



# Search for neutrino emission of gamma-ray flaring blazars with the ANTARES telescope

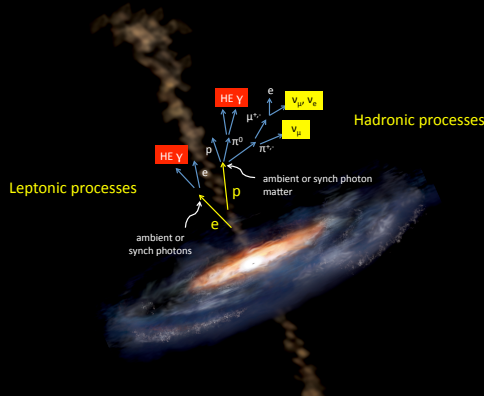
D. Dornic (IFIC - Valencia) on behalf of the ANTARES Collaboration



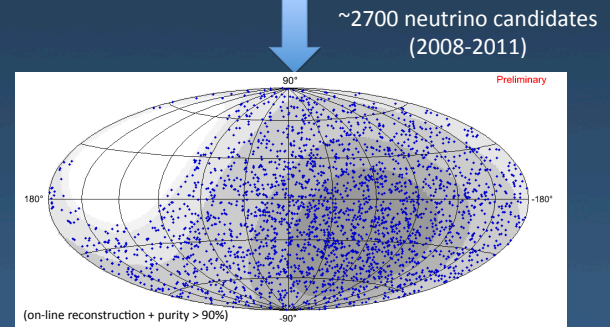
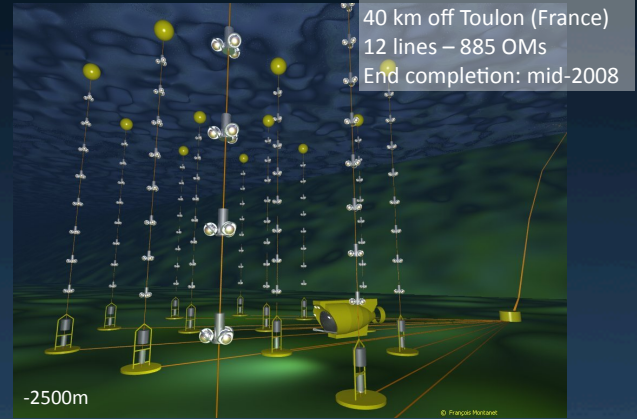
## Motivation: connection CR-γ-v

Search for signal from blazar AGNs – candidate sources for UHECR  
=> Neutrino: smoking gun of the hadronic processes  
=> p-γ or p-p => strong correlation between γ-ray and neutrino fluxes  
=> Larger photon density + Larger magnetic field => enhancement of the neutrino production

HE sky: important time variability: space/time correlation studies  
=> Reduce the atmospheric neutrino background  
=> Improve the discovery potential over a time integrated search



## The ANTARES detector



## Method: time-dependent analysis

Unbinned method: minimization of a likelihood ratio  
Applied to a subsample data in 2008 (~60.8 days live time)  
Event selection: best 5σ discovery potential

$$\lambda = \sum_{i=1}^{N_{\text{event}}} \log \frac{P(x_i | H_{\text{sig}+bkg})}{P(x_i | H_{bkg})} = \sum_{i=1}^{N_{\text{event}}} \log \frac{\frac{n_s}{N} P_{\text{sig}}(\alpha_i, \delta, t_i) + \left(1 - \frac{n_s}{N}\right) P_{bkg}(\alpha_i, \delta)}{P_{bkg}(\alpha_i, \delta)}$$

MC nu+anu    γ-ray LC

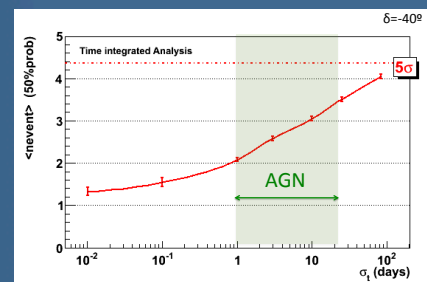
Signal:  $P_{\text{sig}}(\alpha_i, \delta, t_i) = P_{\text{sig}}(\alpha_i, \delta) \times P_{\text{time}}(t_i)$

Noise:  $P_{bkg}(\alpha_i, \delta, t_i) = (\Omega(\alpha_i, \delta)) \times P_{\text{time}}(t_i)$

Extracted from data

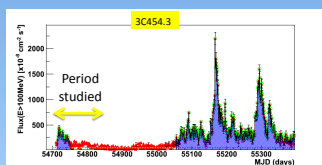
Performance: number of events produced in one source required for a 5σ discovery (90% C.L.):

=> Improvement of the sensitivity: x 2-3



## Identification of the γ-ray flare:

- 1) γ-ray sources: Variable and energetic blazars
- 2) 1-day binned light curve (fit files from Fermi website)
- 3) Flare (⇔ HE state) periods: robust and simple method
  - Extraction of a baseline + error
  - Prior: (flux-erflux)>(baseline+2\*sigma) + flux > (baseline+3\*sigma)
  - Duration: add consecutive points to the prior (flux-erflux)>(baseline+sigma) add +/- 0.5 day to each flare (1-day binned LC + uncertainties models)



## Analysis of 10 sources:

Sources: 0208-512, 0235+164, 1510-089, 3C273, 3C279, 3C454.3, OJ287, 0454-234, WComae, 2155-304

=> 1 neutrino compatible with the time/space distribution (Δα=0.56°) of 3C279 with probability 10.3 %

=> Upper-limits on the neutrino fluence

