

## Nagataki Shigehiro

Position: Associate Professor

Period covered: 24<sup>th</sup> SEP 2009 – 29<sup>th</sup> SEP 2009

### I Scientific Work

I am studying Gamma-Ray Bursts.

At ICRA Net, I gave a talk as below:

Title:

GRB-SN Connection: Central Engine of Long GRBs and Explosive Nucleosynthesis

Abstract:

I would like to present my recent study on collapsars and formation of jet with the General Relativistic MHD (GRMHD) code that I have developed (ApJ, accepted: arXiv:0902.1908). Also, I have developed a General Relativistic Force-Free (GRFFE) code by which Blandford-Znajek's paraboloidal solution is reproduced well. I am going to discuss how important it is to develop a hybrid code that includes GRMHD and GRFFE codes toward understanding the central engine of a long GRB. Further, I have done numerical simulations on collapsars using ZEUS code by adding some microphysics such as a realistic equation of state and neutrino cooling/heating (Nagataki et al. ApJ 2007). Finally, I would like to talk about explosive nucleosynthesis in a collapsar (Nagataki et al. ApJ 2006), which can give a strict constraint on the central engine of a long GRB.

### II Conferences and educational activities

*Conferences and Other External Scientific Work*

After the talk at ICRA Net, I was asked to participate in the 'Galileo - Xu Guangqi meeting (First)' October 26-30, 2009 Shanghai (CHINA) by Prof. She Sheng Xue. So I participated in the meeting and gave a talk there.

### 2009 List of Publications

*Papers in refereed journals:*

K. Kotera, D. Allard, K. Murase, J. Aoi, Y. Dubois, T. Pierog, and S. Nagataki 'Propagation of Ultra-High energy Nuclei in Cluster of Galaxies: Resulting Composition and Secondary Emission' The Astrophysical Journal, accepted (arXiv:0907.2433)

S. Nagataki 'Development of General Relativistic Magnetohydrodynamic Code and its Application to Central Engine of Long Gamma-Ray Bursts' The Astrophysical Journal, 704, 937-950 (2009)

Y. Fukui, N. Furukawa, T.M. Dame, J.R. Dawson, H. Yamamoto, G.P. Rowell, F. Aharonian, W. Hofmann, E. de Ona Wilhelmi, T. Minamidani, A. Kawamura, N. Mizuno, T. Onishi, A. Mizuno,



and S. Nagataki 'A peculiar jet and arc of molecular gas toward the rich and young stellar cluster Westerlund 2 and a TeV gamma ray source' Publication of Astronomical Society of Japan, accepted (arXiv:0903.5340).

K. Murase, B. Zhang, K. Takahashi, S. Nagataki 'Possible Effects of Pair Echos on Gamma-Ray Burst Afterglow Emission', Monthly Notices of the Royal Astronomical Society accepted (arXiv:0812.0124).

H. Takami, K. Murase, S. Nagataki, K. Sato 'Cosmogenic Neutrinos as a Probe of the Transition from Galactic to Extragalactic Cosmic Rays' *Astroparticle Physics* 31, 201-211 (2009).

Y. Mizuno, B. Zhang, B. Giacomazzo, K. Nishikawa, P.E. Hardee, S. Nagataki, D.H. Hartmann 'Magnetohydrodynamic Effects in Propagating Relativistic Jets: Reverse Shock and Magnetic Acceleration', *The Astrophysical Journal*, accepted (arXiv:0810.2779)

K. Murase, S. Inoue, S. Nagataki 'Cosmic Rays above the Second Knee from Clusters of Galaxies and Associated High-Energy Neutrino Emission', *The Astrophysical Journal Letter*, accepted (arXiv:0805.0104)

K. Takahashi, K. Murase, K. Ichiki, S. Inoue, S. Nagataki

*Papers submitted to refereed journals:*

K. Murase, K. Toma, R. Yamazaki, S. Nagataki, K. Ioka 'High-energy emission as a test of the prior emission model for gamma-ray burst afterglows' *The Astrophysical Journal*, submitted (arXiv:0910.0232).

K. Hayasaki, K. Takahashi, Y. Sendouda, S. Nagataki 'Rapid Merger of Binary Primordial Black Holes: A New Approach for Supermassive Black-Hole Formation' *Physical Review D* submitted (arXiv:0909.1738).

J. Aoi, K. Murase, K. Takahashi, K. Ioka, S. Nagataki 'Can we probe the Lorentz factor of gamma-ray bursts from GeV-TeV spectra integrated over internal shocks?' *The Astrophysical Journal*, submitted (arXiv:0904.4878).

Y. Masada, S. Nagataki, K. Shibata, T. Terasawa 'Solar-type Theoretical Model for Magnetar Giant Flare' *The Astrophysical Journal*, submitted (arXiv:0803.3818).

*Proceedings (international only):*

Y. Mizuno, B. Zhang, B. Giacomazzo, K.-I. Nishikawa, P.E. Hardee, S. Nagataki, D.H. Hartmann 'Magnetohydrodynamic Effects in Propagating Relativistic Ejecta: Reverse Shock and Magnetic Acceleration' *GAMMA-RAY BURST: Sixth Huntsville Symposium. AIP Conference Proceedings*, Volume 1133, pp. 229-231 (2009).