Summary of a Variables in passing_events Tree

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1 The Tree

The tree called "passing_events" is stored in outputs/icefinal.root, which is written by `icemc`. Only events that pass all three levels of the Anita trigger are written to the tree. When using this tree for plotting, it is important to weight the events by `weight` (described below).

All distances are in meters unless otherwise stated.

The next four variables use a 2d coordinate system from the view looking down on the South Pole, with the +x axis pointing in the direction of +90 longitude and +y in the 0° longitude direction

`double horizcoord`	Position of the neutrino interaction in km along the +x axis
`double vertcoord`	Position of the neutrino interaction in km along the +y axis
`double horizcoord_bn`	Position of the balloon in km along the +x axis
`double vertcoord_bn`	Position of the balloon in km along the +y axis
`double weight1`	Weight due to absorption in the earth. Is it the probability that the neutrino would have survived its trip through the earth.
`double weight2`	A phase space factor. For each balloon position, we choose the neutrino interaction position and direction such that the Cerenkov signal is visible at the balloon. This phase space factor is supposed to remove the bias that this selection introduces.
`double weight`	Total weight for the neutrino interaction, which is `weight1`× `weight2`
`double logweight`	$\log_{10}$ of `weight`

The following arrays are defined by a coordinate system whose origin is at the center of the earth, +z is pointed towards the South Pole, +x is parallel to 90°E at the South Pole and +y is parallel to 0° longitude at the South Pole.

`double posnu[3]`	Position of the neutino interaction point
`double r_bn[3]`	Position of the balloon
`double n_bn[3]`	Normalized array pointing from center of the earth to the balloon
`double costheta_nutraject`	$\cos\theta_\nu$ where θ_ν is the zenith angle of the neutrino's incident trajectory
`double phi_nutraject`	ϕ of the neutrino's incident trajectory
`double nnu[3]`	Normalized array pointing in the direction of the neutrino's incident trajectory
`double n_exit2bn[5][3]`	Five 3-element arrays, each a unit vector pointing from the exit point to the balloon for the ray seen by the balloon. We find the exit point in three iterations, and each array is the result of a different iteration. So what you want is `n_exit2bn[2]` because that is the third iteration. The last two are zeros.
`double rfexit[5][3]`	Five 3-element arrays, each a unit vector pointing from the center of the earth to the point where the RF seen at the balloon exits the ice.
`double n_exit_phi`	ϕ of `n_exit2bn[2]`
`double pnu`	Energy of the neutrino in eV
`double altitude_int`	"altitude" of the interaction point relative to the ice surface (it is a negative number because the interaction is always below the surface)
`double elast_y`	Inelasticity of the interaction (fraction of the neutrino's energy that goes into the hadronic shower)
`double emfrac`	Fraction of neutrino energy that goes into the EM component of the shower
`double hadfrac`	Fraction of the neutrino energy that goes into the hadronic component of the shower
`double sumfrac`	`emfrac+hadfrac`. This can be less than unity since some of the energy can be carried away by a lepton.
`int nuflavor`	Neutrino flavor. 1=electron, 2=muon, 3=tau
`int current`	Type of interaction. 1=charged current, 2=neutral current.
`double viewangle`	Angle in the ice between the ray seen by the balloon and the neutrino direction in radians (actually in the firn just below the surface)
`double changle`	Cerenkov angle in the ice or firn, depending on where the interaction occured in radians
`double offaxis`	|`viewangle-changle`|

`int l1trig[3]`	For each trigger layer, which antennas pass L1. 16 bit, 16 bit and 8 bit for trigger layers 1 (top), 2 (bottom) and nadirs
`int l2trig[3][400]`	For each trigger layer, which set of three neighboring antennas pass L2. 16 bit, 16 bit and 8 bit for layers 1 (top) & 2 (bottom) and nadirs. Indexed according to the number of the centre antenna. It is 400 long in the 2nd dimension so that the same array can be used for EeVA. Only the relevant elements are filled.
`int l3trig[400]`	16 bit number which says which phi sectors pass L3
`double arrivaltimes[40]`	Time of arrival of the signal at each antenna, relative to the time the signal hits the first antenna
`double e_component,h_component`	Projection of the polarization of the signal along the horizontal (vertical) polarization of the antenna

Each of the three arrays below are filled for the antenna that is closest to the interaction (with the minimum arrival time). The first index is the polarization (0=LCP, 1=RCP)

`double rx0_signal_eachband[2][5]`	The signal strength in each band, including noise fluctutions. Here the signal strength is $\int V(f)df$ where V(f) is the signal spectrum in Volts/Hz read by each channel and df is the frequency bin width.
`double rx0_noise_eachband[2][5]`	The average noise voltage that we use for each channel.
`double rx0_threshold_eachband[2][5]`	The threshold a signal must exceed for a channel to pass, in terms of a multiple of the average noise.
`double vmmhz_max`	Electric field per frequency in V/m/MHz at FREQ_HIGH=1200 MHz of the signal as it is incident on the payload
`double vmmhz_min`	Electric field per frequency in V/m/MHz at FREQ_LOW=200 MHz of the signal as it is incident on the payload
`volts_rx_rfcm_lab_e_all[48][512]`	Filled voltages in Volts for vertical polarization, 48 antennas and 512 samples each, with the samples being every 1/2.6 ns so that the waveforms are 196.9 ns long
`volts_rx_rfcm_lab_h_all[48][512]`	Filled voltages in Volts for horizontal polarization, 48 antennas and 512 samples each, with the samples being every 1/2.6 ns so that the waveforms are 196.9 ns long