Accretion heated atmospheres of X-ray bursting neutron stars

V. F. Suleimanov[1,2*], J. Poutanen[3,4], J. Nättilä[3], J. J. E. Kajava[3,5], K. Werner[1]

[1]Institut für Astronomie und Astrophysik, Kepler Center for Astro and Particle Physics, Universität Tübingen, Sand 1, D-72076 Tübingen, Germany

[2]Kazan (Volga region) Federal University, Kremlevskaya str. 18, Kazan 420008, Russia

[3]Tuorla Observatory, Department of Physics and Astronomy, University of Turku, Väisäläntie 20, FIN-21500 Piikkiö, Finland

[4]Nordita, KTH Royal Institute of Technology and Stockholm University, Roslagstullsbacken 23, SE-10691 Stockholm, Sweden

[5]European Space Astronomy Centre (ESA/ESAC), Science Operations Department, 28691 Villanueva de la Cañada, Madrid, Spain

X-ray bursts taking place at hard persistent states of low-mass X-ray binaries show a spectral evolution consistent with the passively cooling neutron star model. This kind of bursts are used for neutron star radii and masses determination by the cooling tail method and its modifications. However, many of the bursts exhibit significant deviations of the model at the later cooling phases of the burst, at burst fluxes less than half the Eddington flux. The deviation significance depends on the persistent flux before the burst, and we proposed that the restarted accretion on the neutron star surface is the main reason of the deviation. Here we present a method for the modeling of neutron star atmospheres heated from above by the accreted fast particles to check this hypothesis. We further compare the computed models to the data for the spectral evolution of the several X-ray bursts at late stages of the cooling tail.

*E-mail: suleimanov@astro.uni-tuebingen.de