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THE TEV GAMMA-RAY SKY OBSERVED BY HAWC AFTER ITS FIRST YEAR OF OPERATIONS

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The High Altitude Water Cherenkov (HAWC) gamma-ray observatory, located in the slopes of the Sierra Negra volcano near Puebla, México, was inaugurated in March 2015. HAWC was designed to continuously monitor the TeV gamma-ray emission from both galactic and extra galactic sources, with a technique that allows to monitor 2/3 of the sky every day, and with an order of magnitude better sensitivity than the previous generation of wide field of view gamma-ray observatories. In this talk we will report on the observation of gamma-ray sources (both point and extended sources) by HAWC and their physical properties. Several of the sources detected by HAWC during its first year of operations have not been previously observed.

The HAWC observatory is composed of 300 Water Cherenkov Detectors (WCDs) instrumented with four photomultiplier tubes. The array of WCDs covers an area of 22,000 m^2 (Smith for the HAWC Collaboration 2015). Due to its wide instantaneous field of view (2 sr) and large duty cycle (>95%) HAWC can continuously survey the sky searching for gamma-ray emission from galactic and extragalactic sources. A complete description of the HAWC performance can be found in Abeysekara et al. (2017).

A preliminary catalogue obtained with data from 507 days has been published recently in Rivière for the HAWC Collaboration (2017). An example sky map is shown in Figure 1, where the inner Galactic Plane is visible as well as the Crab Nebula and the pulsar wind nebulae Geminga. Two extragalactic sources are visible: Markarian 421 and 501. The first source catalogue from HAWC is in preparation and will contain details on individual sources as well as on the search method.

Due to its large field of view, HAWC is specially suited to study extended emission, such as the one observed from Geminga and from the environment

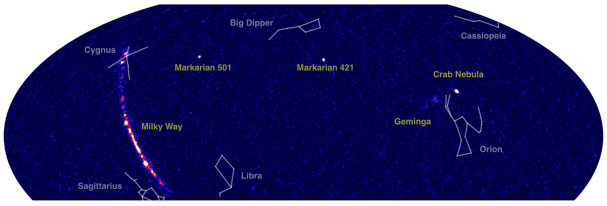

Fig. 1. Sky map of TeV gamma-ray sources obtained with 340 days of HAWC data. Some constellations are shown as reference.

associated to PSR J0659+1414 (López-Coto, Salesa and Zhou for the HAWC Collaboration 2017). The pulsars located in these sources are particularly interesting because they are candidates to be the origin of the positron excess detected by several instruments such as PAMELA and AMS. The HAWC collaboration is currently preparing a paper containing a detailed analysis of theses sources. Even though HAWC has just recently been completed, a first upgrade is underway (Sandoval 2015). It consists on a sparse outrigger array composed of small WCDs that will be used to improve the core location and angular resolution for the highest energy showers whose core falls outside of the current array.

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