Long-Term Accretion Flow Evolution and Neutrino Production in NGC 4151

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The nearby Seyfert NGC 4151 has recently emerged as a candidate for high-energy neutrino production, motivating detailed investigations of possible particle acceleration in its central engine. This is of particular importance as the IceCube Neutrino Observatory revealed non-jetted seyferts as primary neutrino candidate sources. In this work, we test the black hole coronal activity model as a framework for explaining the neutrino emission potentially associated with NGC 4151 and assess its consistency with observations from the IceCube Neutrino Observatory. To characterize the long-term evolution of the accretion flow and corona, we analyze 16 years of multiwavelength observations, combining X-ray (from MAXI and Swift/BAT) and optical data to trace changes in the luminosity, spectral properties, and accretion state of the source. These measurements provide a time-dependent description of the environment in which particle acceleration and hadronic interactions may occur within the corona surrounding the supermassive black hole. Using the observed evolution of the accretion flow as input, we evaluate the expected neutrino production and compare the model predictions with the neutrino signal reported by IceCube.