



## On temporal variations of the multi-TeV cosmic ray anisotropy using the Tibet III Air Shower Array

M. AMENOMORI<sup>1</sup>, X. J. BI<sup>2</sup>, D. CHEN<sup>3</sup>, W. Y. CHEN<sup>2</sup>, S. W. CUI<sup>4</sup>, DANZENGLUOBU<sup>5</sup>, L. K. DING<sup>2</sup>, X. H. DING<sup>5</sup>, C. F. FENG<sup>6</sup>, ZHAOYANG FENG<sup>2</sup>, Z. Y. FENG<sup>7</sup>, Q. B. GOU<sup>2</sup>, H. W. GUO<sup>5</sup>, Y. Q. GUO<sup>2</sup>, H. H. HE<sup>2</sup>, Z. T. HE<sup>4,2</sup>, K. HIBINO<sup>8</sup>, N. HOTTA<sup>9</sup>, HAIBING HU<sup>5</sup>, H. B. HU<sup>2</sup>, J. HUANG<sup>2</sup>, W. J. LI<sup>2,7</sup>, H. Y. JIA<sup>7</sup>, L. JIANG<sup>2</sup>, F. KAJINO<sup>10</sup>, K. KASAHARA<sup>11</sup>, Y. KATAYOSE<sup>12</sup>, C. KATO<sup>13</sup>, K. KAWATA<sup>3</sup>, LABACIREN<sup>5</sup>, G. M. LE<sup>2</sup>, A. F. LI<sup>14,6,2</sup>, C. LIU<sup>2</sup>, J. S. LIU<sup>2</sup>, H. LU<sup>2</sup>, X. R. MENG<sup>5</sup>, K. MIZUTANI<sup>11,15</sup>, K. MUNAKATA<sup>13</sup>, H. NANJO<sup>1</sup>, M. NISHIZAWA<sup>16</sup>, M. OHNISHI<sup>3</sup>, I. OHTA<sup>17</sup>, S. OZAWA<sup>11</sup>, X. L. QIAN<sup>6,2</sup>, X. B. QU<sup>2</sup>, T. SAITO<sup>18</sup>, T. Y. SAITO<sup>19</sup>, M. SAKATA<sup>10</sup>, T. K. SAKO<sup>12</sup>, J. SHAO<sup>2,6</sup>, M. SHIBATA<sup>12</sup>, A. SHIOMI<sup>20</sup>, T. SHIRAI<sup>8</sup>, H. SUGIMOTO<sup>21</sup>, M. TAKITA<sup>3</sup>, Y. H. TAN<sup>2</sup>, N. TATEYAMA<sup>8</sup>, S. TORII<sup>11</sup>, H. TSUCHIYA<sup>22</sup>, S. UDO<sup>8</sup>, H. WANG<sup>2</sup>, H. R. WU<sup>2</sup>, L. XUE<sup>6</sup>, Y. YAMAMOTO<sup>10</sup>, Z. YANG<sup>2</sup>, S. YASUE<sup>23</sup>, A. F. YUAN<sup>5</sup>, T. YUDA<sup>3</sup>, L. M. ZHAI<sup>2</sup>, H. M. ZHANG<sup>2</sup>, J. L. ZHANG<sup>2</sup>, X. Y. ZHANG<sup>6</sup>, Y. ZHANG<sup>2</sup>, YI ZHANG<sup>2</sup>, YING ZHANG<sup>2</sup>, ZHAXISANGZHU<sup>5</sup>, X. X. ZHOU<sup>7</sup> (THE TIBET AS $\gamma$  COLLABORATION)

<sup>1</sup>*Department of Physics, Hirosaki University, Hirosaki 036-8561, Japan*

<sup>2</sup>*Key Laboratory of Particle Astrophysics, Institute of High Energy Physics, Chinese Academy of Sciences, Beijing 100049, China*

<sup>3</sup>*Institute for Cosmic Ray Research, University of Tokyo, Kashiwa 277-8582, Japan*

<sup>4</sup>*Department of Physics, Hebei Normal University, Shijiazhuang 050016, China*

<sup>5</sup>*Department of Mathematics and Physics, Tibet University, Lhasa 850000, China*

<sup>6</sup>*Department of Physics, Shandong University, Jinan 250100, China*

<sup>7</sup>*Institute of Modern Physics, SouthWest Jiaotong University, Chengdu 610031, China*

<sup>8</sup>*Faculty of Engineering, Kanagawa University, Yokohama 221-8686, Japan*

<sup>9</sup>*Faculty of Education, Utsunomiya University, Utsunomiya 321-8505, Japan*

<sup>10</sup>*Department of Physics, Konan University, Kobe 658-8501, Japan*

<sup>11</sup>*Research Institute for Science and Engineering, Waseda University, Tokyo 169-8555, Japan*

<sup>12</sup>*Faculty of Engineering, Yokohama National University, Yokohama 240-8501, Japan*

<sup>13</sup>*Department of Physics, Shinshu University, Matsumoto 390-8621, Japan*

<sup>14</sup>*School of Information Science and Engineering, Shandong Agriculture University, Taian 271018, China*

<sup>15</sup>*Saitama University, Saitama 338-8570, Japan*

<sup>16</sup>*National Institute of Informatics, Tokyo 101-8430, Japan*

<sup>17</sup>*Sakushin Gakuin University, Utsunomiya 321-3295, Japan*

<sup>18</sup>*Tokyo Metropolitan College of Industrial Technology, Tokyo 116-8523, Japan*

<sup>19</sup>*Max-Planck-Institut für Physik, München D-80805, Deutschland*

<sup>20</sup>*College of Industrial Technology, Nihon University, Narashino 275-8576, Japan*

<sup>21</sup>*Shonan Institute of Technology, Fujisawa 251-8511, Japan*

<sup>22</sup>*RIKEN, Wako 351-0198, Japan*

<sup>23</sup>*School of General Education, Shinshu University, Matsumoto 390-8621, Japan*

zhangyi@mail.ihep.ac.cn

**Abstract:** We analyze the large-scale two-dimensional sidereal anisotropy of multi-TeV cosmic rays by Tibet Air Shower Array, with the data taken from 1999 November to 2008 December. To explore temporal variations of the anisotropy, the data set is divided into nine intervals, each in a time span of about one year. The sidereal anisotropy of magnitude about 0.1% appears fairly stable from year to year over the entire observation period of nine years. This indicates that the anisotropy of TeV Galactic cosmic rays remains insensitive to solar activities since the observation period covers more than a half of the 23rd solar cycle.

**Keywords:** cosmic rays — diffusion — ISM: magnetic fields — solar neighborhood — Sun: activity