# IceCube search for neutrinos from precursors and afterglows of Gamma Ray Bursts

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IceCube overview
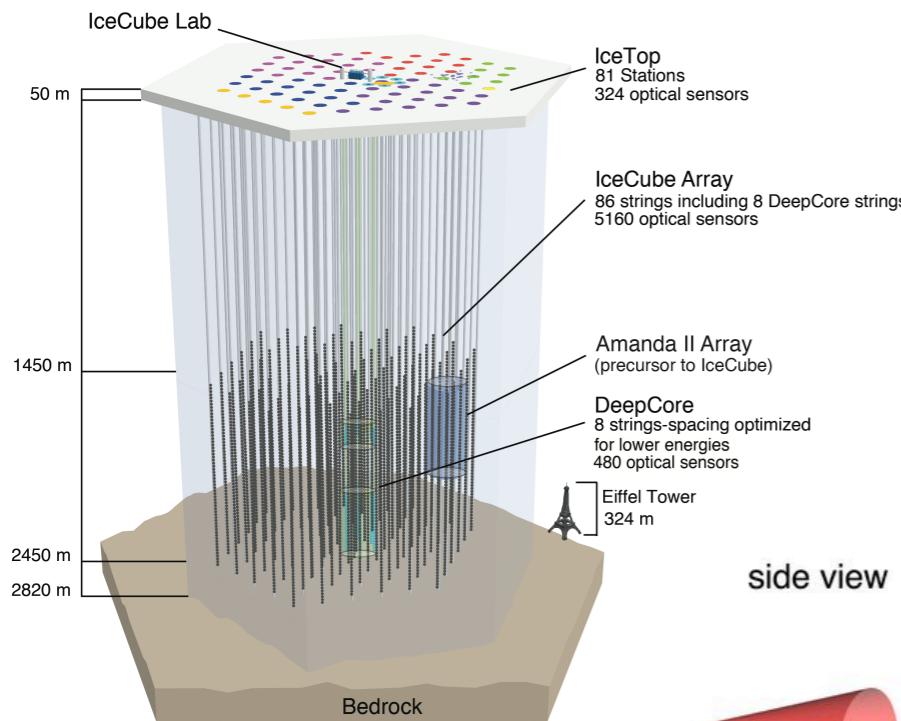


The IceCube detector
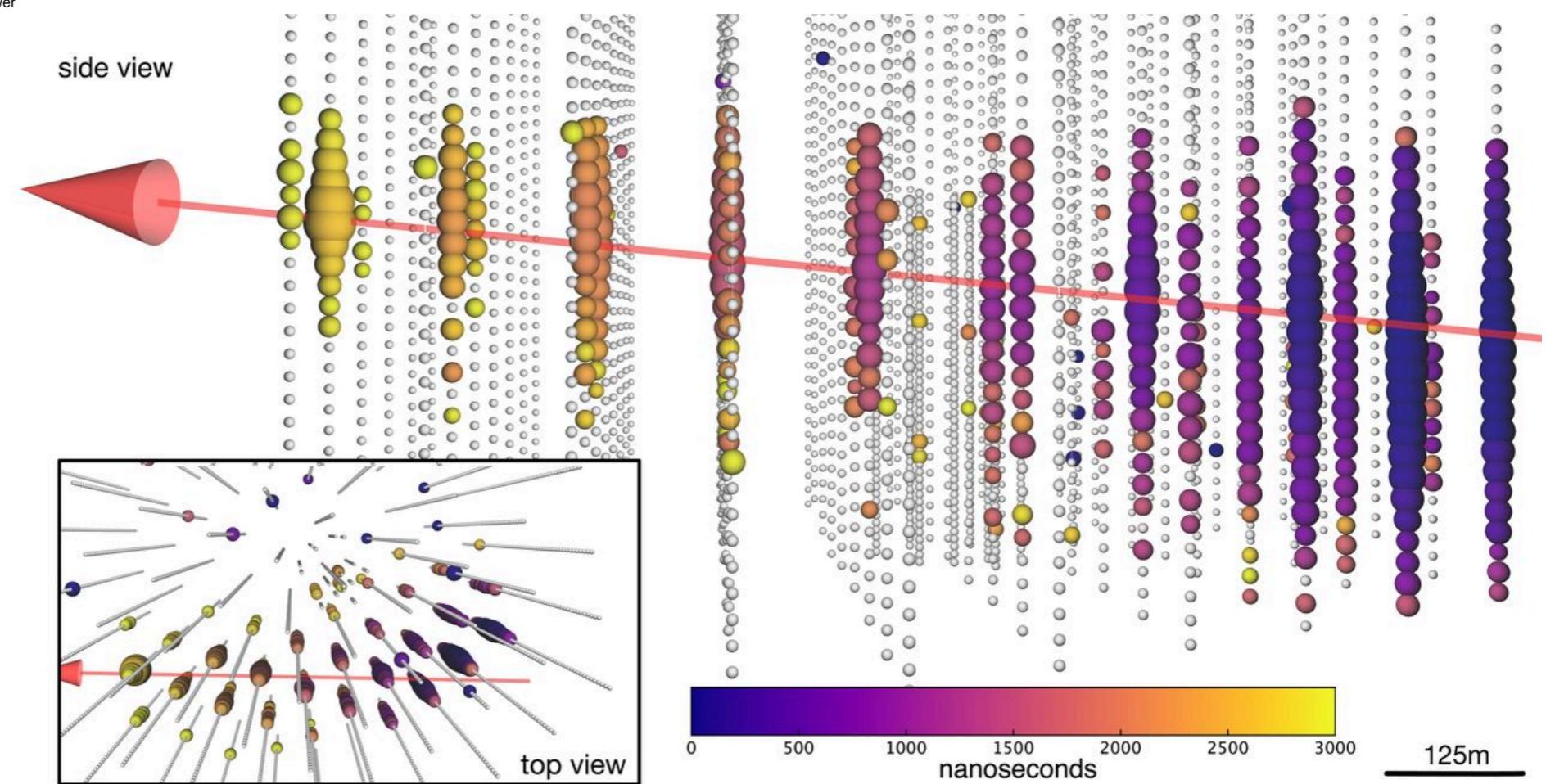
Event display for neutrino event IceCube-170922A.
(The IceCube Collaboration, *Fermi*-LAT, MAGIC et al., Science 361, eaat1378 (2018))

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Neutrinos from GRB precursors and afterglows
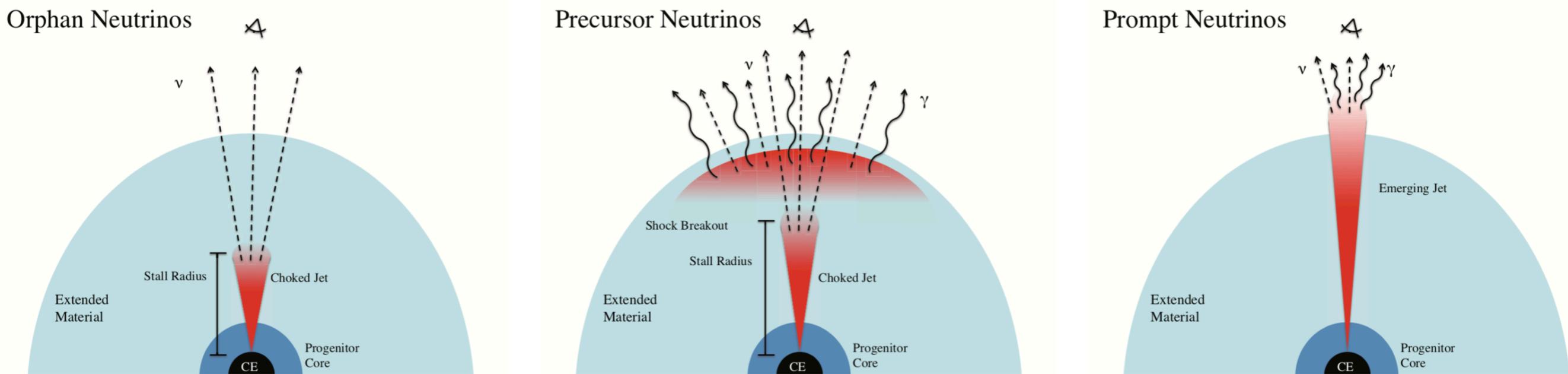
Left Panel: Choked jet model for jet-driven SNe. **Middle Panel:** The shock breakout model for Low Luminosity GRBs. **Right Panel:** The emerging jet model for GRBs and LL GRBs. (Nicholas Senno, Kohta Murase, Peter Meszaros, Phys.Rev. D93 (2016) no.8, 083003)

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Analysing a single GRB
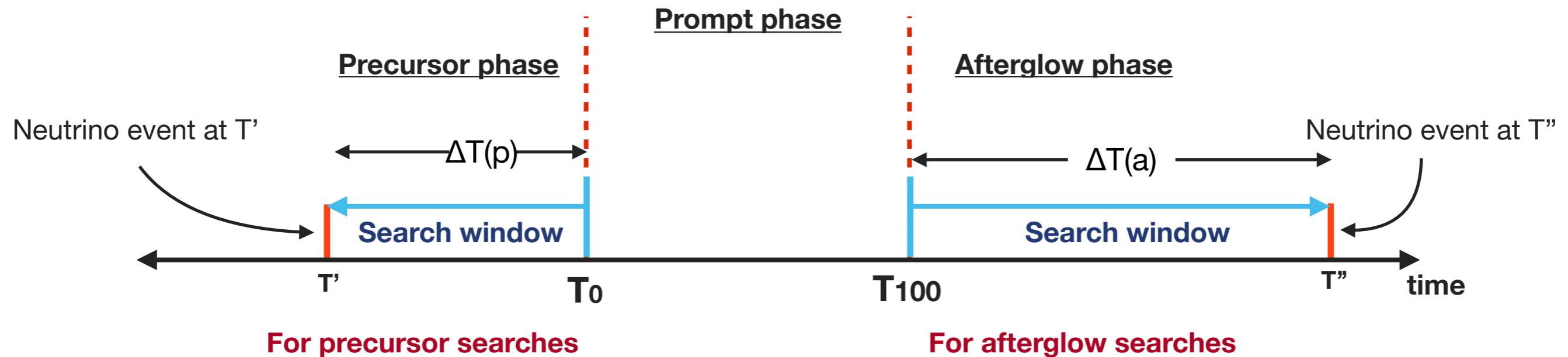
A schematic diagram of the analysis procedure for neutrino searches in the precursor and the afterglow phases of a GRB

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Simulation studies: Binomial testing result for a list of GRBs

● Local p-value   ● Binomial p-value   ● Random distribution of p-values
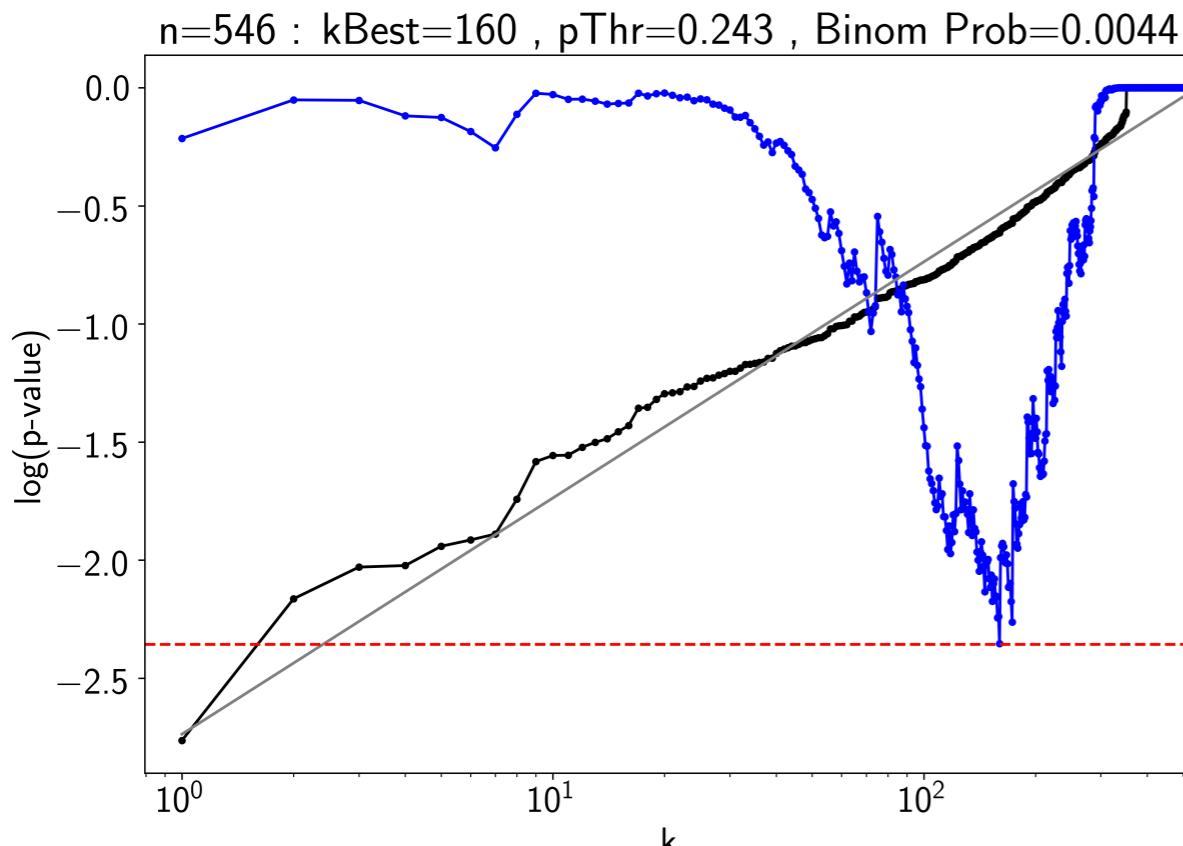
Simulation of binomial test result for the precursor analysis of a list of GRBs using randomised neutrino data. The best binomial p-value for this analysis was **log(p-value) = -2.36.**
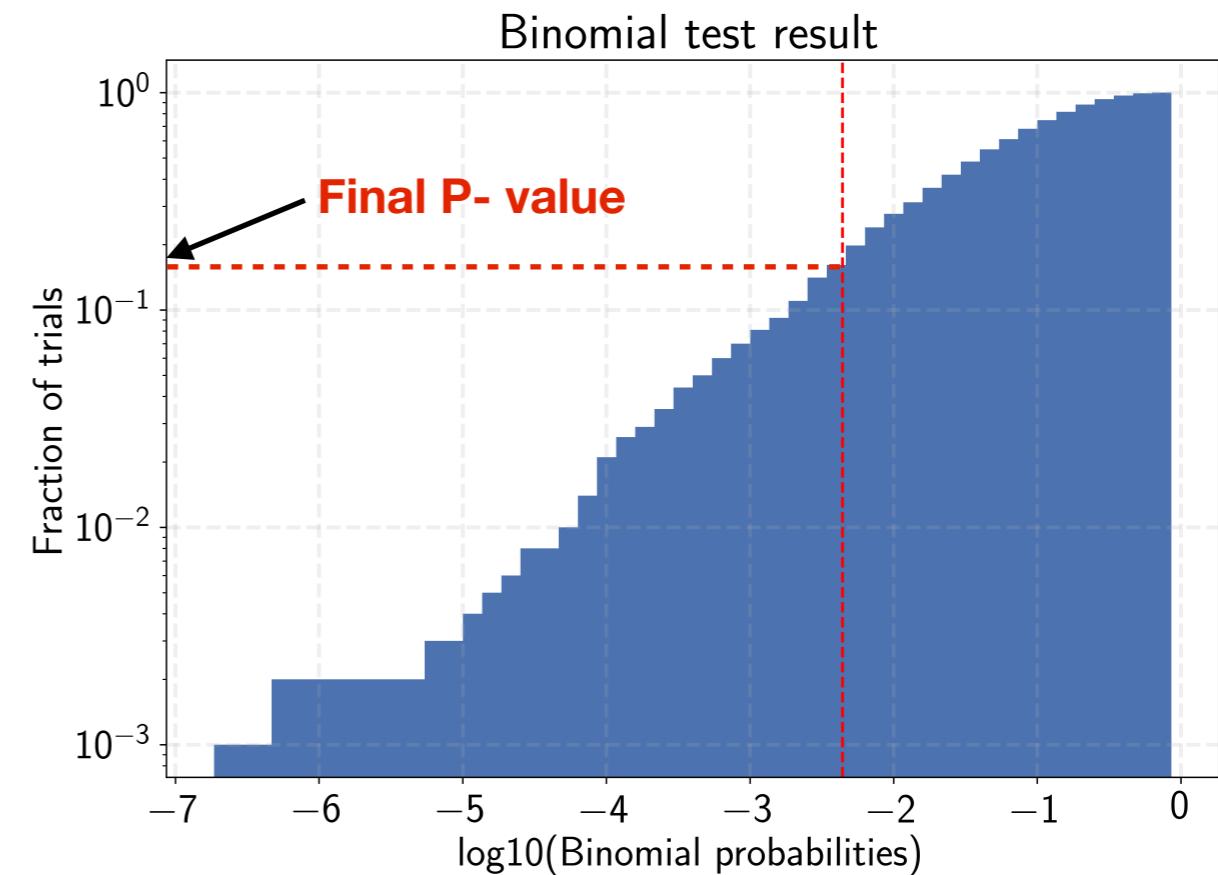
Repeating the binomial test for 1000 precursor analysis of simulated data to obtain the significance of our result. We infer from the histogram that **final p-value ~ 0.2**

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