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Igniting the Superburst on KS1731-260

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Superbursts are rare, energetic explosions observed from accreting neutron stars in low-mass X-ray binaries. Associated with the unstable ignition of carbon, superbursts are challenging to model as their energetics are too low and recurrence times too short to be easily accommodated with theoretical models of the neutron star crust and the standard extrapolation of the C12+C12 cross-section to astrophysical energies. The quasi-persistent neutron star transient KS1731–260 is a particularly good site to probe these enigmatic bursts since its quiescent luminosity has been monitored over 20 years, which provides good constraints on the temperature of the neutron star’s outer layers. In addition, it had one observed superburst while actively accreting in 1996. We explore the ignition of carbon on KS1731–260 using different C12+C12 cross-sections. We find tension between the burst depth in our models and the depth inferred from observations of the superburst indicating greater heating at shallow depths than expected. This discrepancy may be reconciled by either the lack of precision in the measured distance to KS1731–260 or an increase of the C12+C12 cross-section at ~ 1.5 MeV.

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