Cosmic rays (CRs) are high-energy particles bombarding the Earth continuously. The energies of CRs observed at Earth range from few GeV (=10^9eV) up to several EeV (=10^{20}eV), which corresponds to almost one billion of times the maximum energy achieved in the most powerful terrestrial accelerators, such as LHC at Cern. In 1912 the austrian scientist, Viktor Hess, won the Nobel Price for the discovery of cosmic rays. Scientists have been trying to unveil the origin of the most energetic CRs for more than 100 years without success. Even if scientists do not know which astrophysical sources accelerate particles to these fantastic energies, scientists know a lot about CRs. For instance, the flux of CRs is well-known thanks to the measurements from several particle detectors. The shape of the CR spectrum reveals a feature around few PeV (=10^{15}eV), the so-called *knee*, that make scientists believe that the knee can indicate the maximum energy at which Galactic sources can accelerate CRs. The knee would thus mark the maximum energies achieved by astrophysical sources in our Galaxy. CRs of higher energies are likely accelerated outside our Galaxy, in the powerful centres of these external galaxies.

The goal of our project is to find the astrophysical sources in the Galaxy able to accelerate particles up to the knee at PeV energies, so called *PeVatrons*. In other words, we want to establish the nature, distribution and acceleration mechanism of the most energetic Galactic CR sources in order to understand if these sources can explain the Galactic population of cosmic rays.

Since CRs are charged particles, they are deflected in the Galactic magnetic fields and isotropised, and it is impossible to directly observe them close to their suspected acceleration sites and thus pin down their sources. The best tracer for CR populations distant from Earth are gamma-rays, which are emitted in various interactions between the CRs and their environment. For CRs close to PeV energies the dominant processes are the decay of pions produced when CR hadrons collide with ambient gas in the interstellar medium (ISM), which is commonly called the hadronic production mechanism, and inverse Compton scattering of CR electrons off radiation fields, which is called the leptonic production mechanism. Either process will produce gamma-rays of around 10 per cent of the energy of the parent CR population, so tens to hundreds of TeV gamma-rays for PeV CRs. Therefore, detecting sources able to produce gamma-rays with energies extending well beyond 10 TeV would be a clear indication that cosmic rays can also be accelerated to PeV energies in the same sources.

In order to search for this Pevatron candidates we will use the gamma-ray observations from the HAWC observatory. The HAWC Observatory is located on the flank of the Sierra Negra volcano, inside the Pico de Orizaba National Park, at an elevation of just over 13,500 feet in the Mexican state of Puebla. HAWC consists of more than 300 massive water tanks that detect cascades of particles initiated by gamma rays, often with more than a million times the energy of a dental x-ray, 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. Collecting many gamma rays from the same region of the sky allows HAWC to build sharp images of individual gamma-ray sources.
Our project will in particularly benefit from the new HAWC outrigger array, currently under construction and to be finished by the end of 2018, which has been designed to enhance the detector sensitivity at high-energies, above 10 TeV, the range in energies crucial for our project.

The confirmation of the existence of a new population of PeVatrons would be a breakthrough in the understanding of the origin of the highest energy CRs in the Galaxy.