Thermonuclear Magnetic Deflagrations and Type I Bursts

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When the surface layers of accreting neutron stars explosively burn the fresh fluid, the ensuing Type I Burst outshines all the other accretion powered emission for tens of seconds: that makes the bursts one of the best observable phenomena of accreting neutron stars.

Due to general relativistic effects of the star gravitational potential, the escaping photons of the bursts encode information about star parameters such as spin, mass and radius that are key to constraining the equation of state of the core matter. However, to be able to unambiguously extract that information from the observations, we need to know the details of the emission on the surface and that begins with understanding how the burning flame propagates.

I will present the results of ab initio calculations of the flame spreading, describing the physical mechanisms behind the propagation[1, 2] and showing how the balance between magnetic tension and Coriolis force can lead to *fast* deflagrations in very good agreement with the observations[3].

References

[1] Y. Cavecchi, A. L. Watts, J. Braithwaite & Y. Levin, *MNRAS* 434, 3526 (2013)

[2] Y. Cavecchi, A. L. Watts, Y. Levin & J. Braithwaite, *MNRAS* 448, 445 (2015)

[3] Y. Cavecchi, Y. Levin, A. L. Watts & J. Braithwaite, *MNRAS* 459, 1259 (2016)

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