The Blazar Times

A Research Newsletter Dedicated to the BL Lac and Blazar Phenomena

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Journal Abstracts

Are the jets accelerated from the disk coronas in some active galactic nuclei?

Xinwu Cao

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We use a sample of radio-loud active galactic nuclei (AGNs) with estimated central black hole masses to explore their jet formation mechanisms. The jet power of AGNs is estimated from their extended radio luminosity. It is found that the jets in several AGNs of this sample are too powerful to be extracted from the standard thin accretion disks or rapidly spinning black holes surrounded by standard thin disks. If the advection dominated accretion flows (ADAFs) are present in these AGNs, their bright optical continuum luminosity cannot be produced by pure-ADAFs due to their low accretion rates and low radiation efficiency, unless the ADAFs transit to standard thin disks at some radii $R_{\rm tr}$. If this is the case, we find that the dimensionless accretion rates $\dot{m}=\dot{M}/\dot{M}_{\rm Edd}$ as high as ≥ 0.05 and transition from ADAFs to standard thin disks at rather small radii around $\sim 20GM_{\rm bh}/c^2$ are required to explain their bright optical continuum emission. We propose that the disk-corona structure is present at least in some AGNs in this sample. The plasmas in the corona are very hot, and the pressure scale-height of the corona $H_{\rm c}\sim R$. Powerful jets with $Q_{\rm jet}\sim L_{\rm bol}$ (bolometric luminosity) can form by the

large-scale magnetic fields created by dynamo processes in the disk corona of some AGNs. The maximal jet power extractable from the corona $Q_{\rm jet}^{\rm max} \leq 0.6 L_{\rm c}$ ($L_{\rm c}$ is the corona luminosity) is expected by this jet formation scenario. The statistic results on the sample of AGNs are consistent with the predictions of this scenario. Finally, the possibility that the jet is driven from a super-Keplerian rotating hot layer located between the corona and the cold disk is discussed. We find that, in principle, this layer can also produce a powerful jet with $Q_{\rm jet} \sim L_{\rm bol}$.

Accepted by ApJ

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http://arxiv.org/abs/astro-ph/0406570

TeV blazar gamma-ray emission produced by a cooling pile-up particle energy distribution function

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We propose a time-dependent one-zone model based on a quasi-Maxwellian 'pile-up' distribution in order to explain the time-averaged high energy emission of TeV blazars. The instantaneous spectra are the result of the synchrotron and synchrotron self-Compton emission (SSC) of ultra-relativistic leptons. The particle energy distribution function (EDF) is computed in a self-consistent way, taking into account an injection term of fresh particles, a possible pair creation term, and the particles radiative cooling. The source term is not a usual power-law but rather a 'pile-up' distribution, which can result from the combination of a stochastic heating via second order Fermi process and radiative cooling. To validate this approach, we have performed time-averaged fits of the well-known TeV emitter Mrk 501 during the 1997 flaring activity period taking into account the attenuation of the high energy component by cosmic diffuse infrared background (DIrB) and intrinsic absorption via the pair creation process. The model can reproduce very satisfactorily the observed spectral energy distribution (SED). A high Lorentz factor is required to avoid strong pair production; in the case of smaller Lorentz factor, an intense flare in the GeV range is predicted due to the sudden increase of soft photons density below the Klein-Nishina threshold. The possible relevance of such a scenario is discussed.

Accepted by ApJ

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Abstract Guidelines

Abstracts for "The Blazar Times" are solicited for papers that have been recently accepted for publication by a refereed journal, and for recent Ph.D. theses. Please do not submit an abstract before it has been accepted, nor after it is published. Abstracts from papers which are not refereed (e.g., conference proceedings) are not accepted.

The subject matter should pertain directly to the BL Lac and/or blazar phenomenon in general. Both observational and theoretical abstracts are appropriate. Abstracts from papers dealing with other classes of AGN will generally not be included unless they explicitly discuss their relevance to the blazar phenomenon; however exceptions to this rule will be considered.

A monthly call for abstracts will be issued and abstracts received by the last day of the month will usually appear in the following month's newsletter. Announcements of general interest to the BL Lac and blazar communities may also be submitted for posting in the newsletter. These might include (but are not restricted to) the following: (i) *Job Openings* directed toward blazar researchers, (ii) announcements of *Upcoming Meetings*, (iii) announcements of *Upcoming Observing Campaigns* for which participation is solicited from the community at large, (iv) reviews of *New Books*, and (v) *General Announcements* that provide or request research-related information.

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