

Project Title:

Study of ultra-high energy cosmic rays from space with the JEM-EUSO experiment

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1. The JEM-EUSO space observatory will be launched and attached to the Japanese module of the International Space Station (ISS) by 2018. It aims to observe UV photon tracks produced by Ultra High Energy Cosmic Rays (UHECR) developing in the atmosphere and producing Extensive Air Showers (EAS). JEM-EUSO will use our atmosphere as a huge calorimeter, to detect the electromagnetic and hadronic components of the EAS with a large and wide-angle telescope to be mounted on the International Space Station will open up "particle astronomy" from space. It will characterize Ultra High-Energy Cosmic Rays (UHECR) by detecting fluorescent and Cherenkov photons generated by air showers in the earth's atmosphere. The JEM-EUSO telescope consists of 3 light-weight optical Fresnel lenses with a diameter of about 2.5 m, 300 k channels of MAPMTs, frontend readout electronics, trigger electronics, and system electronics. An infrared camera and a LIDAR system on-board and a global light system on the ground will also be used to monitor the earth's atmosphere and to calibrate the telescope instruments.

For UHECR experiments, the atmosphere acts not only as the showering medium for the primary cosmic ray, but it is also an essential part of the readout system. Thus, the atmosphere must be calibrated, and considered as input to the analysis of the fluorescence data. Major uncertainties in the fluorescence energy measurements come from the precision of various atmospheric transmission effects, air Cherenkov subtraction, multiple scattering of light and cloud corrections.

2. The use of RICC focused on the simulation of EAS in the atmosphere, very time consuming

since each event produces 10^{11} secondary particles. To evaluate the performance in exposure, a large number of EAS simulations are generated taking into account EAS properties, background noise, role of the cloud and the configuration of the JEM-EUSO telescope.

3. Next year the work will continue by post-doc and students, so at the current time it will not be necessary to keep my personal account active.

RICC Usage Report for Fiscal Year 2013

Fiscal Year 2013 List of Publications Resulting from the Use of RICC

[Proceedings, etc.]

Proceedings of 2013 ICRC, Brazil (attached)

Calibration and testing of a prototype of the JEM-EUSO telescope on Telescope Array site p26

Estimated exposure of UHECR observation by the JEM-EUSO mission , p34

A study on JEM-EUSO's trigger probability for neutrino-initiated EAS p42

ESAF-Simulation of the EUSO-Balloon p 54

Simulating the JEM-EUSO Mission: Expected Reconstruction Performance p58

An End to End Simulation code for the IR-Camera of the JEM-EUSO Space

Observatory. p150

[Oral presentation at an international symposium]

ICRC 2013, Brazil (same as the proceedings)