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economy p. 120

Time invested matters for mice,
rats, and humans pp. 124 & 178

Two spindles are better
than one pp. 128 & 189

Science

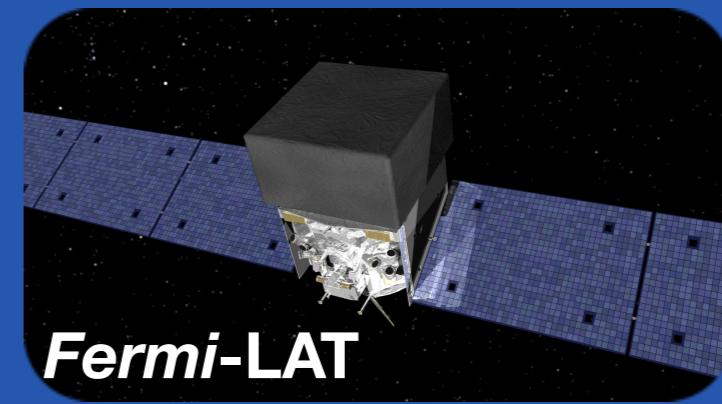
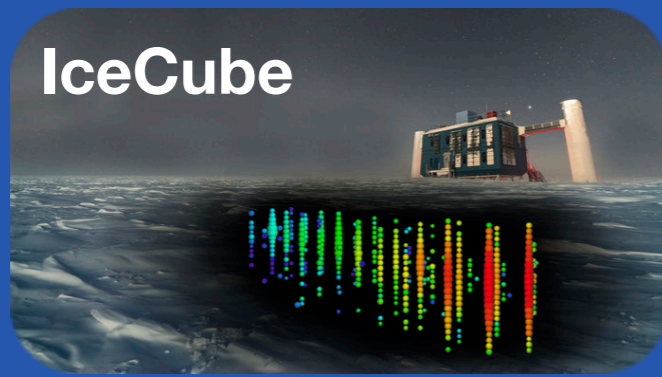
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TXS
0506+056
FERMI-LAT analysis of
the first source
associated to an
astrophysical neutrino

NEUTRINOS
FROM A BLAZAR
Multimessenger observations
of an astrophysical neutrino
source pp. 115, 146, & 147

source pp. 115, 146, & 147
of an astrophysical neutrino
Multimessenger observations



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 Kocevski (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

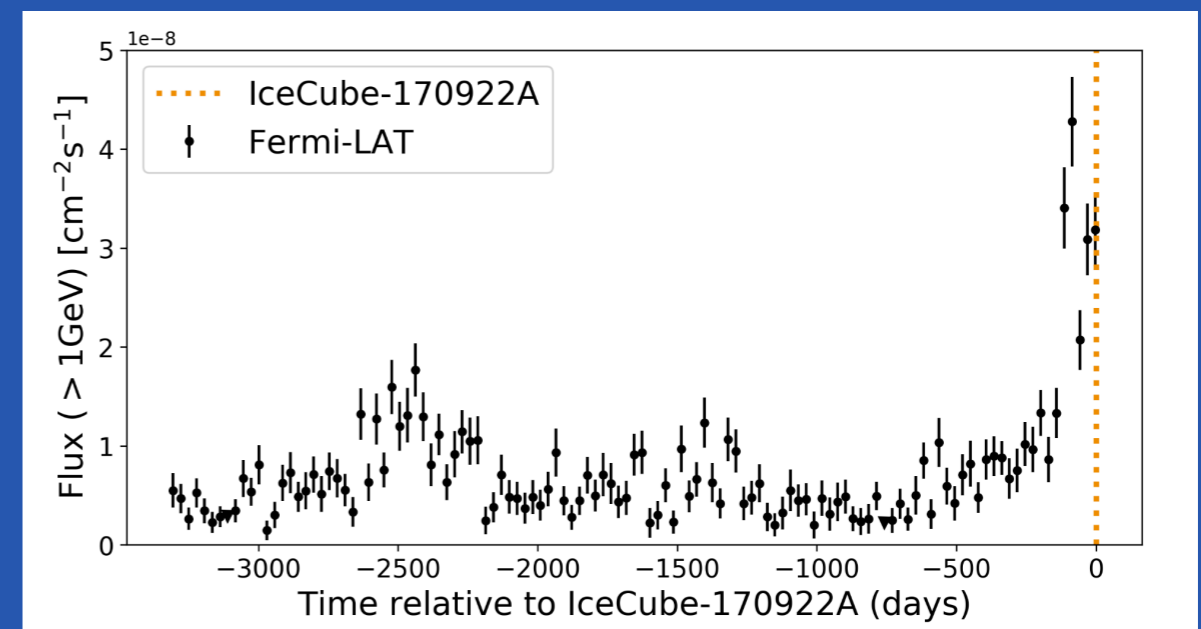
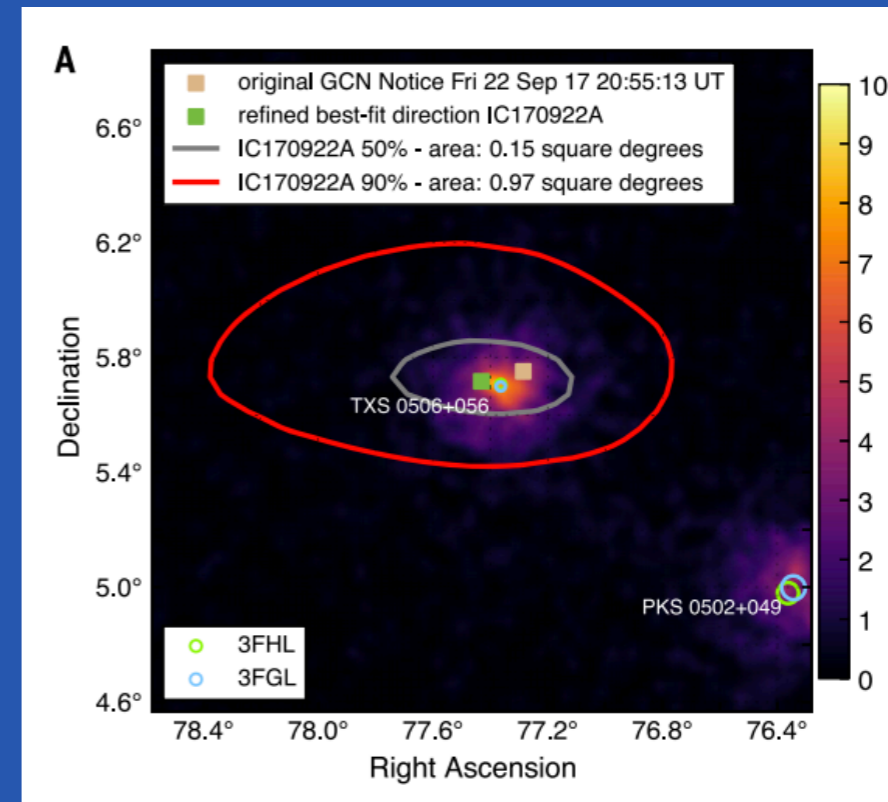
Referred to by ATel #: 10792, 10794, 10799, 10801, 10817, 10830, 10831, 10833, 10838, 10840, 10844, 10845, 10861, 10890, 10942, 11419, 11430, 11489, 12260



We searched for Fermi-LAT sources inside the extremely high-energy (EHE) IceCube-170922A neutrino event error region (<https://gcn.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 ~ 6 compared to the 3FGL flux, with nearly the same power-law index of 2.0 ± 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.physics.purdue.edu/astro/MOJAVE/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 DOE in the U.S. and many scientific institutions across France, Italy, Japan and Sweden.



What will you do

Mandatory

- Download and reprocess 5 years of LAT data centered at the time of the neutrino detection in the 100 MeV-1 TeV energy band
- Perform a standard analysis (e.g., optimisation, fit, find new sources, localisation)
- Produce the main output maps (counts map, TS maps, residual maps, localization maps) and SED
- Generation of light-curve with different time bins (e.g., 3 and 6 months) and test for variability

Optional

- Extract the source spectrum and significance for CTAO simulated data in the low- and high-states measured by MAGIC

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References

- IceCube paper (<https://www.science.org/doi/epdf/10.1126/science.aat1378>)
- MAGIC paper (<https://iopscience.iop.org/article/10.3847/2041-8213/aado83/pdf>)