Fig. 2 Time-independent weight of individual events during the IC86b period.
Each vertical line represents an event observed at the time indicated by calendar year (top) or MJD (bottom). Overlapping lines are shifted by 1 to 2 days for visibility. The height of each line indicates the event weight: the product of the event's spatial term and energy term in the unbinned likelihood analysis evaluated at the location of TXS 0506+056 and assuming the best-fitting spectral index γ = 2.1 ([30]). The color for each event indicates an approximate value in units of TeV of the reconstructed muon energy (muon energy proxy), which the analysis compares with expected muon energy distributions under different hypotheses. [A distribution for the true neutrino energy of a single event can also be inferred from the event's muon energy ([30]).] The dashed curve and the solid bracket indicate the best-fitting Gaussian and box-shaped time windows, respectively. The distribution of event weights and times outside of the best-fitting time windows is compatible with background.

The Gaussian time window is centered at 13 December 2014 [modified Julian day (MJD) 57004] with an uncertainty of ±21 days and a duration $T_W = 110^{+35}_{-24}$ days. The best-fitting parameters for the fluence $J_{100} = \int \Phi_{100}(t)dt$ and the spectral index are given by $E^2 J_{100} = 2.1^{+0.9}_{-0.7} \times 10^{-4}$ TeV cm^{-2} at 100 TeV and γ = 2.1 ± 0.2, respectively. The joint uncertainty on these parameters is shown in Fig. 3 along with a skymap showing the result of the time-dependent analysis performed at the location of TXS 0506+056 and in its vicinity during the IC86b data period.
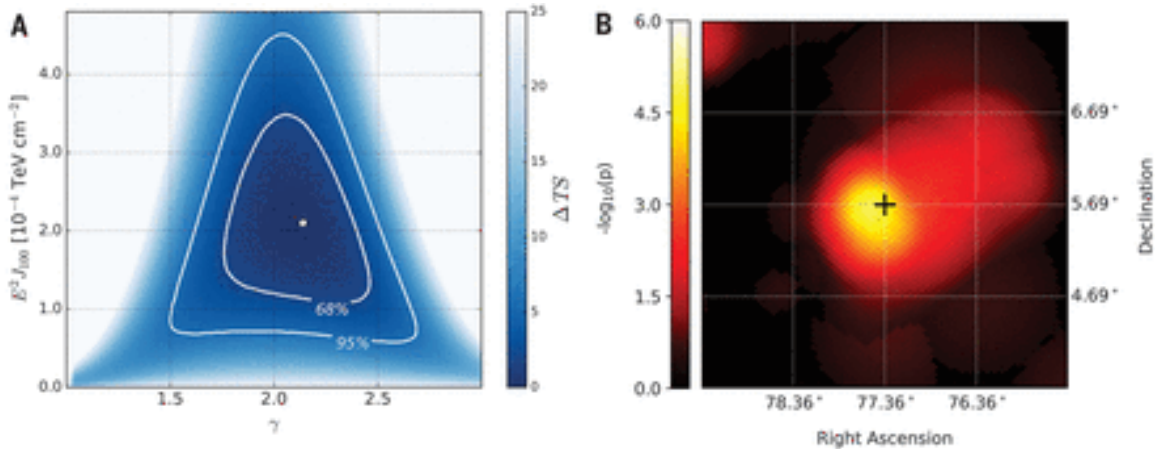

Fig. 3 Time-dependent analysis results for the IC86b data period (2012–2015).
(**A**) Change in test statistic, ΔTS, as a function of the spectral index parameter γ and the fluence at 100 TeV given by $E^2 J_{100}$. The analysis is performed at the coordinates of TXS 0506+056, using the Gaussian-shaped time window and holding the time parameters fixed (T_0 = 13 December 2014, T_W = 110 days). The white dot indicates the best-fitting values. The contours at 68% and 95% confidence level assuming Wilks' theorem ([36]) are shown in order to indicate the statistical uncertainty on the parameter estimates. Systematic uncertainties are not included. (**B**) Skymap showing the P value of the time-dependent analysis performed at the coordinates of TXS 0506+056 (cross) and at surrounding locations. The analysis is performed on the IC86b data period, using the Gaussian-shaped time window. At each point, the full fit for (Φ, γ, T_0, T_W) is performed. The