

al. 1995) that these shocks could accelerate the protons up to the Greisen cutoff energy at 60 EeV via diffusive shock acceleration mechanism, provided the mean magnetic field strength in the region around the shocks is at least of order a microgauss. By adopting a simple model of self-similar evolutions of clusters (Bertschinger 1985), we have estimated the proton flux at earth from 95 observed clusters of galaxies to the cosmic ray flux near 10^{19} eV can be significant, assuming that about 0.3% of the infall kinetic energy could be injected into the intercluster space in the form of the CR protons. A map of flux-weighted distribution of these clusters is constructed and compared with the arrival directions of the UHE CRs. We show that the expected arrival directions of the UHE protons from clusters are nearly isotropic for energies below the Greisen cutoff, while observed super-GZK events show a rather strong correlation with the general direction of the supergalactic plane (Stanev et al. 1995).

Spherical Wind Accretion onto Supermassive Black Hole at the Galactic Center

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The unique compact radio source Sgr A* shows many observational signs that it is powered by supermassive black hole. Recent observations also imply that it is surrounded by winds from nearby IR sources. So we explore the model in which multiwavelength spectrum from Sgr A* is due to the spherical accretion of these winds onto the central supermassive black hole.

Improving upon the previous work, we allowed the possibility that ions and electrons have different temperatures, included the Compton effects and pair processes. Electrons radiate via synchrotron process and bremsstrahlung with comptonization.

We find that ion temperature approaches the virial one $\sim 10^{13}$ K while electron temperature saturates at $\sim 10^{10}$ K. However, this does not greatly affect the shape of the emission spectrum. If the black hole mass is $\sim 10^6 M_\odot$, radio, X-ray and γ -ray band spectrum is reasonably explained by the model. Yet Compton effect which is neglected in previous works makes significant emission in IR band which could be incompatible with observations. Pair production is negligible and annihilation lines cannot be observed.