

**TXS  
0506+056  
FERMI-LAT analysis of  
the first source  
associated to an  
astrophysical neutrino**







IceCube



Fermi-LAT

### Fermi-LAT detection of increased gamma-ray activity of TXS 0506+056, located inside the IceCube-170922A error region.

ATel #10791; *Yasuyuki T. Tanaka (Hiroshima University), Sara Buson (NASA/GSFC), Daniel Kovcevski (NASA/MSFC) on behalf of the Fermi-LAT collaboration*  
 on 28 Sep 2017; 10:10 UT  
 Credential Certification: David J. Thompson (David.J.Thompson@nasa.gov)

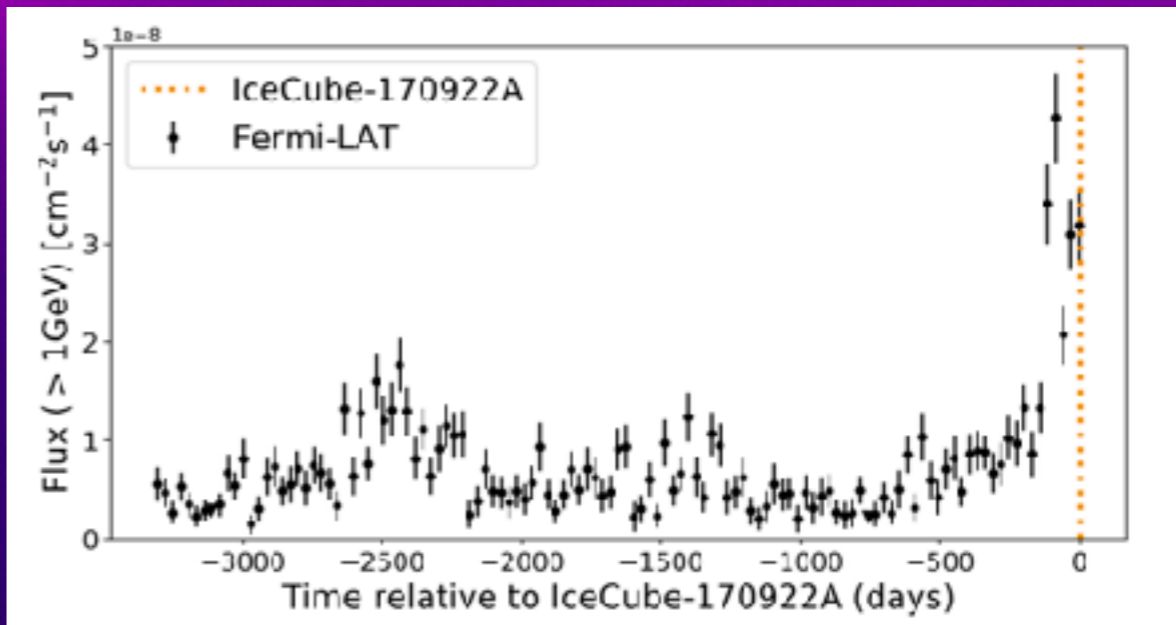
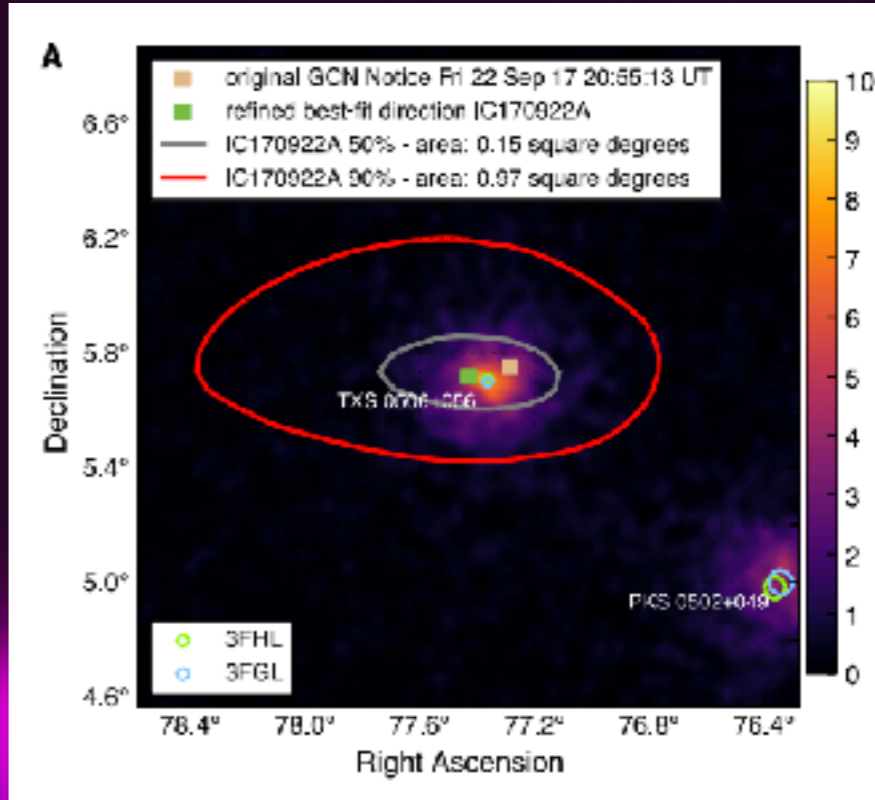
Subjects: Gamma Ray, Neutrinos, AGN

Referred to by ATel #: 10792, 10794, 10799, 10801, 10817, 10830, 10831, 10833, 10838, 10840, 10844, 10845, 10861, 10890, 10942, 11419, 11430, 11489, 12260



We searched for Fermi LAT sources inside the extremely high energy (EHE) IceCube 170922A neutrino event error region (<https://gc.gsfc.nasa.gov/gcn3/21916.gcn3>, see also ATels 10773, 10787) with all sky survey data from the Large Area Telescope (LAT), on board the Fermi Gamma-ray Space Telescope. We found that one Fermi-LAT source, TXS 0506+056 (3FGL J0509.4+0541 and also included in the 3FHL catalog; Ajello et al., arXiv:1702.00664, as 3FHL J0509.4+0542), is located inside the IceCube error region. The FAVA (Fermi All-sky Variability Analysis) light curve at energies above 800 MeV shows a flaring state recently (<https://fermi.gsfc.nasa.gov/ssc/data/access/lat/FAVA/SourceReport.php?week=477&flare=27>). Indeed, the LAT 0.1–300 GeV flux during 2018 September 15 to 27 was  $(3.6 \pm 0.5) \times 10^{-7}$  photons  $\text{cm}^{-2} \text{s}^{-1}$  (errors are statistical only), increased by a factor of  $\sim 6$  compared to the 3FGL flux, with nearly the same power law index of  $2.0 \pm 0.1$ . We strongly encourage multiwavelength observations of this source. We also encourage optical spectroscopy for this source, because the redshift is still unknown. According to NED, the R band magnitude is reported as 15.1 (Healey et al. 2008, ApJS 175, 97). Radio observations show that this blazar has had increasing flux during the past year: [http://www.astro.caltech.edu/ovroblazars/data.php?page=data\\_query](http://www.astro.caltech.edu/ovroblazars/data.php?page=data_query), <http://www.physics.purdue.edu/astro/JOJAVE/sourcepages/0506+056.shtml>.

Because Fermi operates in an all-sky scanning mode, regular gamma-ray monitoring of this source region will continue. For this source the Fermi-LAT contact person is Yasuyuki T. Tanaka (ytanaka@astro.hiroshima-u.ac.jp). The Fermi-LAT is a pair conversion telescope designed to cover the energy band from 20 MeV to greater than 300 GeV. It is the product of an international collaboration between NASA and DOR in the U.S. and many scientific institutions across France, Italy, Japan and Sweden.





# What will you do

## Mandatory

- Download of 5 years data centered at the time of the neutrino detection
- Visualization of the count maps/count cube
- Spectral analysis
- Light curves production with different time bins (e.g. 6m and 3m)
- Testing the source variability (for each adopted time bin)

## Optional

- Multi-messenger SED combining your *Fermi*-LAT results with literature data (provided by us)



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