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Simultaneous particles influence on the LAGO's Water Cherenkov Detectors signals

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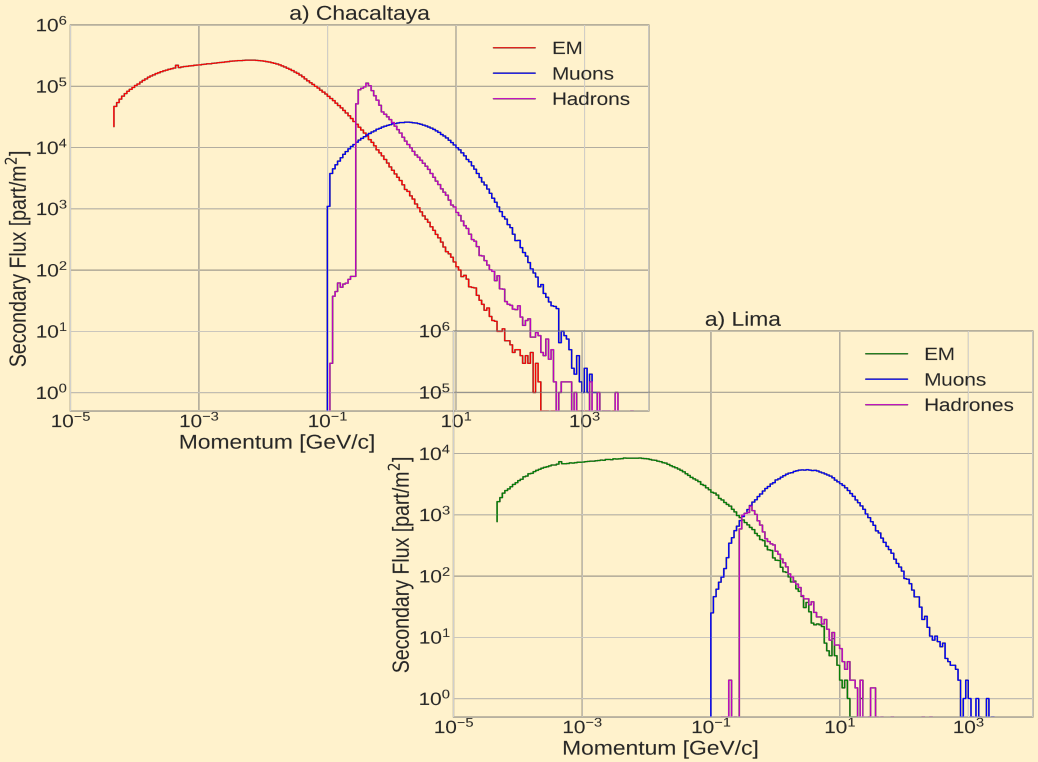
What is done here?

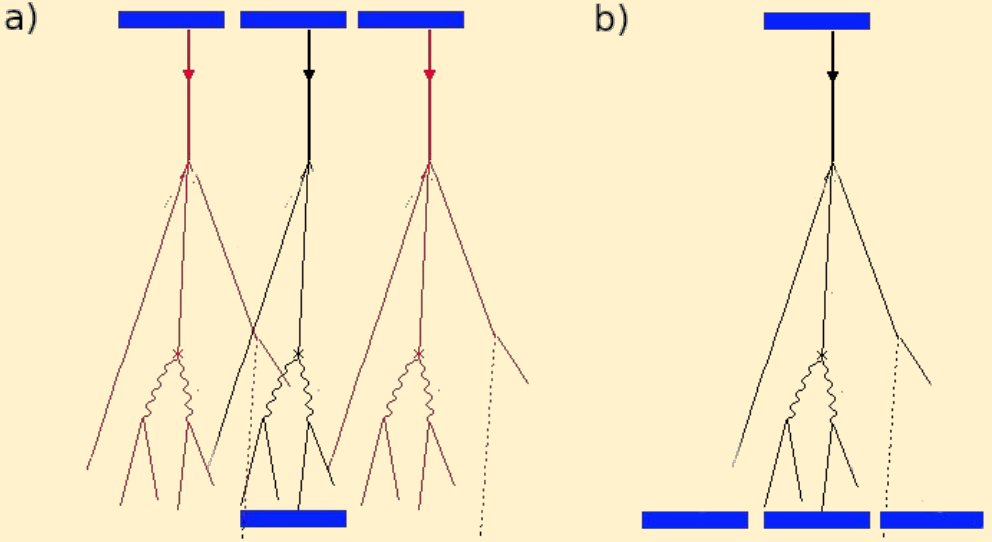
We use ARTI, the simulation framework of LAGO, that integrates CORSIKA, GEANT4, GDAS and MAGNETOCOSMIC to estimate the flux of secondaries that reach two extreme LAGO sites, we re-analyze this flux searching for simultaneous particles reaching the detectors (multiparticles).



We have calculated the secondary particle spectrum, from one hour of primary cosmic ray flux with 10^{11}>E/eV>10^{15}, at Chacaltaya (5200 m a.s.l.) and Lima (950 m a.s.l.) using ARTI

How was it done?

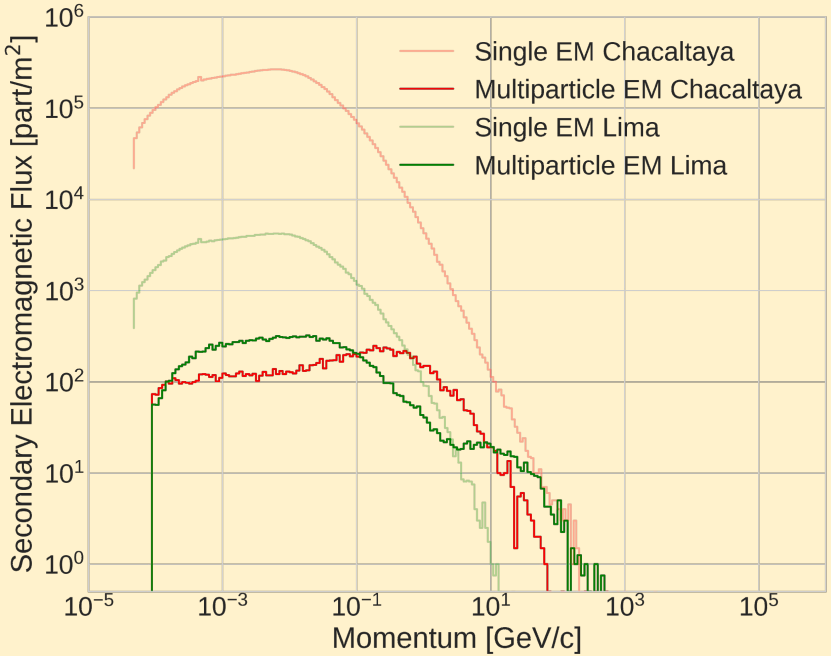
We perform a spatial analysis of CORSIKA's simulated air showers in the field of view (4 m^2) and in the time window of the DAQ system (300 ns) of two typical water Cherenkov detectors (WCDs) in two places of extreme altitudes of the LAGO network.



ARTI calculates the secondary particle that reaches a WCD field of view, at each site (Fig. a). We segmented the ground in squares of 4 m side (detection area), as an approximation of the real effective area of one WCD (Fig. b). And then we search for coincidences at each segment.

Why was it done?

To study the impact on the WCD's calibration of LAGO and the role of these simultaneous particles in discriminating primaries.



We calculate one hour electromagnetic (EM) component of secondary cosmic ray spectrum calculated by ARTI for Chacaltaya (red) and Lima (green) sites. It is also showed the spectrum of all multiparticles that reach the detection area in red and green respectively.

What have we learned?

Multiparticles that reach the detector can give us information about the flux of primaries between 10 GeV and 1 TeV. For this we identify primaries that generate multiparticles

The analyses of the multiparticle secondary flux that reach a WCD results in a better tool to reach an understanding of detector calibration.

More detailed studies must be done in order to fully understand the relation between primaries and multiparticles in different altitude conditions.