

Project Title:

Generation of cosmic ray air showers at large statistics

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1. JEM-EUSO is the innovated space mission aiming at the efficient observation of ultra-high cosmic rays (UHECRs) from the International Space Station. The EUSO Team is hosting the international collaboration formed by 350 researchers from 16 nations (see <http://jemeuso.riken.jp> for details). The JEM-EUSO detector is designed to detect air shower phenomenon initiated by UHECRs. The phenomenon involves a huge amount of particles, far more than trillions. The experience of cosmic ray observation from space has been never carried out and many aspect should be tested in simulation based studies. The high computational power is a key factor to maximize the mission's scientific output.

2. For this fiscal year, we used a few 100k hours of CPU time. We used CORSIKA software package (<https://web.ikp.kit.edu/corsika/>) for air shower simulations along with ESAF (EUSO Simulation and Analysis Framework; C. Berat et al, *Astroparticle Physics* 33 (2010), 221). This fiscal year, we mainly in collaboration with University of Tuebingen (Germany), Integral Data Centre (Switzerland), Institute of Experimental Physics (Slovakia) etc., we generated a large amount of air showers under cloudy conditions.

3. Results: For the cloudy-condition simulations, we are analyzing the simulated data towards final results and publication.

4. Conclusion: We are now working on the analysis of the cloudy-condition simulations. In this fiscal year, we have published four articles which are partly based on the simulation results mainly made in FY

2013.

5. For JEM-EUSO related tasks, we will utilize RICC facility for air shower simulations on quick use basis.

Fiscal Year 2014 List of Publications Resulting from the Use of RICC

[Publication]

- M Bertaina et al. (2014), “Performance and air-shower reconstruction techniques for the JEM-EUSO mission”, *Advances in Space Research*, 53, 1515-1535.
- JEM-EUSO Collaboration (2014), “Performances of JEM-EUSO: angular reconstruction” *Experimental Astronomy*, Article in Press. doi: 10.1007/s10686-013-9371-0.
- JEM-EUSO Collaboration (2014), “The JEM-EUSO observation in cloudy conditions” *Experimental Astronomy*, Article in Press. doi: 10.1007/s10686-014-9377-2.
- JEM-EUSO Collaboration (2014), “JEM-EUSO observational technique and exposure” *Experimental Astronomy*, Article in Press. doi: 10.1007/s10686-014-9376-3.