of these observations with data on changes in the shape of