Physical Orbit for Lambda Virginis and a Test of Stellar Evolution Models

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Lambda Virginis (LamVir) is a well-known double-lined spectroscopic Am binary with the interesting property that both stars are very similar in abundance but one is sharp-lined and the other is broad-lined. We present combined interferometric and spectroscopic studies of LamVir. The small scale of the LamVir orbit (~20 mas) is well resolved by the Infrared Optical Telescope Array (IOTA), allowing us to determine its elements as well as the physical properties of the components to high accuracy. The masses of the two stars are determined to be 1.897 Msun and 1.721 Msun, with 0.7% and 1.5% errors respectively, and the two stars are found to have the same temperature of 8280 +/- 200 K. The accurately determined properties of LamVir allow comparisons between observations and current stellar evolution models, and reasonable matches are found. The best-fit stellar model gives LamVir a subsolar metallicity of Z=0.0097, and an age of 935 Myr. The orbital and physical parameters of LamVir also allow us to study its tidal evolution time scales and status. Although currently atomic diffusion is considered to be the most plausible cause of the Am phenomenon, the issue is still being actively debated in the literature. With the present study of the properties and evolutionary status of LamVir, this system is an ideal candidate for further detailed abundance analyses that might shed more light on the source of the chemical anomalies in these A stars.

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