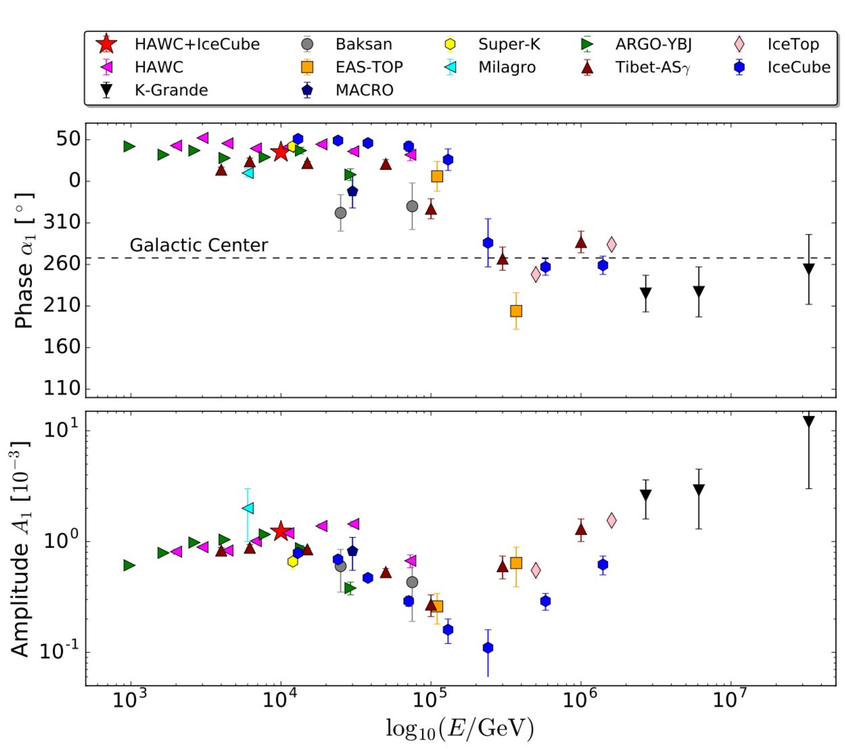
Composition Sensitivity for the Cosmic Ray Anisotropy with SWGO

The Southern Wide-field Gamma-ray Observatory

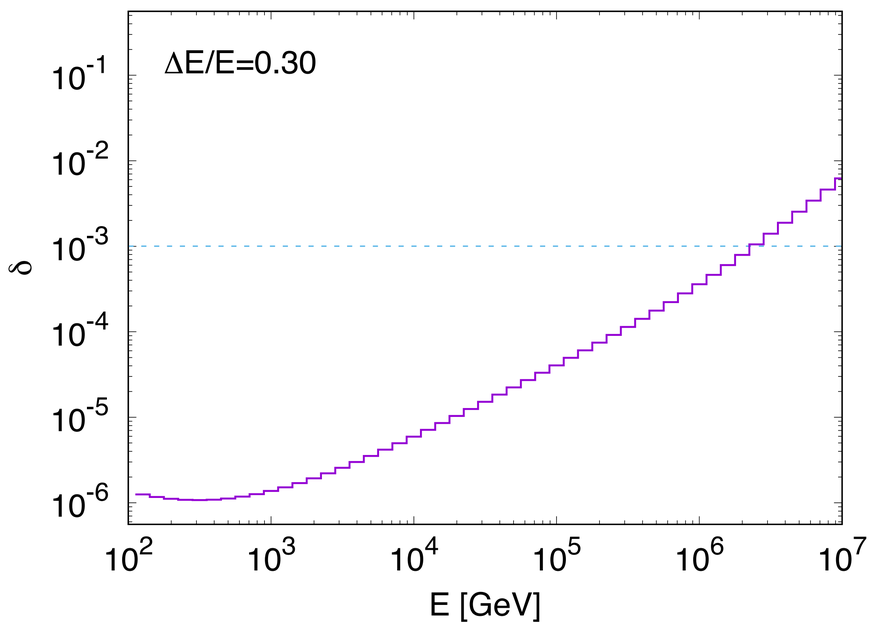
We investigate the potential sensitivity that the future instrument SWGO will offer for probing the evolution of the cosmic ray anisotropy in the two decades of energy below the knee.

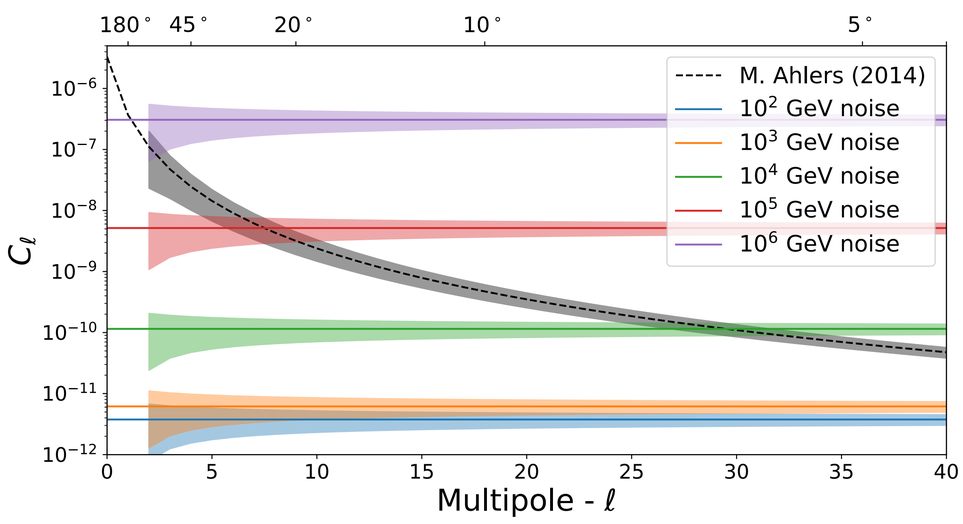


In the two preceeding energy decades below the knee (0.03-3 PeV), the dipole in the cosmic ray anisotropy exhibits a swing in its phase and a corresponding dip in its amplitude. This observational signal, however, has yet to be probed in terms of the underlying signal for different cosmic ray species groups.

Beyond the dipole, the multipole evolution in this energy range has also not been probed, nor broken down into the multipole signal for different species groups.

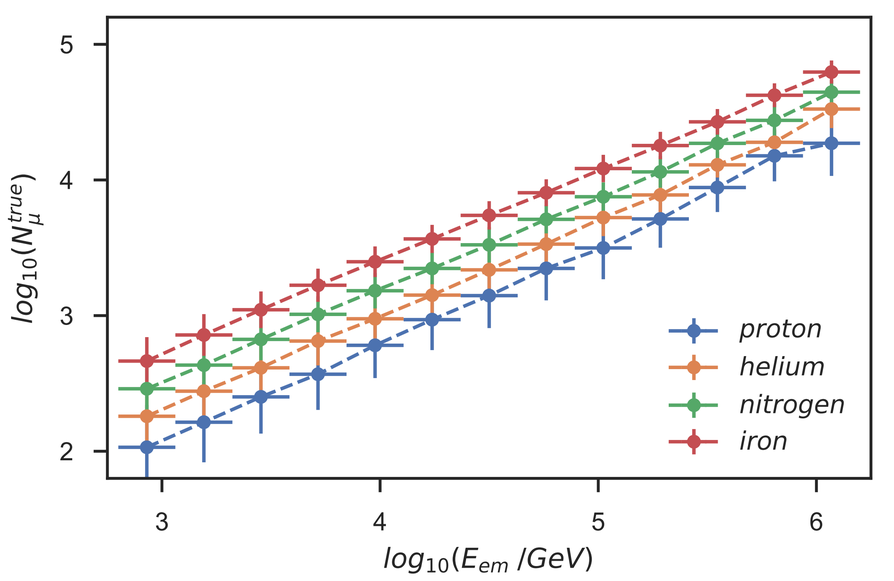
Utilising the large effective area of the planned instrument, and convolving it with the cosmic ray spectru, the detection rates per year are obtained. These indicate that a probe of the dipole, at its level of 10^{-3}, will be achievable up to energies of at least knee (3 PeV).





The same exercise applied for probing the weaker higher order cosmic ray multipole anisotropies, indicates that at an energy of 0.1 PeV, a probe of the multipole up to l=6 will be possible.

Taking advantage of the good muon counting capabilities of the SWGO instrument, a separation of the arriving cosmic rays into 4 equal logarithmically spaced mass groups between proton and iron (ie. $\sigma_{\ln A} \simeq 1$) is estimated to be possible above an energy of 3 TeV.



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