

Gamma-ray bursts (GRBs) are among the most energetic events in the Universe, which at their peak luminosity outshine all other astrophysical objects. Some of the most intriguing topics in astronomy, such as the structure and formation of relativistic jets, the physics of dense matter and the acceleration of particles up to incredibly high energies, billions of times higher than the energies obtained in particle accelerators on Earth, can be investigated studying the physics of these transients in the Universe. Time-domain astronomy, the field of astronomy studying transient sources, has recently obtained an extraordinary impulse from the unprecedented quality and especially variety of different data collected and shared among astronomers. We are witnessing the dawn of the era of multi-messenger astronomy. Within this approach, simultaneous or near simultaneous observations of the same source in various messengers, namely photons of different bands of the electromagnetic spectrum, cosmic rays, neutrinos and gravitational waves, are collected and analysed. This approach has led to some of the most important breakthroughs ever in time domain astronomy, such as the discovery by Ligo of gravitational waves (GW) from a gamma-ray burst counterpart resulting from the neutron star merger. Teraelectronvolt (TeV) γ -rays are the highest energy band of the electromagnetic wave spectrum that is detectable from GRBs and convey unique information on the mechanisms which power these transients and accelerate particles up to the highest energies. The High Altitude Water Cherenkov (HAWC) Observatory is located on the flank of the Sierra Negra volcano, at an elevation of about 4100 m asl in the Mexican state of Puebla. HAWC consists of more than 300 massive water tanks that detect cascades of particles initiated by gamma rays slamming into the atmosphere and blasting atoms apart. This produces a shower of particles moving at nearly the speed of light through the atmosphere and reaching the detector. The shower produces flashes of blue light in the water, which allows researchers to reconstruct the energy and cosmic origin of the initiating gamma ray photon. Collecting many γ -rays from the same region of the sky allows HAWC to build images of individual gamma-ray sources. At TeV energies the HAWC observatory is among the most sensitive survey instruments in the world. Over the last years HAWC has obtained stunning scientific results, which have changed radically our view of the sky at energies of tens and hundreds TeV. The proposed project addresses the low-energy band reach of the HAWC observatory below 1 TeV. The HAWC sensitivity at sub-TeV energies, so crucial for the discovery of transients, has been recently improved thanks to the implementation of custom particle reconstruction and recognition algorithms in the novel Pass5 and Pass6 pipelines of the HAWC data analysis. The improvements in Pass5 and Pass6 boost the chances of detecting TeV γ -ray counterparts to GRBs and make HAWC an optimum transient monitor. The primary objective of this project is to analyse new and archival data from GRBs with Pass5 and Pass6, carry out the survey of the Northern sky in the sub-TeV energy band and interpret the HAWC observations within a multi-messenger context, namely looking for coincidences with other sets of data from neutrinos and other gamma-ray bands. The analysis of HAWC data from GRBs will enable us a better understanding of the processes that govern these extremely energetic phenomena. Furthermore, HAWC will be successfully part of the multi-messenger surveying network facilities. Within the gamma-ray community HAWC will alert imaging Cherenkov telescopes, which can conduct high sensitivity studies of the GRBs, and cooperate with LHAASO to cover a wide range in time-zones for GRBs follow-ups.