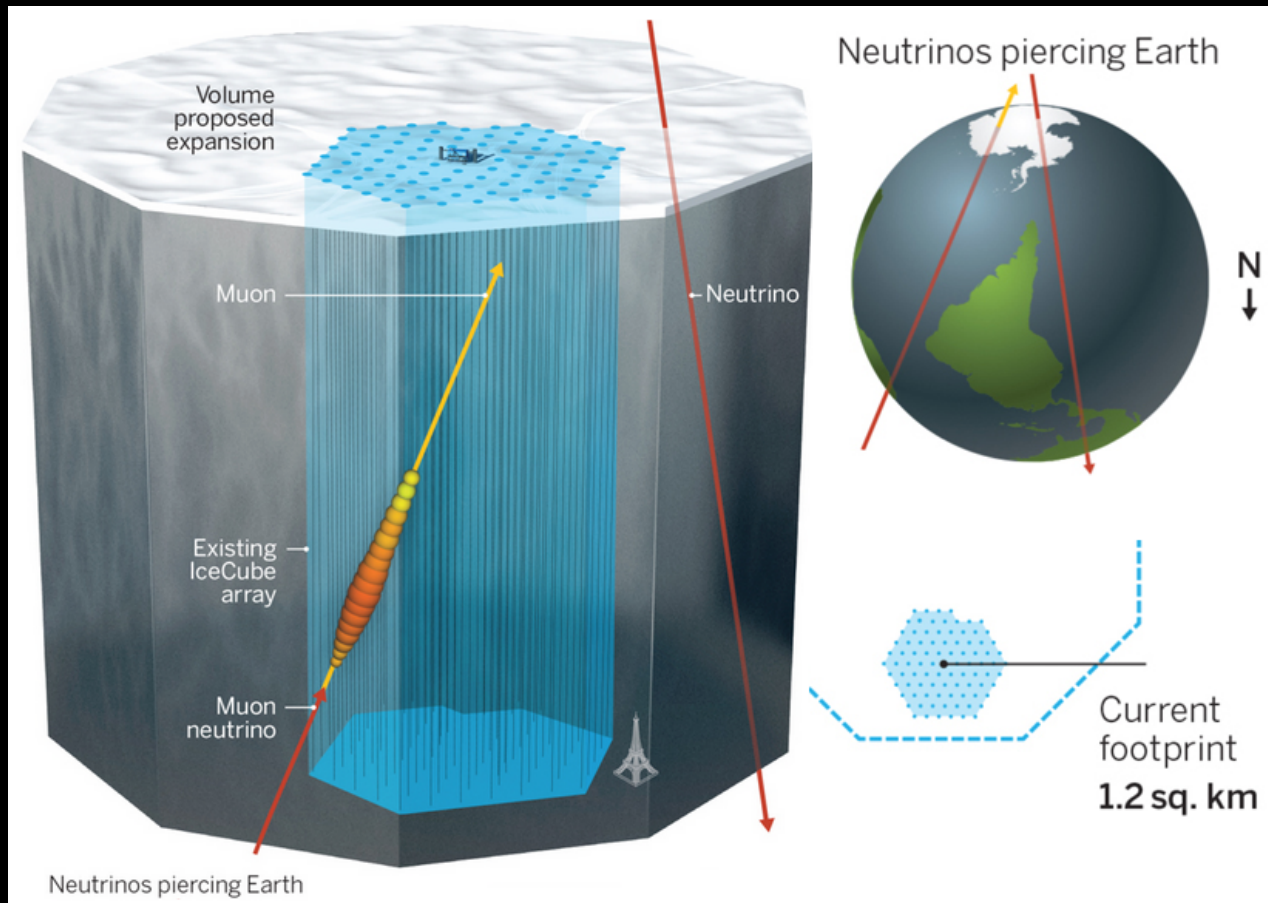
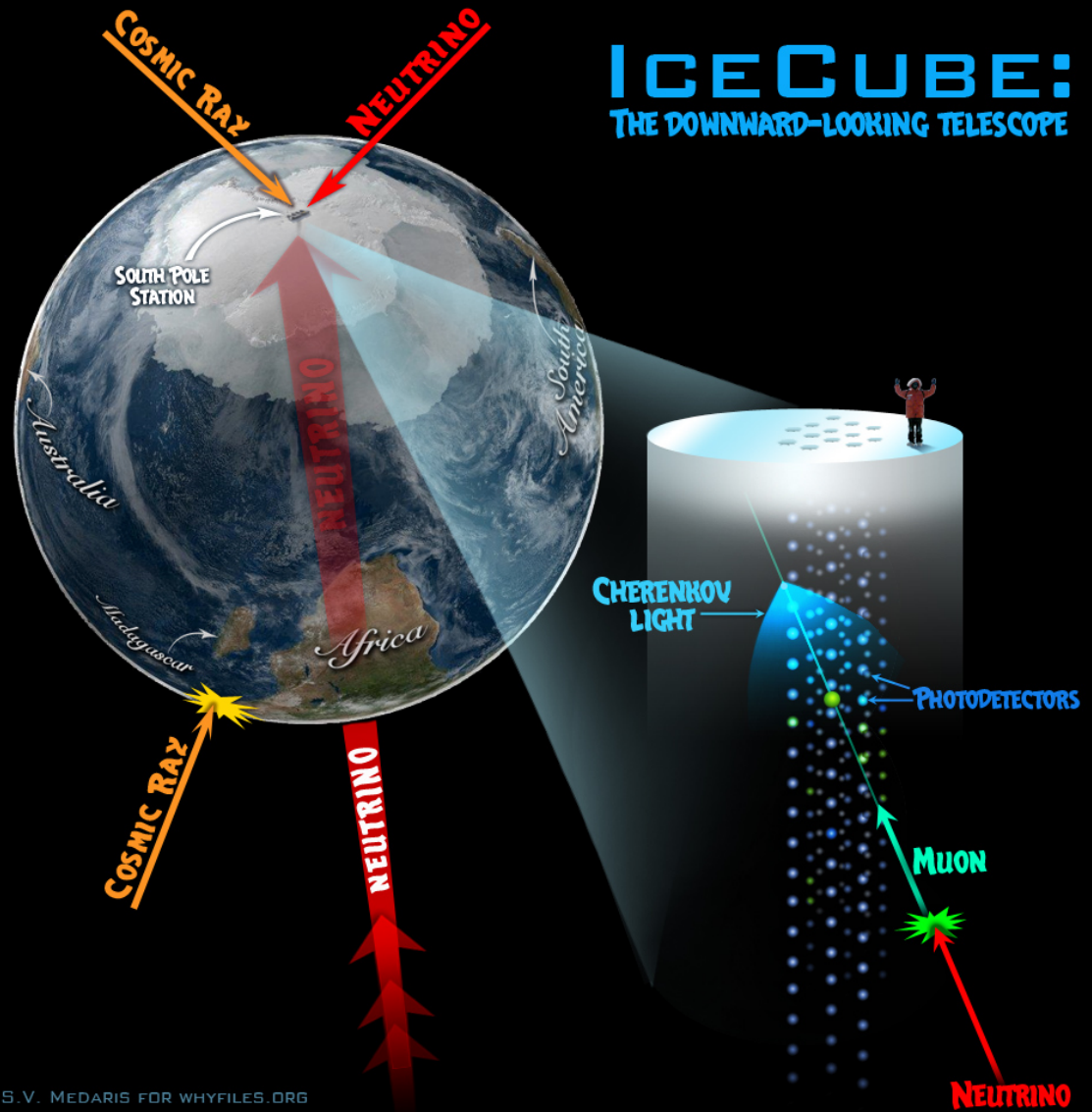


# Neutrinos de alta energia: IceCube

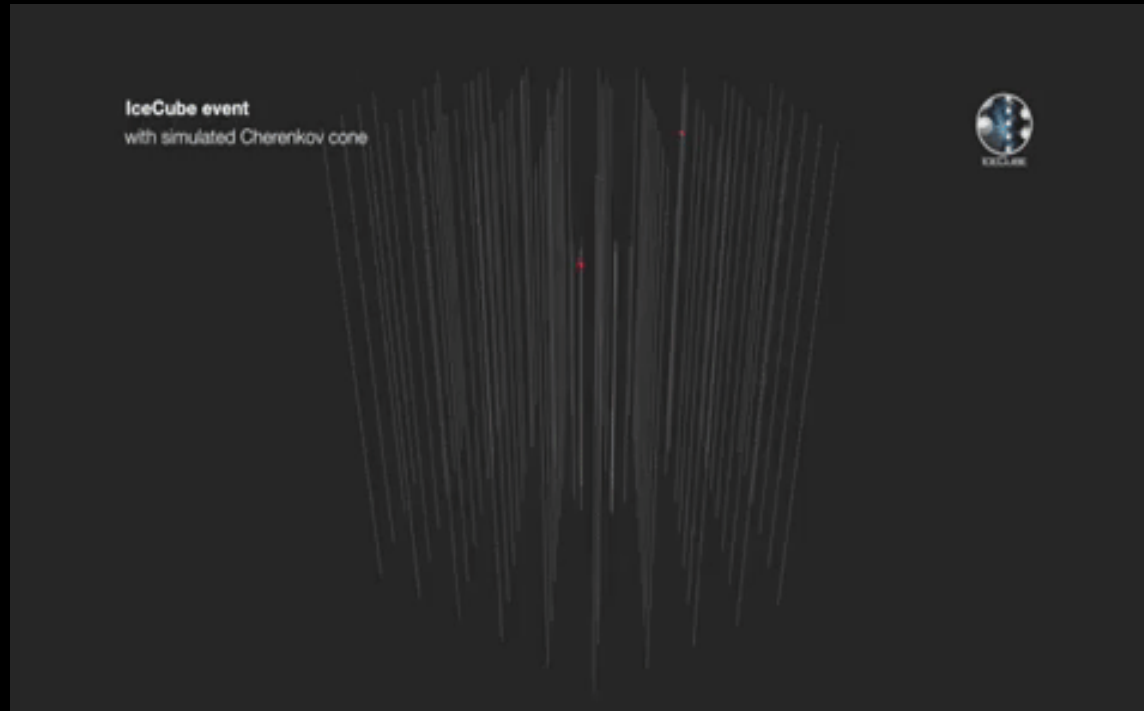
- Colaboração de 12 países
- Localizado no Polo Sul
- 1 kilômetro cúbico de gelo
- Detecta luz Cherenkov



- Cosmic neutrinos interacting with water molecules in ice produce HE muons, taus and electrons
- Cherenkov light of charged particles is used to reconstruct the neutrino parameters



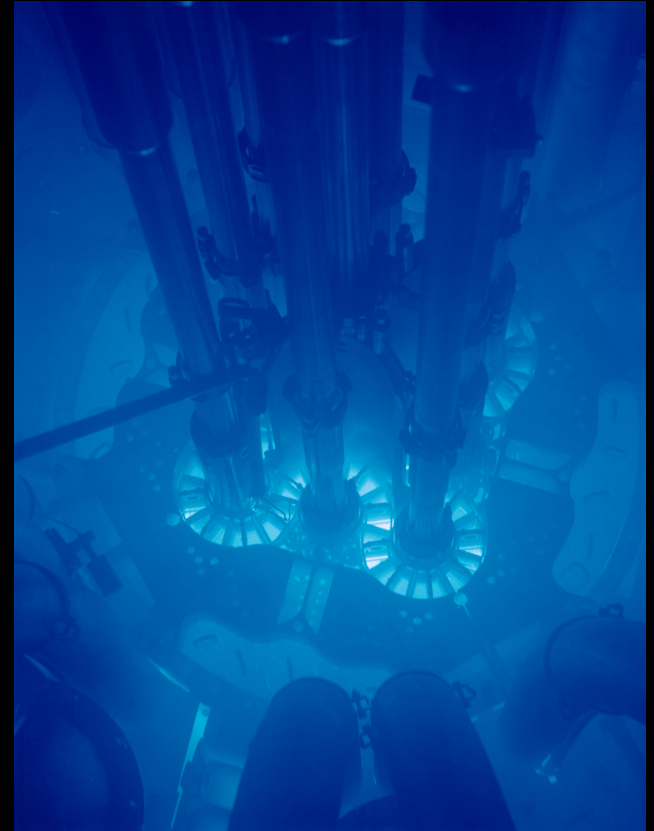
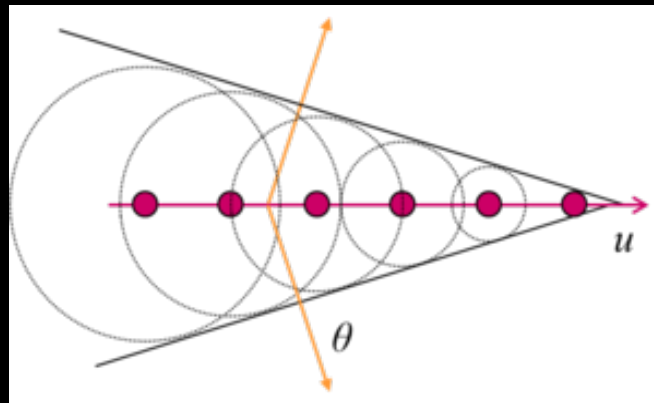
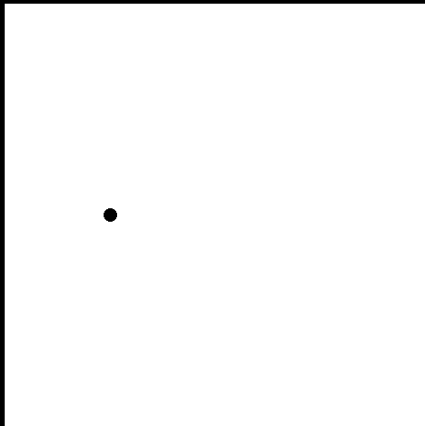
# Neutrino event



Credit: IceCube Collaboration

# Cherenkov Radiation

- A charged particle is traveling faster than the speed of light within a dielectric a medium (e.g. air, water, ice)
- An electric field disturbance is created, which propagates throughout the medium
- A shock front of Cherenkov light is formed



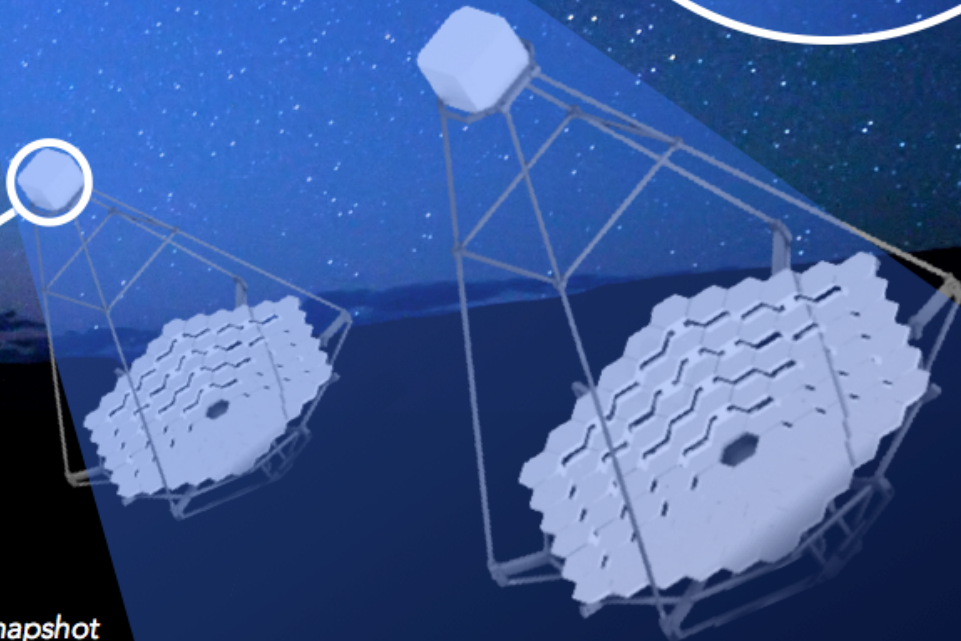
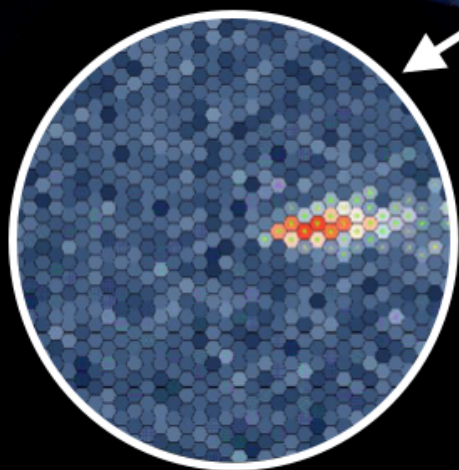
- Eléctrons produzem radiação Cherenkov na água que rodea o núcleo do reator nuclear ATR

# Detecting very high energy gamma rays on the ground: Cherenkov telescopes



$\gamma$ -ray enters the atmosphere

Electromagnetic cascade



Aula 04: estudar Seções 8.1, 8.2, 8.3, 8.5 e 9.7 do Longair.

Para os conceitos relacionados aos efeitos relativísticos na radiação, recomendo

“The Feynman Lectures on Physics” Vol. 1 cap 34, e Vol. 2 cap. 42:

[https://www.feynmanlectures.caltech.edu/I\\_34.html](https://www.feynmanlectures.caltech.edu/I_34.html)

[https://www.feynmanlectures.caltech.edu/II\\_42.html](https://www.feynmanlectures.caltech.edu/II_42.html)