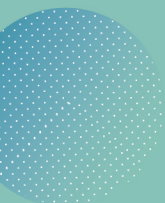




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Profile Analysis of the Multiwavelength 2.1-year Oscillations of PG 1553+113

by P. Peñil, et al. (including A. Domínguez)

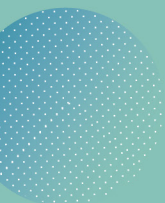
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Abstract

We investigate the morphology of the oscillation profiles of the blazar PG 1553+113 in relation to its well-known ~ 2.1 yr periodicity. We identify individual cycles in the gamma-ray, X-ray, UV, and optical light curves and characterize their temporal profiles using analytical models for single- and multi-peaked events. We find that the oscillations are generally described by a broad activity envelope with shorter-timescale substructure, showing that the ~ 2.1 yr signal is not a strictly sinusoidal or self-similar modulation. The internal morphology varies across cycles and energy bands. This is particularly evident in X-rays, where all analyzed cycles show a strong formal preference for multi-component profiles, unlike the gamma-ray band, where several cycles admit statistically comparable empirical descriptions. The contemporaneous MWL oscillations show broadly aligned activity episodes, but the timing and relative amplitudes of secondary components are not systematically repeated. This suggests that a common long-term modulation affects the broadband emission, while additional local or energy-dependent processes shape individual cycles. Such a picture is compatible with a geometric, jet-related contribution to the broad recurrent envelope, with intrinsic variability superimposed on it. We also identify new cycles with a dominant peak accompanied by weaker twin-peak-like features, similar to structures previously discussed in a supermassive black hole binary scenario for PG 1553+113. Although our results do not provide definitive evidence for this interpretation, the recurrence of comparable morphologies in newly analyzed cycles keeps this scenario viable.

