



Obtaining cloud top height from WRF model vertical profiles: application to the EUSO program

Andrés Merino (1), Laura López (1), José Luis Sánchez (1), Maria Dolores Rodriguez-Frias (2), Luis Del Peral (2), Sebastian Franchini (3), Javier Licandro (4), Eduardo García-Ortega (1), José Luis Marcos (1), Estíbaliz Gascón (1), Sergio Fernández-González (1), Lucía Hermida (1), and Elena Rodríguez (1)

(1) University of León, Química y Física aplicadas, León, Spain (amers@unileon.es), (2) University of Alcalá de Henares, Spain, (3) IDR/UPM. E.T.S.I Aeronáutica y del Espacio. Universidad Politécnica de Madrid. Spain, (4) Instituto de Astrofísica de Canarias (IAC), Tenerife, Spain

The objective of the Extreme Universe Space Observatory (EUSO) program is detection and measurement of high-energy particles that reach earth's atmosphere from space. Clouds at mid and upper levels of the troposphere can interfere with such detection. Therefore, determining cloud top height with high accuracy is crucial to estimating the effect of clouds on these measurements. With this aim, we developed a method to extract that height using cloud temperature via vertical profiles predicted by the WRF model.

First, we evaluated model ability to represent temperature and humidity profiles in different climatic regions of the globe. To this end, we established 12 windows covering the earth and all seasons of the year. From these, points with available soundings were selected to calibrate and obtain the optimal WRF configuration for producing vertical temperature profiles. Within the WRF, we defined two domains for each window, with spatial resolutions 15 and 5 km. Vertical resolution was established with 58 levels, because we required profiles of high accuracy. In each study window, we evaluated a series of parameterizations (microphysics, cumulus, radiation). For this, we compared vertical profiles obtained by the WRF for each parameterization, using sounding data in each study area.

Once we obtained the optimum physical configuration of the model for each climatic region, we developed an application to automatically determine cloud top height at each pixel of the infrared camera images, taking as input cloud-top temperature plus temperature and humidity profiles output by the WRF at each pixel.