PERFORMANCE OF THE CHERENKOV TELESCOPE ARRAY IN THE PRESENCE OF CLOUDS

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WHAT THE PAPER IS ABOUT?

This paper presents the impact of clouds on the Cherenkov Telescope Array (CTA) performance and a method developed to analyze very high-energy data taken in the presence of clouds.

WHY IS IT RELEVANT?

Different atmospheric conditions, such as clouds, can reduce the fraction of Cherenkov photons produced in air showers that reach ground-based telescopes, which degrade the performance of the telescopes. If the air shower maximum is deeper in the atmosphere, the major fraction of Cherenkov photons is not affected by clouds, therefore the telescopes may be triggered. By applying correction methods to the data taken in the presence of clouds we can use the data that would otherwise be unusable. This may yield an increase in the duty cycle of the CTA.

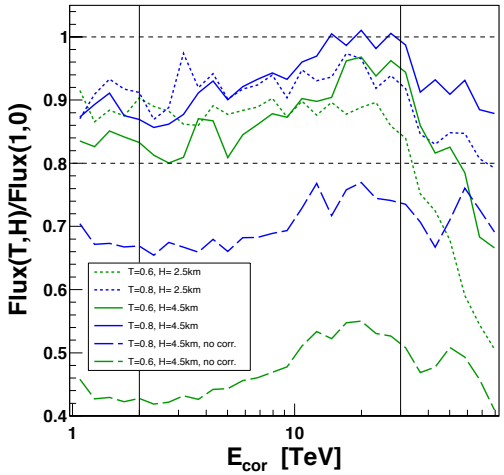

Fig. 1: The ratio between the corrected spectrum and the spectrum for cloudless conditions.

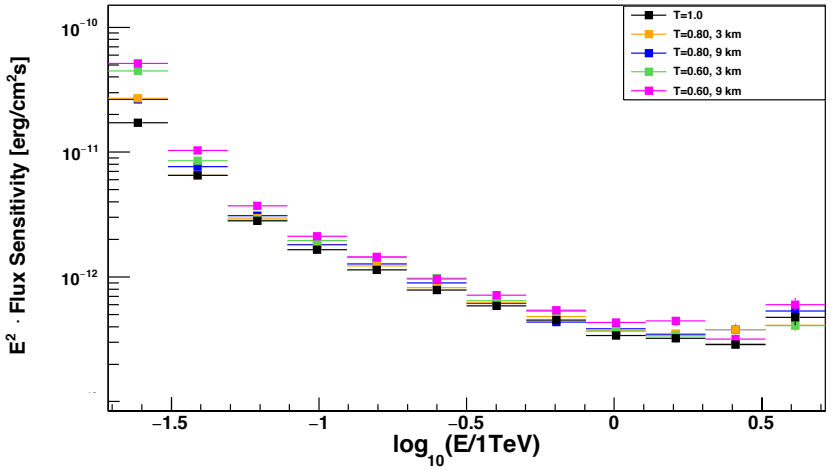

Fig. 2: The differential sensitivity for the layout of 4 Large-Sized CTA telescopes.

WHAT IS DONE?

The development of air showers and the telescope response to the Cherenkov photons produced in the showers simulations In the different atmospheric conditions were done using Monte Carlo (MC) tools and the MODerate resolution atmospheric TRANsmission (MODTRAN) code.

WHAT IS THE RESULT?

In the presence of high-density clouds with low transmissions through the atmosphere, it is shown that the performance of all three types of CTA telescopes degrades. Although the degradation effects are most prominent at the energy thresholds, the effects of the clouds are evident across the entire energy range for each telescope type and if not taken into account, they might result in additional systematic errors affecting the measurement. It is shown that for very high-energy data extremely time-consuming MC simulations can be avoided by using the proposed correction method.