Contribution ID: **342** Type: **not specified**

Multi-messenger emission from weak-jetted active galactic nuclei

Monday, September 11, 2023 11:40 AM (25 minutes)

The majority of active galactic nuclei (AGN; accreting supermassive black holes in the centers of galaxies) do not possess strong jets. A large part of the broadband emission of such weak-jetted active galactic nuclei (a.k.a. radio-quiet AGN) is understood to be thermal in nature, but there is increasing observational evidence for important nonthermal contributions, particularly at radio frequencies, and possibly also in gamma rays. Most remarkable is the recent detection of high-energy neutrinos from the Seyfert 2 galaxy NGC 1068 by IceCube. On the other hand, numerical simulations for such AGN of accretion disks, coronae, winds, small-scale jets, etc. are beginning to reveal the potential prevalence of various types of shock waves, magnetic dissipation events, turbulence, etc. that can be conducivet to particle acceleration and nonthermal emission. We review recent progress in this field and highlight future prospects for elucidating the nature of the sub-parsec regions of AGN, some aspects of feedback processes onto their environment, and multi-messenger implications.

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Session Classification: Plenary

Track Classification: Neutrinos