A Limit on Energetic Electrons in the Solar Corona from Radio Observations
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It has been suggested that the electron distribution in the solar corona may be well represented by a "kappa" distribution function (Owocik & Scudder 1983, ApJ 270, 758; Scudder 1992, ApJ 398, 319). The kappa distribution, which approaches a Maxwellian as kappa approaches infinity, simulates a thermal core with a power-law tail of energetic particles. I derive a relativistic generalization of the kappa distribution function and compute the gyrosynchrotron radio emission from it for typical non-flaring active region conditions. I find that the computed radio brightness temperature exceeds observations for all values of kappa less than ~ 10.

The gyrosynchrotron code used for these computations will be available as part of the modeling package being developed for the HESSI project. This work is supported in part by the NASA Sun-Earth Connection SR&T Program in Solar Physics.

The Solar Helium Abundance in the Outer Corona Determined from Observations with SUMER/SOHO
J. M. Laming, U. Feldman (NRL)

At altitudes of about 1.05 solar radii or more, the corona above quiet solar regions becomes essentially isothermal. This obviates many of the difficulties associated with the inverse problem of determining emission measure distributions, and allows for fairly straightforward relative element abundance measurements. We present new values for the He abundance. The first is based on a reanalysis of the He/O ratio studied by previously by Feldman (1998) using data acquired by SUMER. We use a revised value of the O abundance, and a more thorough evaluation of the atomic physics for He II to derive an He/H abundance ratio of 0.092, (mass fraction, Y = 0.27), with an error of ~ 17% coming mainly from the O abundance uncertainty. We demonstrate that this result may be affected by gravitational settling of O relative to He. We also derive an abundance for He by direct comparison to emission lines of the H I Lyman series, with the result He/H = 0.083 ± 10% (Y = 0.25). Gravitational settling, if present, has the opposite effect on this result to that above. Combining the two measurements leads to a final result of He/H = 0.084 ± 0.008.

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Variation of the Large-Scale Coronal Temperature at Mid-to-High Latitudes over 1.5 Solar Cycles
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Observations of the forbidden coronal lines Fe XIV 530.3 nm and Fe X 637.4 nm obtained at the National Solar Observatory at Sacramento Peak are used to determine the variation of coronal temperature at latitudes above 30 degrees outside of active regions during cycles 22 and 23. A pattern, which is symmetric about solar maximum during cycle 22 and consistent between the northern and southern hemisphere, is seen. Beginning near solar minimum in 1985, the temperature above 60 degrees latitude is at a minimum value, varying from about 1.3 MK near the poles to about 1.5 MK near 60 degrees. Near the time that the "Rush-to-the-Poles" begins in 1987, the high-latitude temperature increases abruptly, reaching values of 1.7 MK at the North pole and 1.6 MK at the South pole in 1989. After 1990, the process reverses, and temperatures at the poles are below 1.3 MK by 1995. The rise to the maximum of cycle 23 will be compared with that of cycle 22.

Active Longitudes in Solar Corona
E. E. Benevolenskaya (Pulkovo Observatory), A.G. Kosovichev, P.H. Scherrer (Stanford University)

We present the results of the investigation of the large-scale structure of the solar corona during the transition period between solar cycles 22 and 23 and at the beginning of the current cycle 23 using the SOHO/EIT EUV data obtained in 171Å, 195Å, 284Å and 304 Å lines. For this analysis the data were transformed into synoptic maps for each of the spectral lines, and for the 195Å/171Å line ratio which is an index of the coronal temperature. The synoptic maps reveal stable longitudinal structures in the coronal intensities and temperature, which are related to large-scale magnetic field structures. We discuss the relation between the coronal and photospheric magnetic structures obtained from the SOHO/MDI data, and compare the rotation rates of these structures with the rotation profile of the solar interior in order to determine the possible origin of the coronal structures.

Physical Properties of Solar Inner Corona Revealed by Time Series Observations made by EIT and SXT
J. Li, B.J. LaBonte (Institute for Astronomy, University of Hawaii), L.W. Acton (Department of Physics, Montana State University)

We present a useful way to study how the solar corona varies with time. Observations by EIT and SXT are used to construct limb synoptic maps. The maps show limb emissions as functions of solar angle and time.

We identify and interpret various persistent structures such as coronal hole boundaries, polar rays, and polar plumes seen on these maps. The physical properties of these structures are discussed. An empirical 3-dimensional electron density model for the background corona will be introduced. This model was obtained through the use of a median-filtering technique on the EIT coronal images obtained during solar minimum (January through May 1996).

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Evolution of the Solar Corona From Cycle 22 to Cycle 23 As Revealed by X-ray Limb Synoptic Maps
G.L. Slater, S.L. Freeland (Lockheed Martin Solar and Astrophysics Laboratory), B.J. LaBonte, J. Li (Institute for Astronomy, University of Hawaii), L.W. Acton (Montana State University)

How does the solar corona vary within a solar cycle? We present time series observations assembled from the Yohkoh Soft X-ray Telescope (SXT) full mission image database which reveal coronal structures in the inner corona that are not easily identifiable in individual images. We have generated limb synoptic maps prepared from SXT data taken over 8 years (1992 through 1999). This period covers the decay phase of solar cycle 22 and the rise phase of solar cycle 23. The SXT images have recently been re-calibrated using more precise techniques. We will address such topics as the variation of the polar coronal holes, the lifetimes of active regions and associated streamers, and the nature of polar plumes in the two phases of the solar cycle.

Solar Cycle Variations of O VI and H I Lyman Alpha Intensities in the Solar Corona

UVCS/SOHO measurements of O VI (103.2 and 103.7 nm) and H I Lyman alpha intensities in the solar corona have been made from 1996 to the present spanning the rising phase of cycle 23. During solar minimum the corona consisted of large coronal holes at the poles and quiescent streamers.