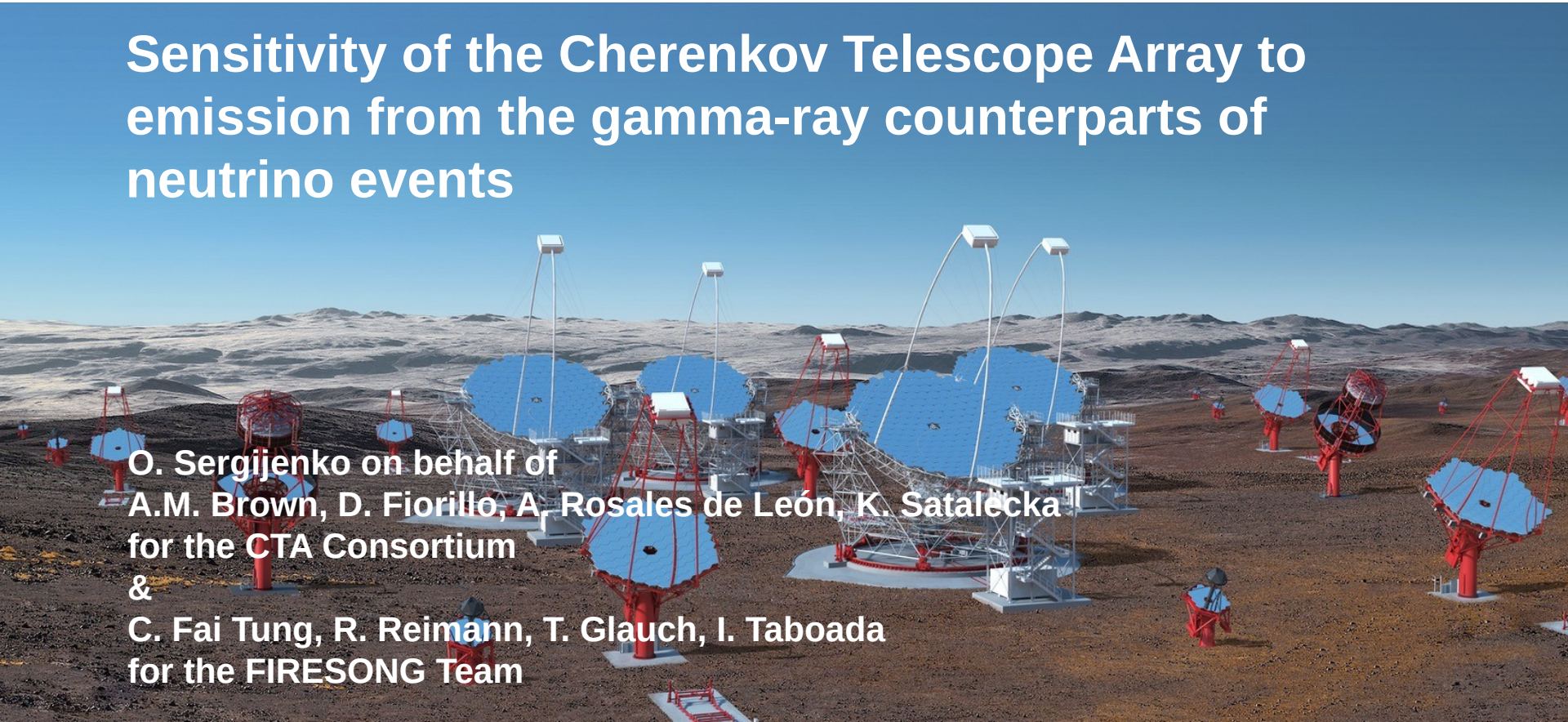
Sensitivity of the Cherenkov Telescope Array to emission from the gamma-ray counterparts of neutrino events



O. Sergijenko on behalf of
A.M. Brown, D. Fiorillo, A. Rosales de León, K. Satalecka
for the CTA Consortium
&
C. Fai Tung, R. Reimann, T. Glauch, I. Taboada
for the FIRESONG Team

Cosmic Messenger Connection

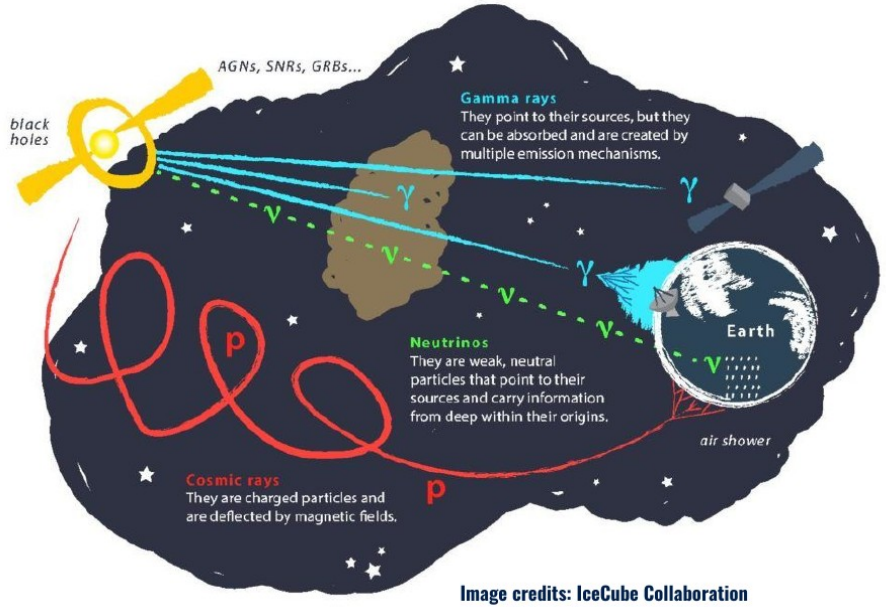


Image credits: IceCube Collaboration

A neutrino/gamma-ray connection is expected if hadronic processes occurs in astrophysical sources (such as AGN)

Neutrinos are considered ideal cosmic messengers and 'smoking gun' for hadronic interactions

Observational evidence: IceCube-170922A & TXS 0506+056

Neutrino Target of Opportunity (NToO)

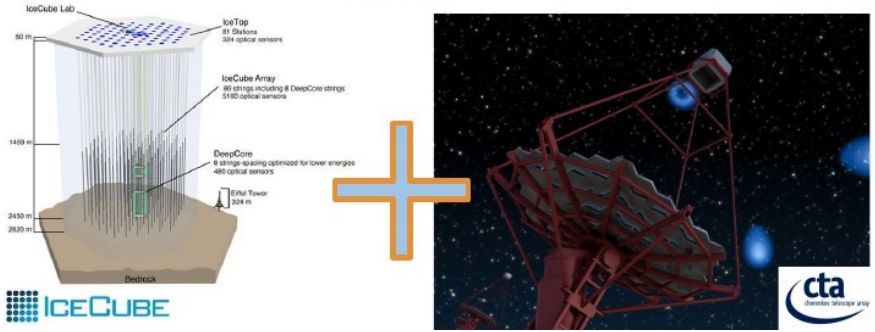
CTA can look for a gamma-ray counterpart from a neutrino source alert info and also monitorate hot-spots that exceeds IceCube (IC) sensitivity

SIMULATIONS:

Hadronic contributions: pγ process

Steady Sources - Looking for an excess point above IC limit

Transient Sources - Alerts coming from flaring blazar sources



Different CTA configurations are being tested:

Alpha configuration

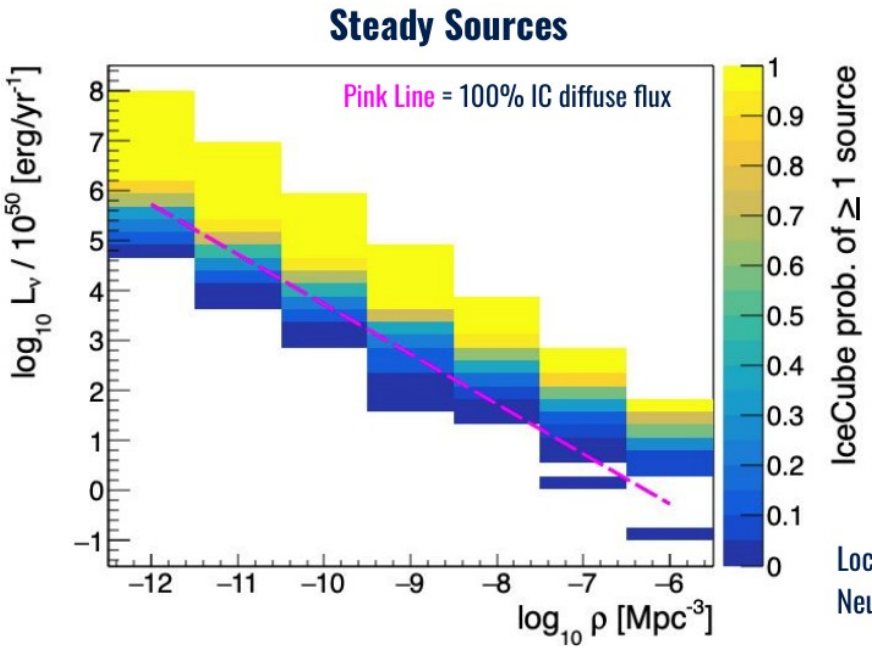
Omega configuration

High NSB (x5 NSB; moon observations)

TS sub-array

FIRESONG

First Extragalactic Simulation of Neutrinos and Gamma-rays



Tung et al., JOSS, 6(61), 3194 (2021)
https://github.com/ChrisCFTung/FIRESONG

Simulates a neutrino population, given:
Source evolution (e.g. star formation rate)
Luminosity function (e.g. standard candle)

Density vs Luminosity

Steady Sources

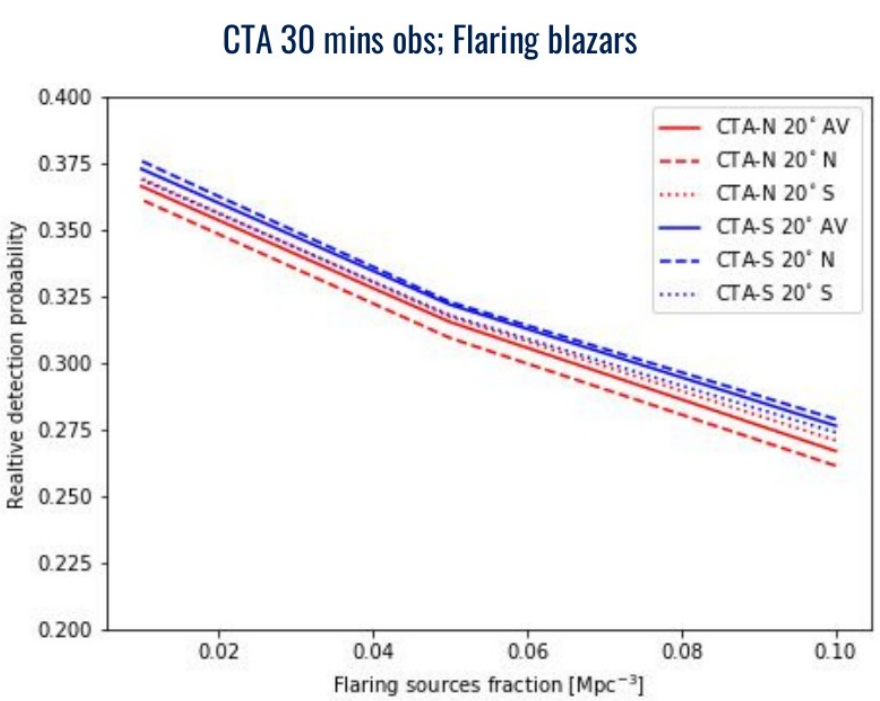
Local source density (sources/Mpc^3)
Neutrino luminosity

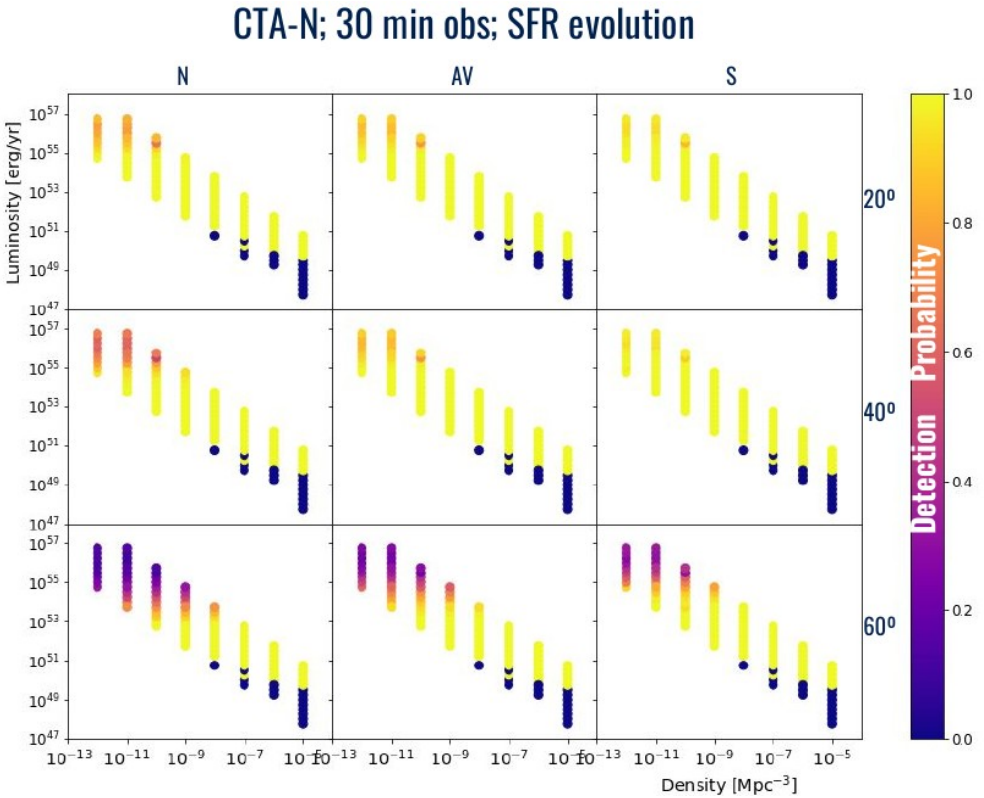
Transient Sources

Local burst density rate (% flaring blazars)
Neutrino flare luminosity

Output: z (redshift), A_ν (neutrino flux @100 TeV) & θ (declination)

Results


CTA 30 mins obs; Flaring blazars
CTA-N 20° AV
CTA-N 20° N
CTA-N 20° S
CTA-S 20° AV
CTA-S 20° N
CTA-S 20° S
Realtive detection probability
Flaring sources fraction [Mpc⁻³]


CTA-N; 30 min obs; SFR evolution
N
AV
S
Luminosity [erg/yr]
Density [Mpc⁻³]
Detection Probability

cherenkov telescope array

More information on the poster

Thank you!