Astrophysical neutrino source searches

The High Energy Starting Event (HESE) data sample

82 previously released events [1,2,3] re-analyzed:
- charge re-calibration (left): DOM-by-DOM single photo electron peak correction by 4%; consequently some events dropped below the HESE charge threshold of 6000 photoelectrons
- improved reconstructions (right): ice anisotropy and global tilt now taken into account → change in reconstructed event directions, especially for cascade-type events; tracks are mostly unaffected; most events reconstruct within previously assumed uncertainties;

The seemingly large differences in the best-fit slopes between different datasets could suggest a second astrophysical component. This possibility has been previously investigated using 4 years and 6 years of HESE data [3][5]. Here, we performed a fit to the HESE 7.5 year dataset introducing a second astrophysical component, described by a power-law without cutoffs.

Data consistency and future steps

Due to its limited statistics and energy range, the HESE data sample cannot distinguish between different astrophysical flux models. Future analyses [8] will combine electron, muon [4] and tau neutrino [6,7] detection channels, at energies down to 1 TeV where atmospheric neutrinos are dominant. Therefore, an improved treatment of atmospheric uncertainties [9,10,11] will be employed. Future detector upgrades [12] will further result in a better understanding of the detector and ice systematics.

References

[1] IceCube, Science, 342 (6161) 2013
[2] IceCube, PRL 113, 101101 (2014)
[8] IceCube, PoS (ICRC 2017) 976

more info here: