

Kazuyoshi Z. Nanjo

Project Associate Professor

Leader of Division for Earthquake Prediction Research

Global Center for Asian and Regional Research, University of Shizuoka

3-6-1, Takajo, Aoi-Ku, Shizuoka-City, Shizuoka Prefecture, 420-0839, Japan

Tel: +81-54-245-5600 Fax: +81-54-245-5603

E-mail: nanjo@u-shizuoka-ken.ac.jp

1. Education

- **Doctor of Science** in Geology, Graduate School of Science, Tohoku University, Japan, 2001
- **Master of Science** in Geology, Graduate School of Science, Tohoku University, Japan, 1998
- **Bachelor of Science** in Geoscience, Department of Geoscience, Shizuoka University, Japan, 1996

2. Journal Articles

[Refereed]

- D. Schorlemmer, N. Hirata, Y. Ishigaki, K. Nanjo, H. Tsuruoka, T. Beutin, and F. Euchner, Earthquake detection probabilities in Japan, *Bulletin of the Seismological Society of America*, 2017 submitted.
- K. Z. Nanjo and A. Yoshida, Anomalous decrease in relatively large shocks and increase in the p and b values preceding the April 16, 2016, M7.3 earthquake in Kumamoto, Japan, *Earth Planets and Space*, 69, 13, DOI: 10.1186/s40623-017-0598-2, 2017.
- K. Z. Nanjo, J. Izutsu, Y. Orihara, N. Furuse, S. Togo, H. Nitta, T. Okada, R. Tanaka, M. Kamogawa, and T. Nagao, Seismicity prior to the 2016 Kumamoto earthquakes, *Earth Planets and Space*, 68, 187, DOI: 10.1186/s40623-016-0558-2, 2016.
- K. Z. Nanjo, A fiber-bundle model for the continuum deformation of brittle material, *International Journal of Fracture*, 204 (2), 225-237, DOI: 10.1007/s10704-016-0175-x, 2016.
- K. Z. Nanjo, S. Sakai, A. Kato, H. Tsuruoka, and N. Hirata, Time-dependent earthquake probability calculations for southern Kanto after the 2011 M9.0 Tohoku earthquake, *Geophysical Journal International*, 193 (2), 914-919, DOI: 10.1093/gji/ggt009, 2013.

- J. G. Anderson and K. Z. Nanjo, Distribution of earthquake cluster sizes in the western United States and in Japan, *Bulletin of the Seismological Society of America*, 103(1), 412-423, DOI: 10.1785/0120100212, 2013.
- A. Talbi, K. Nanjo, K. Satake, J. Zhuang, and M. Hamdache, Comparison of seismicity declustering methods using a probabilistic measure of clustering, *Journal of Seismology*, 17(3), 1041-1061, DOI: 10.1007/s10950-013-9371-6, 2013.
- A. Talbi, K. Nanjo, J. Zhuang, K. Satake, and M. Hamdache, Inter-event times in a new alarm-based earthquake forecasting model, *Geophysical Journal International*, 194 (3), 1823-1835, DOI: 10.1093/gji/ggt194, 2013.
- Y. Ogata, K. Katsura, G. Falcone, K. Z. Nanjo, and J. Zhuang, Comprehensive and topical evaluations of earthquake forecasts in number, time, space and magnitude, *Bulletin of Seismological Society of America*, 103(3), 1692-1708, DOI: 10.1785/0120120063, 2013.
- K. Z. Nanjo, N. Hirata, K. Obara, and K. Kasahara, Decade-scale decrease in b value prior to the M9-class 2011 Tohoku and 2004 Sumatra quakes, *Geophysical Research Letters*, 39, L20304, DOI: 10.1029/2012GL052997, 2012.
- K. Z. Nanjo, H. Tsuruoka, S. Yokoi, Y. Ogata, G. Falcone, N. Hirata, Y. Ishigaki, T. H. Jordan, K. Kasahara, K. Obara, D. Schorlemmer, K. Shiomi, and J. Zhuang, Predictability study on the aftershock sequence following the 2011 Off the Pacific Coast of Tohoku, Japan, earthquake: First results, *Geophysical Journal International*, 191(2), 653-658, DOI: 10.1111/j.1365-246X.2012.05626.x, 2012.
- K. Yamashina and K. Z. Nanjo, An improved relative intensity model for earthquake forecast in Japan, *Earth Planets and Space*, 64(8), 683-691, DOI: 10.5047/eps.2011.02.002, 2012.
- H. Tsuruoka, N. Hirata, D. Schorlemmer, F. Euchner, K. Z. Nanjo, and T. H. Jordan, CSEP Testing Center and the first results of the earthquake forecast testing experiment in Japan, *Earth Planets and Space*, 64(8), 661-671, DOI: 10.5047/eps.2012.06.007, 2012.
- K. Yamasaki, K. Z. Nanjo, and S. Chiba, Symmetry and entropy of one-dimensional legal cellular automata, *Complex Systems*, 20(4), 351-362, 2012.
- A. Talbi, K. Nanjo, K. Satake, J. Zhuang, and M. Hamdache, Testing inter-event times moments as earthquake precursory signals, *Proceedings of the 15th World Conference on Earthquake Engineering*, Paper number 1970, http://www.iitk.ac.in/nicee/wcee/article/WCEE2012_1970.pdf, 2012.
- K. Yamasaki and K. Z. Nanjo, Symmetry and entropy of acoustic-emission patterns in a rock-fracture experiment, In *Theory and Uses of Acoustic Emissions* (Editor: Justin K.

Burnett), Nova Science Publishers, pp. 149-162, https://www.novapublishers.com/catalog/product_info.php?products_id=18319, 2012.

- K. Z. Nanjo, Earthquake forecasts for the CSEP Japan experiment based on the RI algorithm, *Earth Planets and Space*, 63(3), 261-274, DOI: 10.5047/eps.2011.01.001, 2011.
- K. Z. Nanjo, H. Tsuruoka, N. Hirata, and T. H. Jordan, Overview of the first earthquake forecast testing experiment in Japan, *Earth Planets and Space*, 63(3), 159-169, DOI: 10.5047/eps.2010.10.003, 2011.
- K. Z. Nanjo, D. Schorlemmer, J. Woessner, S. Wiemer, and D. Giardini, Earthquake detection capability of seismic networks in Switzerland, *Geophysical Journal International*, 181(3), 1713-1724, DOI: 10.1111/j.1365-246X.2010.04593.x, 2010.
- K. Yamasaki, K. Z. Nanjo, and S. Chiba, Symmetry and entropy of biological patterns: discrete Walsh functions for 2D image analysis, *BioSystems*, 103, 105-112, DOI: 10.1016/j.biosystems.2010.10.010, 2010.
- K. Z. Nanjo, Earthquake forecast models for Italy based on the RI algorithm, *Annals of Geophysics*, 53(3), 117-127, DOI: 10.4401/ag-4810, 2010.
- K. Z. Nanjo, T. Ishibe, H. Tsuruoka, D. Schorlemmer, Y. Ishigaki, and N. Hirata, Analysis of completeness magnitude and seismic network coverage for Japan, *Bulletin of the Seismological Society of America*, 100(6), 3261-3268, DOI: 10.1785/0120100077, 2010.
- K. Yamasaki and K. Z. Nanjo, A new mathematical tool for analyzing the fracturing process in rock: Partial symmetry of microfracturing, *Physics of the Earth and Planetary Interiors*, 173(3-4), 297-305, DOI: 10.1016/j.pepi.2009.01.010, 2009.
- K. Z. Nanjo, H. Tsuruoka, K. Kasahara, S. Sakai, N. Hirata, and K. Obara, Toward unifying available earthquake catalogs for the Tokyo Metropolitan area: Quality characterization, *Bulletin of the Earthquake Research Institute, University of Tokyo*, 84, 145-152, 2009 (in Japanese with English abstract).
- K. Kasahara, S. Sakai, Y. Morita, N. Hirata, H. Tsuruoka, S. Nakagawa, K. Z. Nanjo, and K. Obara, Development of the Metropolitan Seismic Observation network (MeSO-net) for detection of mega-thrust beneath Tokyo Metropolitan area, *Bulletin of the Earthquake Research Institute, University of Tokyo*, 84, 71-88, 2009 (in Japanese with English abstract).
- Y. Nishiyama, K. Z. Nanjo, and K. Yamasaki, Geometrical minimum units of fracture patterns in two-dimensional space: Lattice and discrete Walsh functions, *Physica A*, 387(25), 6252-6262, DOI: 10.1016/j.physa.2008.07.014, 2008.
- K. Z. Nanjo, Rheology based on damage mechanics:—Toward a new view of modeling

the upper crustal deformation—, *Zisin* (Journal of the Seismological Society of Japan. 2nd ser.), 59(3), 223-235, DOI: 10.4294/zisin.59.223, 2007 (in Japanese with English abstract).

- K. Z. Nanjo, B. Enescu, R. Shcherbakov, D. L. Turcotte, I. Takaki, and Y. Ogata, Decay of aftershock activity for Japanese earthquakes, *Journal of Geophysical Research*, 112(B08), B08309, DOI: 10.1029/2006JB004754, 2007.
- K. Z. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry of earthquake patterns -Asymmetry and rotation in a disordered seismic source, *Acta Geophysica*, 54(1), 3-14, DOI: 10.2478/s11600-006-0002-2, 2006.
- K. Z. Nanjo, J. B. Rundle, J. R. Holliday, and D. L. Turcotte, Pattern informatics and its application for optimal forecasting of large earthquakes in Japan, *Pure and Applied Geophysics*, 163(11-12), 2417-2432, DOI: 10.1007/s00024-006-0130-2, 2006.
- K. Z. Nanjo, J. R. Holliday, C.-c. Chen, J. B. Rundle, and D. L. Turcotte, Application of a modified Pattern Informatics to forecasting the locations of future large earthquakes in the central Japan, *Tectonophysics*, 424(3-4), 351-366, DOI: 10.1016/j.tecto.2006.03.043, 2006.
- K. Z. Nanjo, J. R. Holliday, C.-c. Chen, J. B. Rundle, and D. L. Turcotte, Forecasting locations of future large earthquakes, using pattern informatics method: A review, *Proceedings of the Institute of Statistical Mathematics*, 54(2), 281-297, 2006 (in Japanese with English abstract).
- C.-c. Chen, J. B. Rundle, S.-C. Li, J. R. Holliday, K. Z. Nanjo, D. L. Turcotte, and K. F. Tiampo, From tornadoes to earthquakes -Forecast verification for binary events applied to the 1999 Chi-Chi, Taiwan, earthquake, *Terr. Atmos. Ocean. Sci.*, 17(3), 503-516, 2006.
- K. Z. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry of fault patterns -Quantitative measurement of anisotropy and entropic heterogeneity, *Mathematical Geology*, 37(3), 277-293, DOI: 10.1007/s11004-005-1559-z, 2005.
- K. Z. Nanjo, D. L. Turcotte, and R. Shcherbakov, A model of damage mechanics for the deformation of the continental crust, *Journal of Geophysical Research*, 110(B7), B07403, DOI: 10.1029/2004JB003438, 2005.
- K. Z. Nanjo and D. L. Turcotte, Damage and rheology in a fiber-bundle model, *Geophysical Journal International*, 162(3), 859-866, DOI: 10.1111/j.1365-246X.2005.02683.x, 2005.
- J. R. Holliday, K. Z. Nanjo, K. F. Tiampo, J. B. Rundle, and D. L. Turcotte, Earthquake forecasting and its verification, *Nonlinear Processes in Geophysics*, 12(6), 965-977, DOI: 10.5194/npg-12-965-2005, 2005.

- C.-c. Chen, J. B. Rundle, J. R. Holliday, K. Z. Nanjo, D. L. Turcotte, S.-C.. Li, and K. F. Tiampo, The 1999 Chi-Chi, Taiwan, earthquake as a typical example of seismic activation and quiescence, *Geophysical Research Letters*, 32(22), L22315, DOI: 10.1029/2005GL023991, 2005.
- K. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry in the self-organized criticality, *The Journal of the International Society for the Interdisciplinary Study of Symmetry "Symmetry: Art and Science 2004"* (Editors: D. Nagy and G. Lugosi) ISIS-Symmetry, Budapest, Hungary, 302-305, <http://www.mi.sanu.ac.yu/vismath/visbook/sydnanjo/>, 2004.
- K. Nanjo and H. Nagahama, Fractal properties of spatial distributions of aftershocks and active faults, *Chaos, Solitons and Fractals*, 19(2), 387-397, DOI: 10.1016/S0960-0779(03)00051-1, 2004.
- K. Nanjo and H. Nagahama, Discussions on fractals, aftershocks and active faults -Diffusion and seismo-electromagnetism, *The Arabian Journal for Science and Engineering*, 29(2C), 147-167, 2004.
- K. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry and self-organized criticality, *Forma*, 16(3), 213-224, 2001.
- K. Nanjo and H. Nagahama, Spatial distribution of aftershocks and the fractal structure of active fault systems, *Pure and Applied Geophysics*, 157(4), 575-588, DOI: 10.1007/PL00001108, 2000.
- K. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry properties of spatial distribution of microfracturing in rock, *Forma*, 15(1), 95-101, 2000.
- K. Nanjo and H. Nagahama, Observed correlations between aftershock spatial distributions and earthquake fault lengths, *Terra Nova*, 12(6), 312-316, DOI: 10.1046/j.1365-3121.2000.00329.x, 2000.
- K. Nanjo, H. Nagahama, and M. Satomura, Rates of aftershock decay and the fractal structure of active fault systems, *Tectonophysics*, 287(1-4), 173-186, DOI: 10.1016/S0040-1951(98)80067-X, 1998.

[Non-refereed]

- 楠城一嘉, 平田 直, 小原一成, 笠原敬司, 2011年東北地方太平洋沖地震震源域の b 値の時空間変化, *地震予知連絡会会報*, 86, 121-122, 2011.
- 東京大学地震研究所(平田 直, 鶴岡 弘, 楠城一嘉), CSEP 日本の取り組みについて, *地震予知連絡会会報*, 85, 433-436, 2011.
- 楠城一嘉, 鶴岡 弘, 平田 直, 笠原敬司, 地震発生予測システムの構築に向けて-統計物理学者に望むこと-, *物性研究*, 93(2), 125-142, 2009.

- 執筆分担(楠城一嘉, 鶴岡 弘), 関東の地震カタログの整理, 首都直下地震防災・減災特別プロジェクト①首都圏でのプレート構造調査、震源断層モデル等の構築等(平成 22 年度)成果報告書, 文部科学省研究開発局 東京大学地震研究所, 13-14, 2011.
- 楠城一嘉, 国際交流から改めて知ること ―白金台ロッジの交流促進行事を開催―, 東京大学学内広報, 1420, 11, 2011.
- 執筆分担(楠城一嘉, 鶴岡 弘), 関東の地震カタログの整理, 首都直下地震防災・減災特別プロジェクト①首都圏でのプレート構造調査、震源断層モデル等の構築等(平成 21 年度)成果報告書, 文部科学省研究開発局 東京大学地震研究所, 13-15, 2010.
- 執筆分担(楠城一嘉, 鶴岡 弘), 地震活動の統計的解析, 首都直下地震防災・減災特別プロジェクト①首都圏でのプレート構造調査、震源断層モデル等の構築等(平成 20 年度)成果報告書, 文部科学省研究開発局 東京大学地震研究所, 33-34, 2009.
- K. Z. Nanjo, Testing earthquake forecasts -Recent progress for Europe and implication for a first generation of Japanese testing center, ―地震活動のモデルと予測に関する研究―統計数理研究所共同研究集会レポート 19-共研-5002, 169-175, 2008.
- 平田 直, 楠城一嘉, 鶴岡 弘, 横井佐代子, 「地震予報」ができるかも?日本初の検証実験に 91 モデル、「中規模」なら予測に見通しも, なみふる, 84(3), 2-3, 2011.
- N. Hirata, T. H. Jordan, H. Tsuruoka, and K. Z. Nanjo, Preface, Earth Planets and Space, 63(3), 157, DOI: 10.5047/eps.2011.02.011, 2011.
- 平田 直, 酒井慎一, 蔵下英司, 中川茂樹, 楠城一嘉, 「首都直下地震防災・減災特別プロジェクト」序文, "首都直下地震防災・減災特別プロジェクト"論文集東京大学地震研究所彙報第 84 号平成 21 年(2009)抜刷, 2010.
- N. Hirata, T. H. Jordan, H. Tsuruoka, and K. Z. Nanjo, Call for Papers: Special Issue of Earth, Planets and Space (EPS) "Earthquake Forecast Testing Experiment for Japan", Earth Planets and Space, 61(6), 805, 2009.
- 楠城一嘉, 鶴岡 弘, 平田 直, 地震活動の評価に基づく地震発生予測研究グループ, 地震発生予測検証実験に関する公募, 日本地震学会ニュースレター, 20(6), 7-10, 2009.
- 平田 直, 酒井慎一, 蔵下英司, 中川茂樹, 楠城一嘉, 「首都直下地震防災・減災特別プロジェクト」序文, 地震研究所彙報, 84, 39, 2009.
- 楠城一嘉, 鶴岡 弘, 遠田晋次, 平田 直, 地震活動評価に基づく地震予測研究: 世界と日本の動向, 日本地震学会ニュースレター, 20(4), 16-20, 2008.
- 楠城一嘉, 将来の地震の発生場所を予測する新たな手法: パターンインフォマティクス, 形の科学会誌, 20(2), 226-227, 2005.

3. Presentations in International Conferences etc. (invited only)

- K. Nanjo, CSEP Results from Time-Dependent Earthquake Forecasts for the M9 Tohoku Sequence, SCEC CSEP Workshop: Final Evaluation of the Regional

Earthquake Likelihood Models (RELM) Experiment and the Future of Earthquake Forecasting, Rancho Las Palmas Resort, Rancho Mirage, CA (USA), 5-7 June 2012.

- K. Z. Nanjo, S. Yokoi, H. Tsuruoka, D. Schorlemmer, G. Falcone, N. Hirata, Y. Ishigaki, T. H. Jordan, K. Kasahara, K. Obara, Y. Ogata, K. Shiomi, and J. Zhuang (2011), Collaboratory for the predictability study of the aftershock sequence following the 2011 off the Pacific coast of Tohoku earthquake: A preliminary result, APEC Cooperation for Earthquake Simulation (ACES) Workshop on Advances in Simulation of Multihazards, Makena Resort in Kihei, Maui, Hawaii (USA), 1-5 May 2011.
- K. Z. Nanjo, S. Yokoi, H. Tsuruoka, D. Schorlemmer, G. Falcone, N. Hirata, Y. Ogata, and J. Zhuang, CSEP Earthquake Forecast Testing Experiment in Japan: Strategy and Preliminary Results of Testing against the Aftershock Sequence of the 2011 off the Pacific Coast of Tohoku Earthquake (SE73-D1-AM1-203B-001), AOGS 2011 8th Annual Meeting, Taipei International Convention Centre, Taipei, (Taiwan), 8-12 August 2011.
- K. Z. Nanjo, H. Tsuruoka, S. Yokoi, D. Schorlemmer, N. Hirata, and T. H. Jordan, The first earthquake forecast testing experiment in Japan: Scope and recent progress, China-Japan Joint Workshop on Inland Earthquakes: Toward understanding on occurrence mechanism of inland earthquakes, Earthquake Research Institute, University of Tokyo, Tokyo (Japan), 24-25 November 2010.
- K. Nanjo, H. Tsuruoka, N. Hirata, D. Schorlemmer, and F. Euchner, CSEP earthquake forecast testing center for Japan: Primary scope and recent progress, International Symposium on Earthquake Seismology and Earthquake Predictability, Beijing (China), 5-9 July 2009.
- K. Nanjo, J. R. Holliday, C. C. Chen, J. B. Rundle, and D. L. Turcotte, A modified Pattern Informatics (PI) method -Application to forecasting the locations of future large earthquakes in central Japan, American Geophysical Union 2006 Fall Meeting, Moscone Center, San Francisco (USA), 11-15 December 2006.
- K. Nanjo, Statistical approach to understanding and forecasting earthquakes and faults, Seminar of Swiss Seismological Service, ETH, Zurich (Switzerland), 21 March 2006.
- K. Nanjo, H. Nagahama, and E. Yodogawa, Symmetry in the self-organized criticality, 'Intersections of Art and Science' The 5th ISIS-Symmetry Congress and Exhibition, Sydney (Australia), 8-14 July 2001.