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Risk assessment of environmental conditions affecting the useful lifetime of Cherenkov Telescopes at El Roque de Los Muchachos Observatory

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Abstract-

Construction and operation of ground astrophysical facilities can be affected by adverse weather conditions. Some weather risks are obvious, but still there are times when an unforeseen event distorts the perception of how relevant a climate-related risk is. On the other hand, adverse weather conditions can delay or entirely halt the construction project of an astronomical facility. The impact of weather risks becomes stronger if the facility is built at a site far from urban areas, where maintenance activities and hardware availability become more challenging. This paper aims at proposing a procedure to analyze the impact of environmental risks for an astronomical facility. This procedure is illustrated with a case study: El Roque de Los Muchachos Observatory (ORM). ORM hosts a number of large scale instruments for astrophysics research, which will significantly increase during this decade. We analyze in this paper the environmental conditions affecting the useful lifetime of Cherenkov Telescopes installed at the ORM. After a detailed analysis, we conclude that the risks of strongest magnitude are connected to wild fires. This conclusion diverges from the current risk perception, which is strongly influenced by the recent Cumbre Vieja Eruption event.

Index Terms- Astronomical instrumentation; Astronomical site protection; Gamma ray observatories; Gamma-ray telescopes; Ground-based astronomy

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