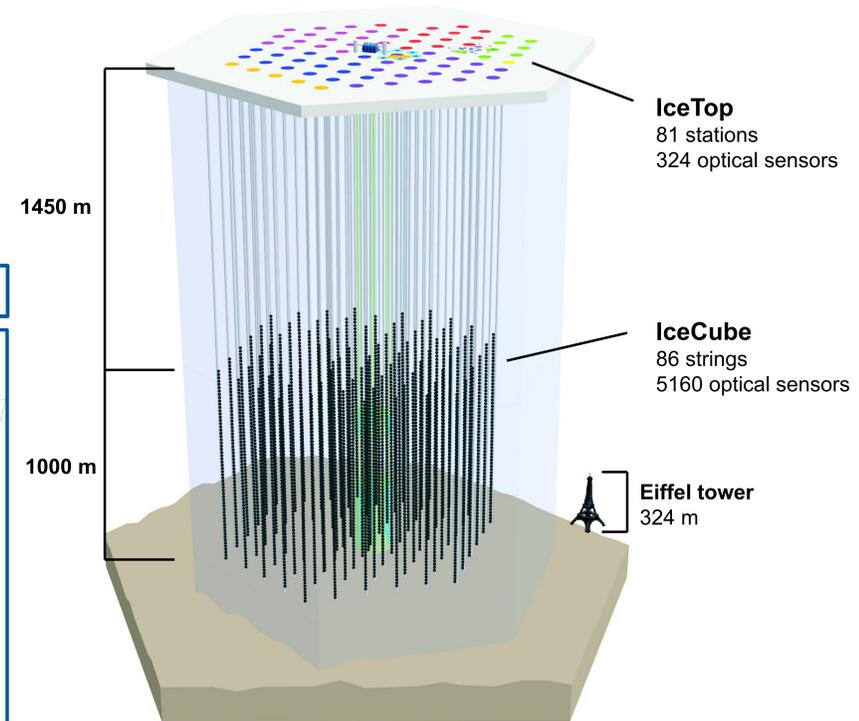
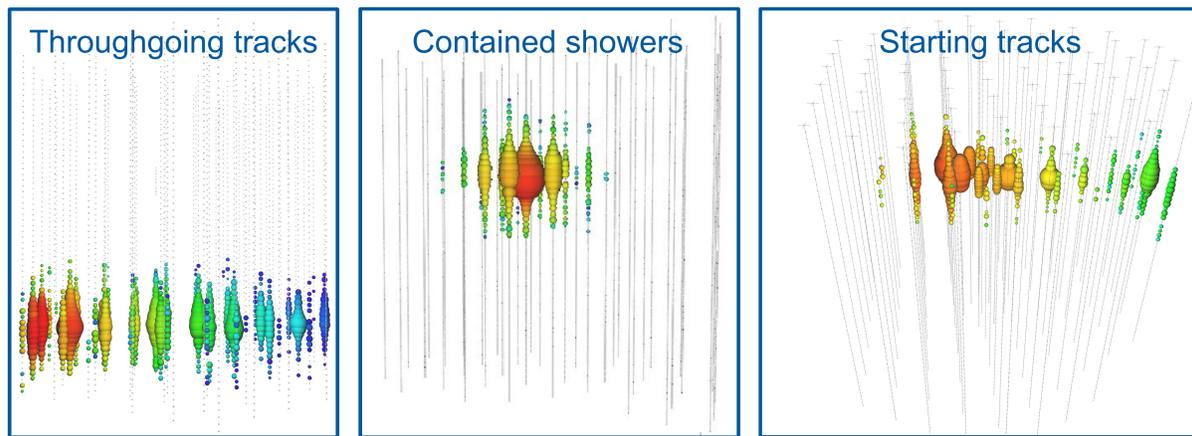


# Evidence for Extraterrestrial Neutrinos in IceCube

Lars Mohrmann (DESY)

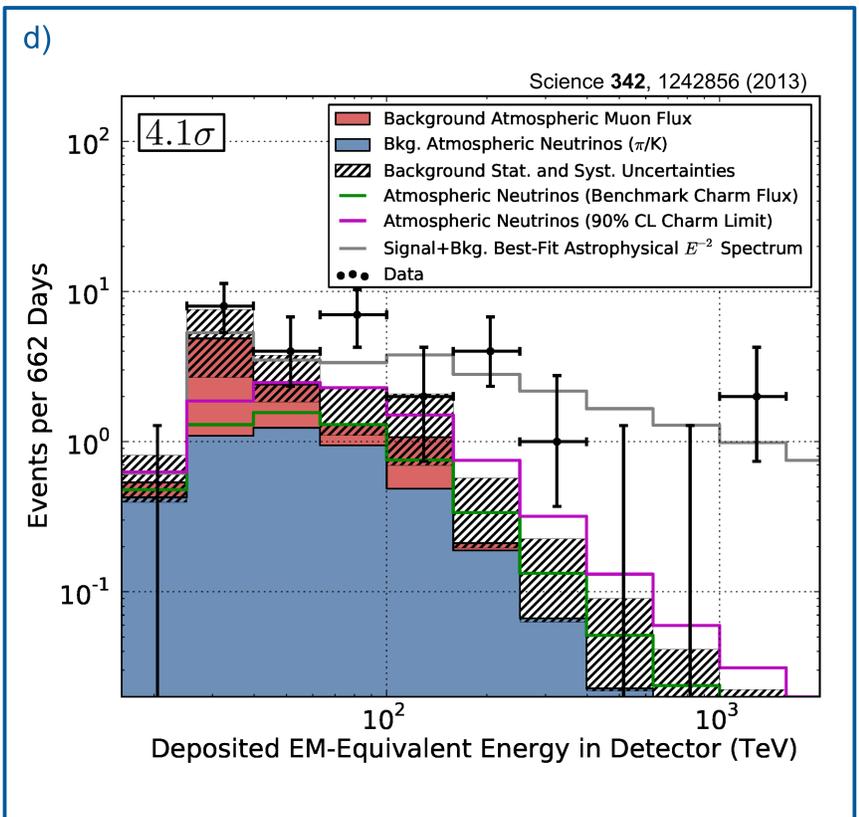
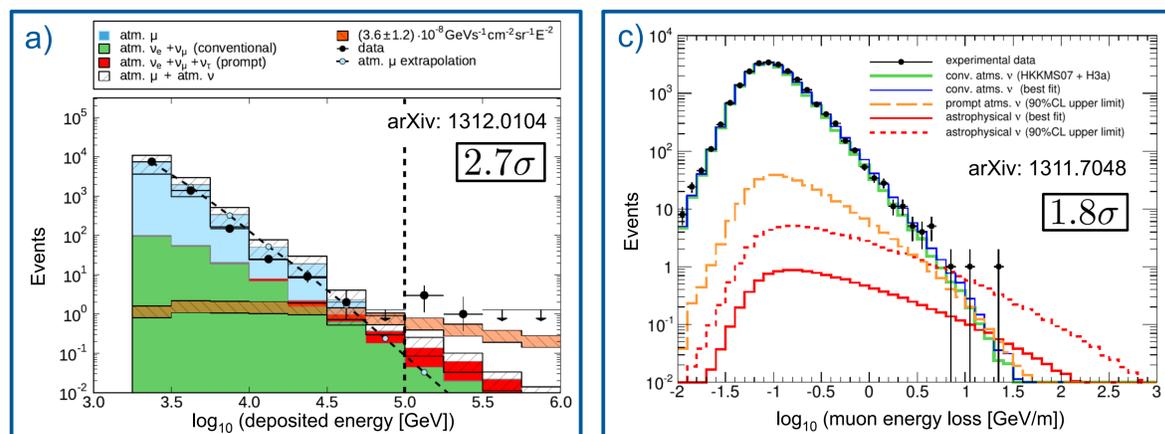
## The IceCube Neutrino Observatory

- Largest operating neutrino telescope (1 km<sup>3</sup> instrumented volume)
- Embedded in glacial ice at geographic South Pole
- Construction time: 6 years (2004-2010)
- Detected > 100,000 atmospheric neutrinos by now
- Main purpose: Detect extraterrestrial neutrinos → lead the path to neutrino astronomy
- Three main detection channels:



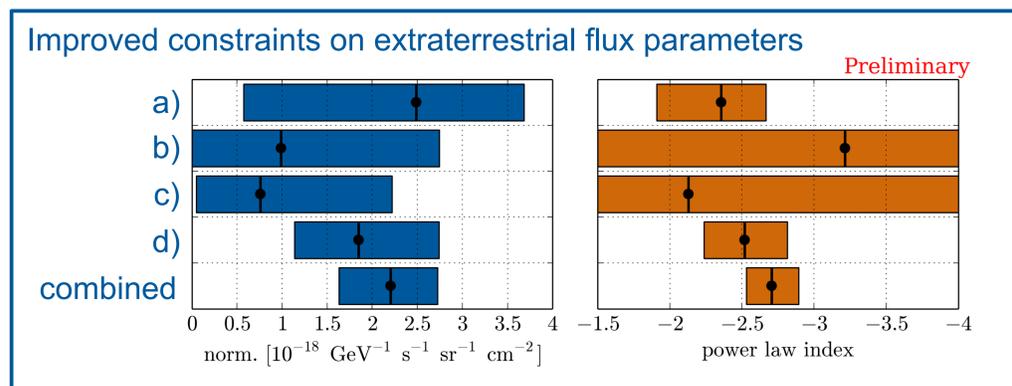
## Evidence for Extraterrestrial Neutrinos

- High-energy excess in multiple data sets / channels:
- Contained showers (40 strings)
  - Contained showers (59 strings)
  - Throughgoing tracks (59 strings)
  - Contained showers+starting tracks (79/86 strings)
- Important step towards identifying cosmic accelerators
  - No evidence for a point source yet...



## Forming a Combined Picture

- **Aim:** Combine the results of individual data sets / channels to achieve better sensitivity to an extraterrestrial flux
- **Method:** Simultaneous likelihood fit of atmospheric and extraterrestrial components to energy distributions ( a ) – d )
- **Results:**
  - Best fit for the extraterrestrial signal is a power law with index  $(-2.7^{+0.2}_{-0.2})$
  - Incompatible with atmospheric-only explanation at  $4.8\sigma$



## Result of combined fit

