

# DIFFUSE WORKSHOP

*steps towards to the global-fit*

EARTHQUAKE RESEARCH INSTITUTE  
UNIVERSITY OF TOKYO  
14-15 SEPTEMBER 2019

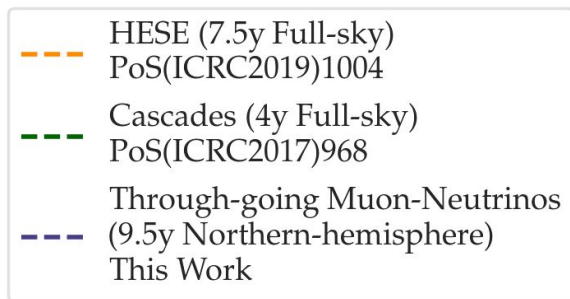
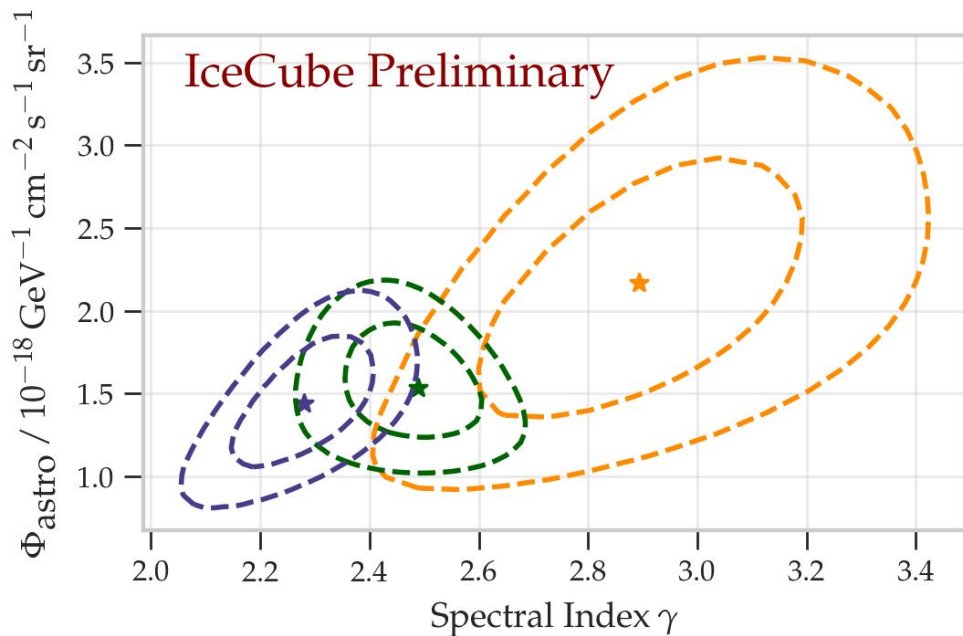
# Workshop overview

Lu Lu  
Chiba University

# Why global-fit now?

Features in diffuse spectrum?  
Cut-off? Multi-component? Flavour ratio?

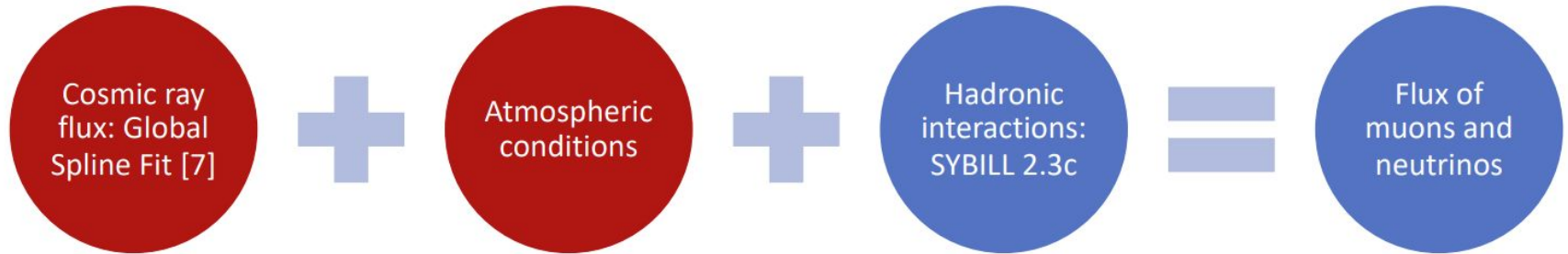
- Astrophysical and atmospheric components measured by different detection channels published



Jöran Stettner, ICRC2019  
Austin Schneider, ICRC2019  
Hans Niederhausen, ICRC2017

# Why global-fit now?

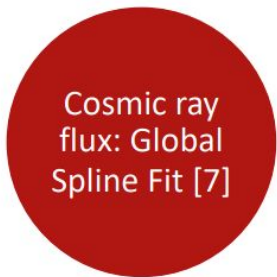
- Astrophysical and atmospheric components measured by different detection channels published
- Innovative progresses on atmospheric neutrino systematic treatments



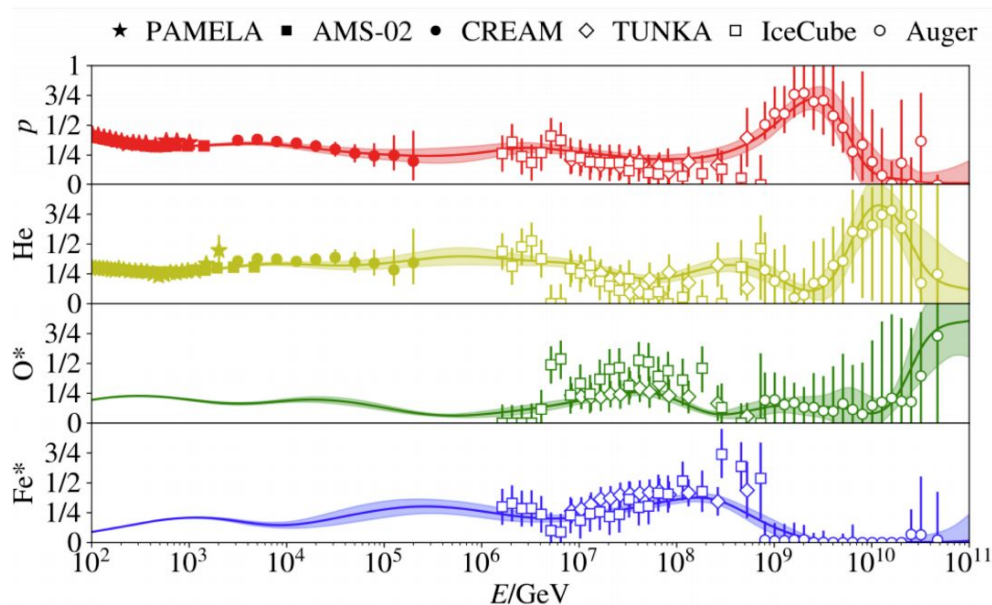
Anatoli Fedynitch, Hiroaki Menjo (calibration with measurements)

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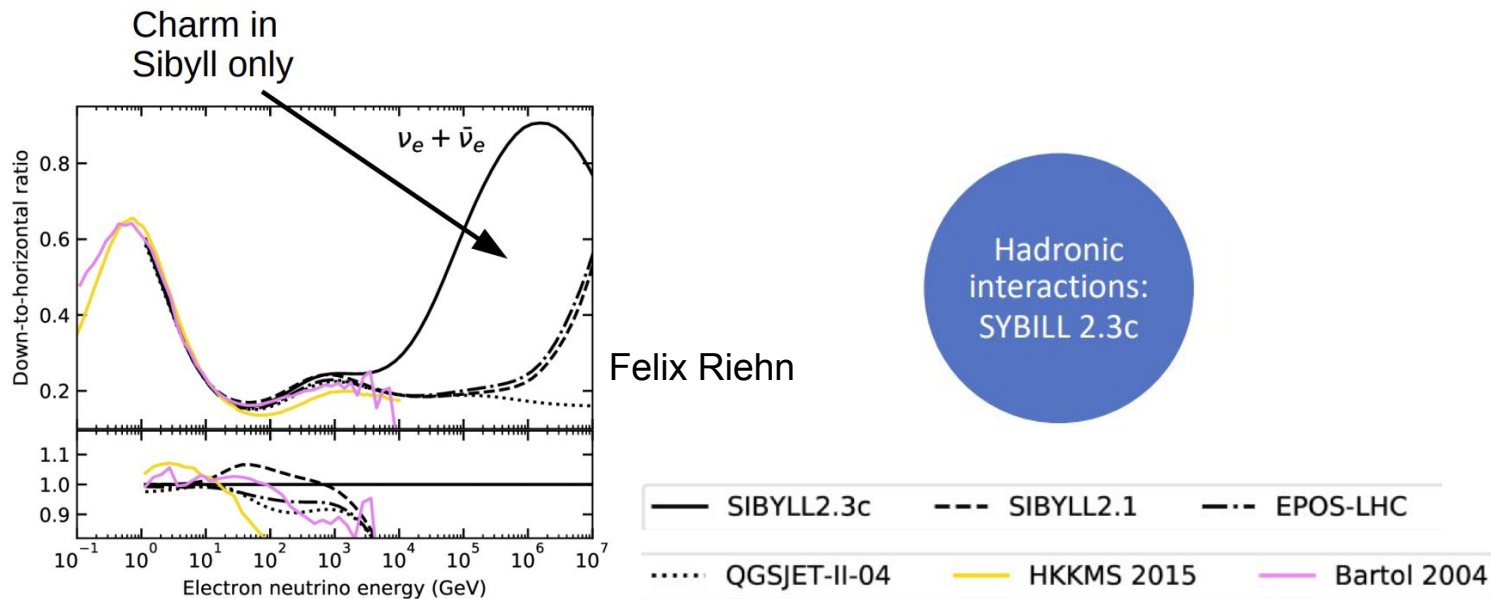


Hans Dembinski



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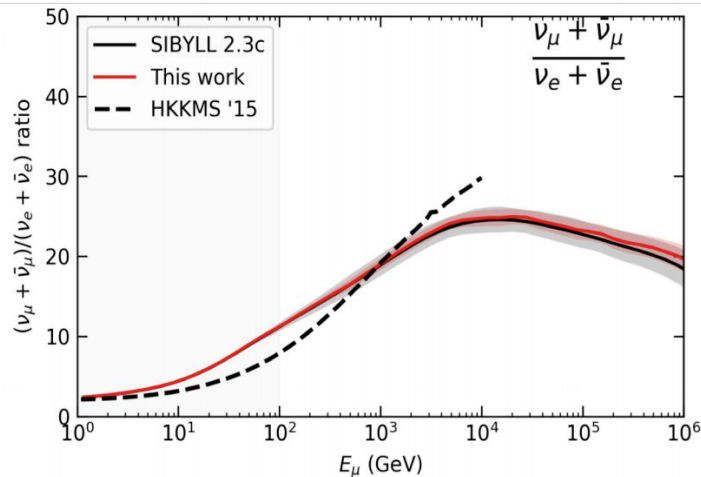
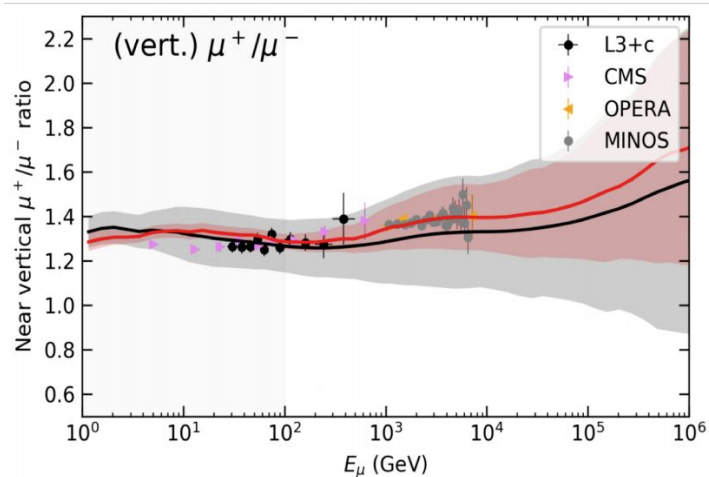


# Why global-fit now?

Honda-model  
Ito  
Menjo  
Sato

MCEq  
Anatoli Fedynitch

- Astrophysical and atmospheric components measured by different detection channels published
- Innovative progresses on atmospheric neutrino systematic treatments

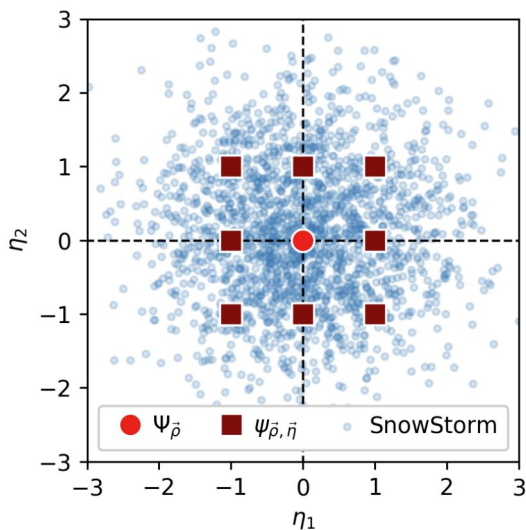


Flux of  
muons and  
neutrinos

Anatoli Fedynitch

# Why global-fit now?

- Astrophysical and atmospheric components measured by different detection channels published
- Innovative progresses on atmospheric neutrino systematic treatments
- On-going new IceCube ice/detector systematics simulation efforts



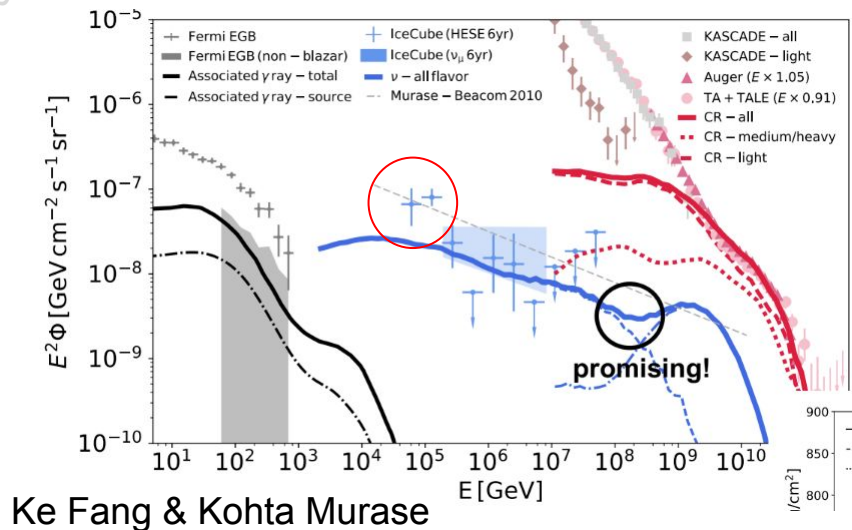
Old: discrete shifts in nuisance parameters (red)  
New: a single Monte Carlo ensemble (blue)

Benjamin Smithers

# Why global-fit now?

- Astrophysical and atmospheric components measured by different detection channels published
- Innovative progresses on atmospheric neutrino systematic treatments
- On-going new IceCube ice/detector systematics simulation efforts
- Exciting theory models to be tested

E.g. (grand) unification model  
Galaxy clusters  
PeV  $\nu$  – confined CR  
UHECR – escaping CR  
sub-TeV photon – “sum”





# Systematics on atmospheric modeling

11:25

## Honda model

past and future; comparison with muon measurements.

**Speakers:** Hiroaki Menjo (Nagoya University), Kazufumi Sato (Nagoya University )

12:00

## MCEq and a universal treatment for systematic errors

**Speaker:** Anatoli Fedynitch (ICRR)

12:35

## Production of high energy neutrinos in the atmosphere - charm and sibyll2.3C

(remote) + news of hadronic interaction uncertainties

**Speaker:** Felix Riehn (University of Santiago de Compostela)

# Astrophysical theory talks

10:50

## Kohta's wishlist for the global-fit

🕒 35m



From perspective of a theorist, what are the physics goals of the global-fit? Which measurements can be helpful determining source parameters?

**Speaker:** Kohta Murase (PSU)

14:30

## Diffuse models from 1 TeV to 1 EeV

🕒 35m



**Speaker:** Dr Haoning He (Riken)

# Experimental talks and discussions

15:05

## Overview of IceCube diffuse analyses in light of global-fit

🕒 30m



which features to include in the global fit? summary of techniques for tau/hadronic shower/ghashow resonance/inelasticity and how to combine to an ultimate global-fit? what are the challenges?

**Speakers:** Claudio Kopper (MSU), Nathan Whitehorn (UCLA)

15:35

## Diffuse numu + HESE consistency checks and combined fit

🕒 30m



public -> method only.

**Speakers:** Joeran Stettner (RWTH Aachen), Erik Ganster (RWTH Aachen), Austin Schneider (UW Madison)

16:05

## Discussions and concluding remarks

🕒 30m



The end of the public part of the workshop.

**Speakers:** Claudio Kopper (MSU), Nathan Whitehorn (UCLA)

Cuber-only session

# Hackathon!

multi-sim/snowstorm

Fitters: i.e. NNM-fit for  
x-section measurement

NuSquids + LeptonInjector

Cascade generator

Dynamic-stack CORSIKA

Lollipop to validate cascade reco

MESE

Application: galactic plane  
with diffuse search

# Thank you for coming and enjoy Tokyo!



Dinner starts at  
20:30

