Contribution ID: **69** Type: **Talk**

Application of hadronic supercriticalities to extreme Blazars

Thursday, 24 January 2019 10:00 (20 minutes)

Hadronic models of high-energy AGN emission become more relevant than ever before after the latest IceCube results that associate a gamma-ray flaring AGN with high-energy neutrinos. Despite offering a unique framework for the production of high-energy neutrinos, hadronic scenarios have been criticized in the past for being radiatively inefficient. However, an overlooked property of hadronic models is that they can become "supercritical" by abruptly transforming the energy stored in relativistic protons into radiation. Supercriticality manifests itself when the proton density exceeds a critical value that depends on source properties. For even higher proton densities, we show that energetic high-energy flares can be produced within a few source light crossing times. For source radii and magnetic fields that are of relevance to high-frequency peaked blazars, and in particular, to extreme blazars, we first examine the parameter space that could drive the system to the supercritical regime. We then present results about the multi-wavelength flaring activity and discuss the expected neutrino signals.

Are you presenting on behalf of collaborations or institutions?

Yes

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Session Classification: Modeling

Track Classification: Main track