PLEνM: A global and distributed monitoring system of high-energy astrophysical neutrinos

July 2021

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Executive Summary

- We propose the Planetary Neutrino Monitoring System (PLEνM), a concept for a global repository of high-energy neutrino observations made by current and future neutrino telescopes, in order to answer open questions about high-energy neutrino astrophysics and particle physics.
- We study two different configurations of PLEνM: one consisting of IceCube and IceCube-like detectors at the locations of KM3NeT, P-ONE and Baikal-GVD (PLEνM-1), and another one with a contribution of a detector that has a 7.5 times larger effective area instead of IceCube (PLEνM-2).
- PLEνM will greatly increasing the rate of astrophysical neutrino detections, in the Southern Hemisphere by up to three orders of magnitude for a spectral index of $\gamma = 3.0$.
- Based on the increased rate of neutrinos, PLEνM will improve the discovery potential of point-like neutrino sources by more than two orders of magnitude.
- The statistical uncertainties on the parameters of the diffuse astrophysical neutrino flux with a power-law spectrum will improve by about a factor of 2 with PLEνM.
- With IceCube, IceCube-Gen2, KM3NeT, P-ONE and Baikal-GVD we have a realistic chance to detect a cutoff at 1 PeV to 10 PeV in the spectrum of the diffuse astrophysical neutrino flux.