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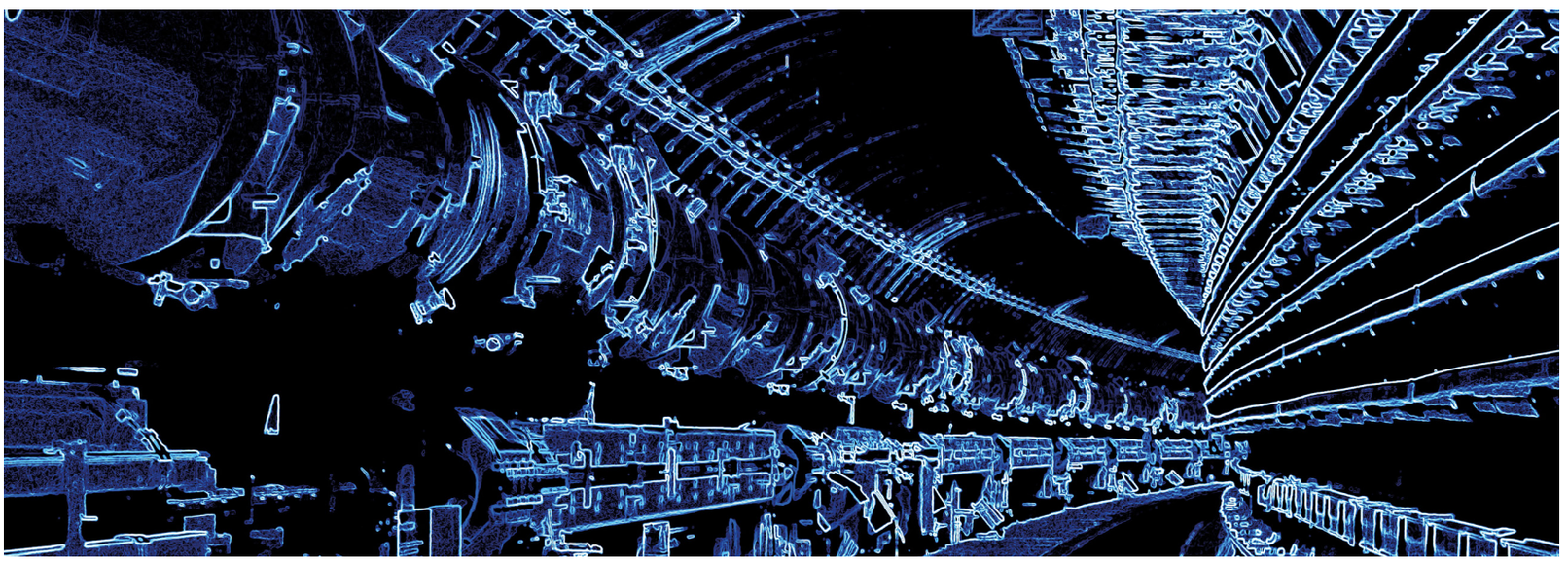

Precessing jets of supermassive black holes and how the IceCube neutrino was produced

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Active Galactic Nuclei (AGN) have been observed since decades with very long baseline interferometry (VLBI) to trace the structural changes in their parsec scale radio jets. In addition, these AGN have been monitored across the wavelength regime (from the radio- to the high energy TeV-regime) to monitor their flaring properties. It is expected that the combination of the two kinds of information yields new insight into the feeding of the central engine (widely believed to be a supermassive black hole).
We propose that the AGN flux variability may have a geometric/kinetic origin primarily, arising mainly from time-variable Doppler beaming of the jet's emission as its direction changes due to precession (and nutation). The most promising mechanism causing such jet precession is the presence of a secondary black hole near the center of the AGN. I will discuss and compare the most prominent reported cases for a precession origin of the flux variability and kinematic evolution (our own work, supplemented with data taken from the literature).
On July 12, 2018, the IceCube collaboration announced the detection of the first high-energy neutrino IceCube-170922A which could be traced back to a distant cosmic origin - to the BL Lac Object TXS 0506+056. Our findings show that the neutrino emission may result from the collision of jetted material in combination with a special viewing angle and jet precession.

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