10.08

Observational Tests of the Nonthermal e± Pair/Reflection Model for AGNs
A. A. Zdziarski (Copenhegn Astron. Ctr.), G. M. Madejski, T. J. Turner (NASA/GSFC), C. Done (Leicester), F. S. Coppi (Chicago), A. P. Lightman (MIT)

We present the current status of this model, in which a compact source of relativistic pair is located above the surface of cold matter (e.g., an accretion disk). The radiated spectrum is solved for self-consistently including all relevant processes.

We have tested the model against X-ray data on NGC 4151 from Granat, on Mrk 335 from BEX for and Ginga, and on MCG -5-30-15 from Einstein. The model can explain features like a soft X-ray excess, power law and reflection components, and a break in hard X-rays. The derived compactnesses are consistent with time variability data on these objects.

10.09

Measuring the Mass of a Black Hole From Its Radiation Spectrum
L. M. O'Connell (NASA/GSFC)

In Bondi accretion onto a black hole (BH), once \( n_x \) and \( v_x \) (density and velocity of gas far from the BH) are known, the accretion rate \( M = M_\odot n_x v_x \) is determined solely by the BH mass, \( M_\odot \). There are arguments that the Bondi case approximates accretion onto a putative BH at the Galactic Center, Sgr A*, which is fed by the wind from a nearby group of hot massive stars, IRS 16. I assume a similar approximation to be valid for a putative BH at the center of M 87, where the gas released from stellar collisions in the density cusp around the BH can feed the latter. Further analysis employs some features from the theory of turbulent spherical accretion.

Heating of the accreting plasma due to dissipation of turbulence and magnetic fields is calculated under different reasonable assumptions and turns out to be basically a function of \( M_\odot \). Cooling due to cyclo-synchrotron emission and inverse Compton scattering can be presented as a function of electron temperature, \( T_e \). The value of \( T_e \) found from the thermal balance turns out to be a function of \( M_\odot \) with a weak dependence upon the uncertainties associated with the dissipative heating. Approximate analytical expressions are obtained to estimate the mass of the BH from its spectral luminosity. To fit the radio spectrum of Sgr A*, \( M_\odot = 5 \times 10^6 M_\odot \) is required; a \( 10^{-7} M_\odot \) BH would result in an electron temperature only marginally relativistic, which is incompatible with the observed (synchrotron) spectrum. A comparatively low value for the BH mass is consistent with the upper limits to Sgr A* mass found earlier (and refs.) therein. I discuss the applications of the elaborated method to putative BHs in nearby galactic nuclei as well as to stellar mass BH candidates in our Galaxy.


NAS/NRC Senior Research Associate

Session 11: Synoptic Studies, Active Regions and Radio Processes on the Sun
Oral Session, 10:00–11:30 am
Union A/B

11.01

Kinematic Modeling of Active Region Decay
G.W. Simon (APSC/LP/GPSS), A.M. Title (Lockheed/PARL), W.O. Weiss (DAMTP/UC, Cambridge)

We have previously used kinematic modeling techniques to describe radial outflow in mesogranules, supergranules, and exploding granules, and thus to explore the relationships among these convective phenomena (ApJ 375, 775–788 (1991)).

In this paper we modify the earlier model to include "suppression" of the convective flows in the presence of a magnetic field, and then apply this new model to investigate the decay of artificial sunspots and plages.

11.02

2-cm Observations of Quiescent and Flaring Emission from a Solar Active Region
J. Lim, S. M. White, and M. R. Kundu (U Md)

We present 2-cm images of a solar active region comprising a large leading spot and several smaller trailing spots, observed with the VLA on 1989 Dec 14 and 16. On both days, slowly-varying quiescent emission and impulsive flaring emission were detected. Comparisons of the radio images with white-light pictures and magnetograms obtained on Dec 13 and 17 revealed that the quiescent emission originated almost entirely from above the penumbra of large spots, whereas the flaring emission originated from regions of complex magnetic field topology near but not necessarily above magnetic neutral lines. The most intense source of quiescent emission had a relatively low brightness-temperature (< 10^5 K), was highly circularly polarized (ranging from about 30% to nearly 100%), and formed an arc on the trailing edge (i.e., limbward side) of the large leading spot. We discuss models for this emission, constrained by the low brightness temperature but high polarization. The weaker flare of Dec 14 showed a single resolved source, and was weakly circularly-polarized. The stronger flare of Dec 16 comprised a strong source with multiple peaks and several weaker compact sources, all with low degrees of circular polarization. Snapshot images of this flare showed an elongated feature moving rapidly away from the main region of emission and joining with the compact sources. We discuss likely mechanisms for this feature, and emission processes of responsible for the flares.

11.03

The Long Term Variability of the X-Ray Bright Point Population in Solar Cycle 22
D. Moses (NRL) and J.H. Davis (NASA/GSFC)

The solar cycle variability of the coronal x-ray bright point (XBP) population has been reported for cycles 20 and 21 by Davis (Solar Physics 85, 377, 1985). This variability was established by the comparison of observations from a series of 8 sounding rocket flights of the AS&E High Resolution X-Ray Imaging Payloads during solar activity cycles 20 and 21. Three additional flights of a comparable version of this payload have been made during cycle 22: 15 August 1987, 11 December 1987, and 21 November 1990. These additional observations span the range of solar activity modulation in cycle 22. The previously observed pattern of reduced XBP population counts with increased solar activity persists in the cycle 22 observations.

11.04

The Current Status of the "Extended Solar Cycle" as Observed in Fe XIV
Richard C. Allred (APSC/LP/GPSS, NSO/SP, Sunspot, NM 88349)

Investigation of the behavior of coronal intensity above the limb in Fe XIV emission (5303A) obtained at the National Solar Observatory at Sacramento Peak over the last nineteen years has resulted in the confirmation of a second