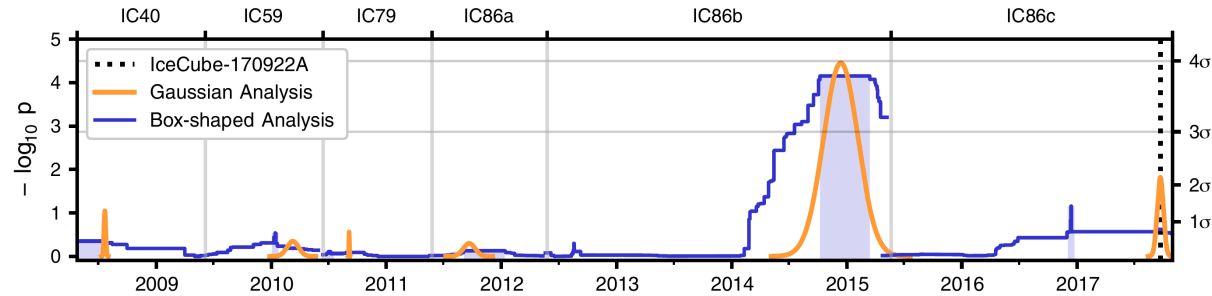


# Search for high-energy neutrino sources from the direction of IceCube alert events

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## 1. Neutrino flare from direction of high-energy Neutrino IceCube170922A (Direction of Blazar TXS0506+056)



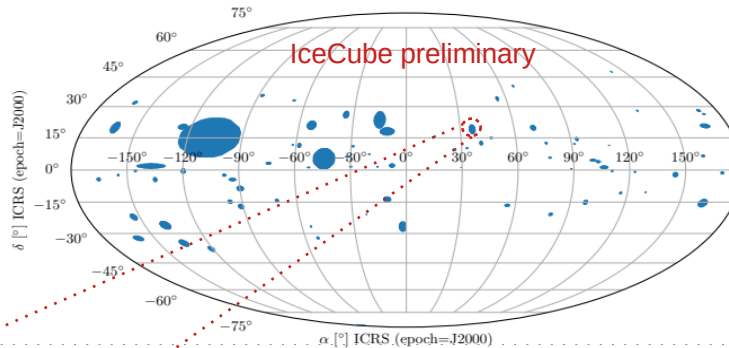
<https://doi.org/10.1126/science.aat2890>

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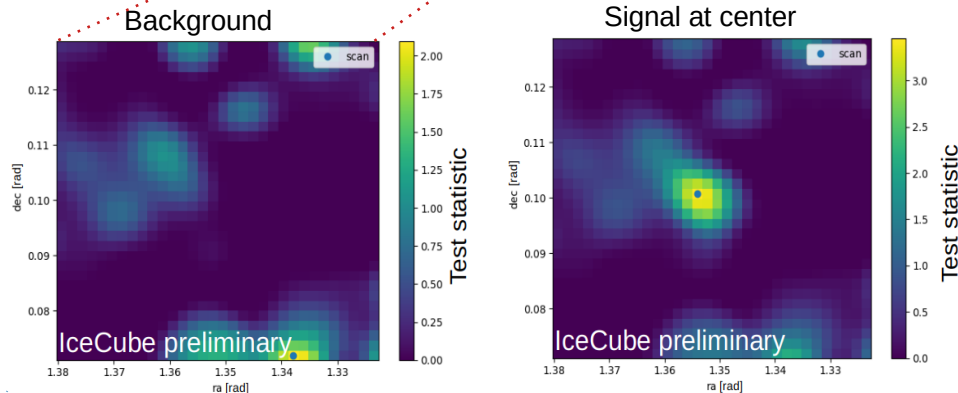
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## 2. Are there neutrino sources at the arrival directions of other high-energy neutrinos?

IceCube **realtime alert system**:  
detection of high-energy neutrino  
event with high probability to be of  
astrophysical origin (~8 per year)



## 3. Finding the source position in the uncertainty region of arrival direction



Choose position with  
best test statistic  
(TS) value

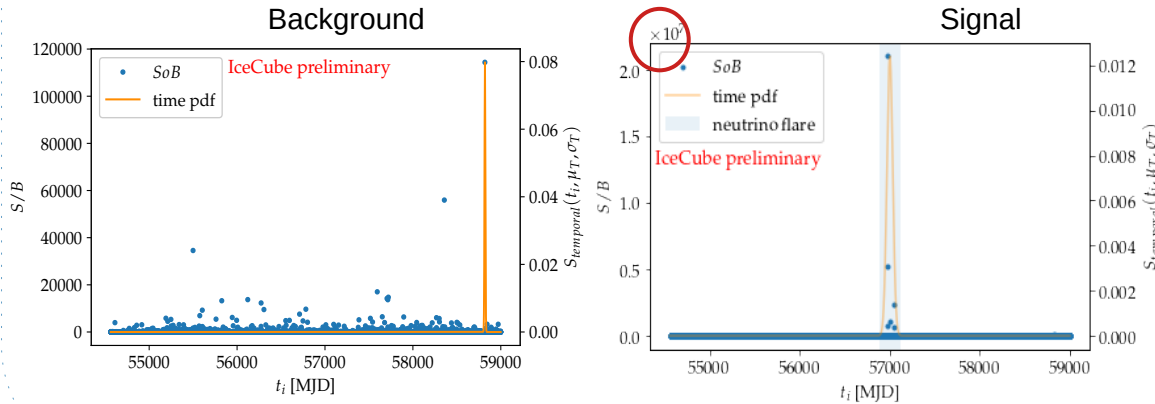
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## 4. Finding neutrino flares

Expectation maximization for finding neutrino flares

Use **energy** and **spatial** information to calculate signal over background ratio (S/B)



## 5. Which sources could we see? Mean $3\sigma$ discovery potential fluence $\sim 2.7 \cdot 10^{-2} \text{GeV/cm}^2$

Fluence:  
flux  $\times$  time

$3\sigma$  discovery potential  
fluence:  
fluence with 50% chance  
to get p-value  $< 3\sigma$

Time pdf shape	Duration of data taking period [days]	$3\sigma$ discovery potential fluence [ $\frac{\text{GeV}}{\text{cm}^2}$ ]
Gaussian	409	0.027
Gaussian	376	0.037
Gaussian	346	0.032
Gaussian	3304	0.026
Box	3304	0.026