



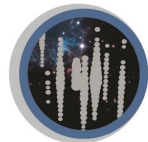
ICECUBE MASTERCLASS

AN AUTHENTIC ASTROPHYSICS RESEARCH EXPERIENCE

IPPOG masterclass working group
May 15, 2014

Building an IceCube Collaboration outreach activity

- Inspired by the [International Masterclasses](#) for hands-on particle physics.
- Pilot project for 2014
 - **Five IceCube institutions:** Universität Mainz, Germany; University of Delaware in Newark, DE, US; Université Libre de Bruxelles, Belgium; Vrije Universiteit Brussel, Belgium; and **WIPAC** at the University of Wisconsin–Madison, WI, US
 - Almost **100 students**, mostly 11th & 12th graders (two years before college)
 - One analysis: replicate the analysis of **first evidence for an astrophysical neutrino flux** published in *Science*, Nov. 2013



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Masterclass approach and resources

- We want students to feel like “**I could be an IceCuber!**”
- Activities grow in complexity while **addressing main ideas** of the analysis:
 - what is signal and what is background
 - how to select signal
 - are these events astrophysical neutrinos and what is the significance of the measured flux
 - can we say where these neutrinos come from
 - what can we do, what do we need to improve these results
- Several **resources** developed: website, icebreaker activities, analysis activities, wiki space



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The IceCube Masterclass

Your first day as a real researcher

The first edition of the IceCube Masterclass program will take place on **May 21, 2014**.

The IceCube Masterclass program, starting in 2014 at select locations around the world, **invites our young students—our future scientists**—to learn about particle astrophysics by doing real research.

IceCube is an amazing experiment. It is the **largest detector** ever built, is taking data in the **harshest place on Earth**, and has observed the **highest energy neutrinos** ever. **Cool, right?**



IceCube is a **team**. A few hundred scientists, with the help of engineers, drillers, IT experts and many other technical staff, have made this project possible. **Will you join us?**

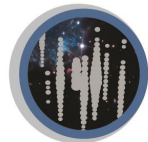
Participate! You will **analyze actual IceCube data**: signals from tiny particles, called **neutrinos**, that have traveled through the Universe over astronomical distances, bringing us information about extreme objects such as black holes or gamma-ray bursts.

What is an IceCube masterclass?

- An opportunity to get out of school and meet IceCube researchers
- An opportunity to learn more about our Universe
- An opportunity to work with international partners

IceCube Masterclasses: future plans

- Engage **more institutions** for 2015 IceCube Masterclass
- Search for better dates. Consider joining the **International Masterclasses**.
- Create **multilingual** content to enable a broader participation
- Add a few **more analyses** to include other research results from IceCube: oscillations, dark matter or cosmic-ray anisotropy
- Expand on developed resources to create **classroom activities** using IceCube research, both as extensions to the masterclass and as standalone activities.



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