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Influence of atmospheric aerosols on the performance of the MAGIC telescopes

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We investigate the performance of the MAGIC telescopes under three simulated atmospheric conditions: an increased aerosol content in the lower part of the troposphere, the presence of a cloud and an extremely clean atmosphere. We find that the effective area of the telescopes system is gradually reduced in the presence of varying concentrations of aerosols whereas the energy threshold rises. Clouds at different heights produce energy-dependent effects on the performance of the system. A clear correlation between total atmospheric transmission at 385nm and energy bias, energy threshold and reconstructed spectral index, respectively, is found, separately for each aerosol layer height. Based on these findings, a correction method could be developed for the case that atmospheric transmission and cloud altitude are measured during the observations. The method can be applied to increase the duty cycle of any other imaging Cherenkov telescope including the next generation Cherenkov Telescope Array.

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