Short introduction to KM3NeT

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ERLANGEN CENTRE
FOR ASTROPARTICLE
PHYSICS

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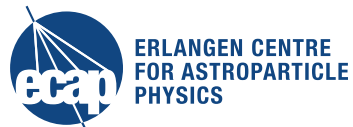
Scientific target

- High-Energy neutrino Astronomy (ARCA) and Oscillation Research (ORCA)

- Measuring neutrinos E_ν > MeV

- Galactic and extragalactic neutrino sources

- Neutrinos from dark matter annihilations

- Transient sources

- Neutrino properties, e.g. oscillation parameters

Atmospheric neutrino background
Unresolved astrophysical sources
Cosmogenic neutrinos

Cosmic accelerator
gammas (0.01 - 10 Mpc)
neutrinos
protons E>10¹⁹ eV (few 10 Mpc)
protons E<10¹⁹ eV
1 parsec (pc) = 3.26 light years (ly)
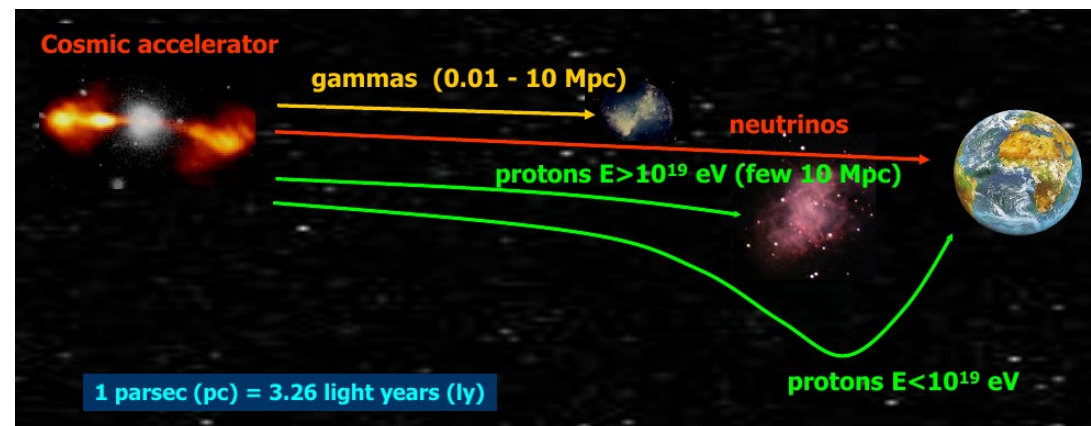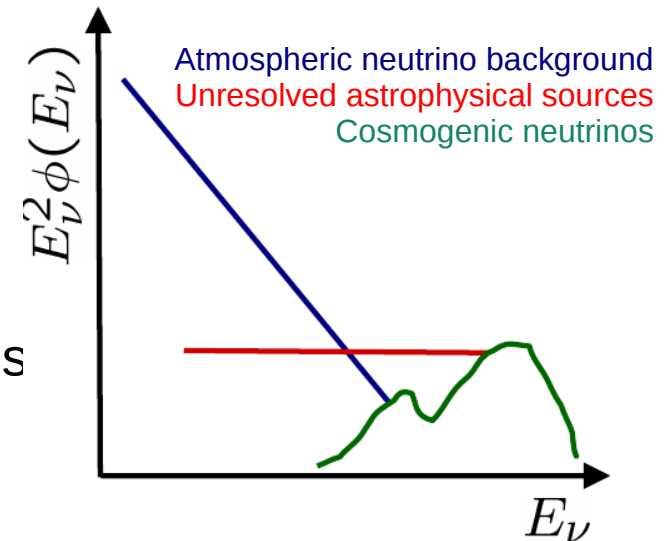
The Collaboration and Sites

Neutrino research infrastructure

- 15 Countries
- 55 Institutes
- Growing collaboration

2 Detection Sites

ARCA

off shore Capo Passero, Italy
@ 3500 m depth

ORCA

off shore Toulon, France
@2500 m depth

Detection principle and data taking

Water Cherenkov detector

- Multi-PMT modules
  (31 3''-PMTs in one sphere)

- 18 modules per string
  (Detection Unit)

- Building blocks of 115 DUs

- Under construction
  - 1 DU working in ARCA
  - 6 DUs ready for deployment in ORCA

- Phase 1 fully funded (24 **ARCA** + 6 **ORCA** strings)

  KM3NeT 2.0 Letter of Intent: arXiv:1601.07459
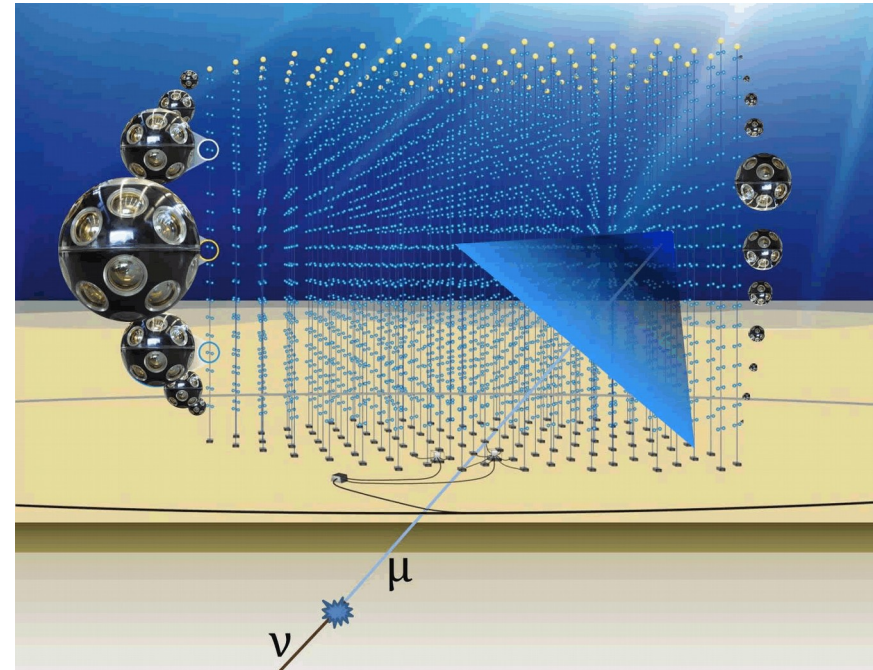
|	ARCA	ORCA
DU distance	90 m	20 m
DOM spacing	36 m	9 m
Instrumented mass	2*500 Mton	5.7 Mton

Data taking and processing

Data: In final set-up

- 192500 PMTs

- 5-10 kHz single-photon rate each

- all data to shore → some GB/second

Data processing

- Online data filter (on shore)

- Calibration and reconstruction

- Data analysis

→ Monte Carlo (including atmospheric muon background)
→ Online analysis for alerts etc.
→ Earth and sea sciences
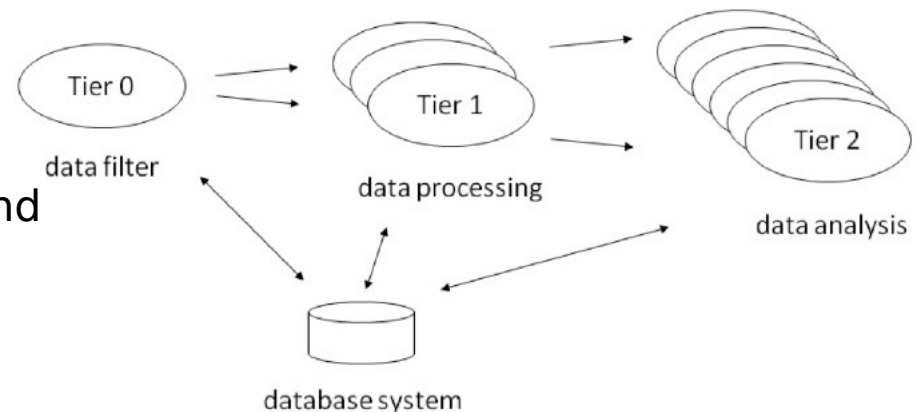
Current usage

1) Tools under construction!

   – Triggering, Data Filter and Calibration of raw data set up

   – Common analysis frameworks

   – But: Still heavy development of tools

     → Ideal time-line to integrate in wider community!

2) First analyses with operating DU

   – Full analysis chain available

   – Based on widely used formats (root, xml etc.)