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The Atmospheric Science of JEM-EUSO

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An Atmospheric Monitoring System (AMS) is a mandatory and key device of a space-based mission which aims to detect Ultra-High Energy Cosmic Rays (UHECR) and Extremely-High Energy Cosmic Rays (EHECR) from Space. JEM-EUSO has a dedicated atmospheric monitoring system that plays a fundamental role in our understanding of the atmospheric conditions in the Field of View (FoV) of the space telescope. Our AMS consists of a very challenging space infrared camera, a LIDAR device and a Global Light System (GLS) Laser Stations, that are being fully designed with space qualification to fulfil the scientific requirements of this space mission. The AMS will provide information of the cloud cover in the FoV of JEM-EUSO, as well as measurements of the cloud top heights with an accuracy of 500 m and the optical depth profile of the atmosphere transmittance in the direction of each air shower with an accuracy of 0.15 degree and a resolution of 500 m. This will ensure that the energy of the primary UHECR and the depth of maximum development of the EAS (Extensive Air Shower) are measured with an accuracy better than 30% primary energy and 120 g/cm^2 depth of maximum development for EAS occurring either in clear sky or with the EAS depth of maximum development above optically thick cloud layers. Moreover a very novel radiometric retrieval algorithm considering the LIDAR shots as calibration points in the FoV of the Infrared Camera, that seems to be the most promising retrieval algorithm is under development to infer the Cloud Top Height (CTH) of all kind of clouds, thick and thin clouds in the FoV of the JEM-EUSO space telescope. Moreover all the Atmospheric Science developed for the JEM-EUSO collaboration will be reviewed as pattern recognition for different levels of UV background, the atmospheric effects on the calibration of GLS or even the capabilities of JEM-EUSO to contribute to the Space weather.

Collaboration

JEM-EUSO

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958

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