

Workshop for Atmospheric neutrino production in the MeV to PeV range

12,13 Jan 2020, ONLINE

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Information:

The workshop will be recorded

- The video will be uploaded somewhere (Youtube with access restriction ?) after the workshop and the link will be provided to the all registered participants.
- If you do not want to recode your presentation, please let us know before your presentation. We will stop the recode during your presentation.

Upload your presentation file

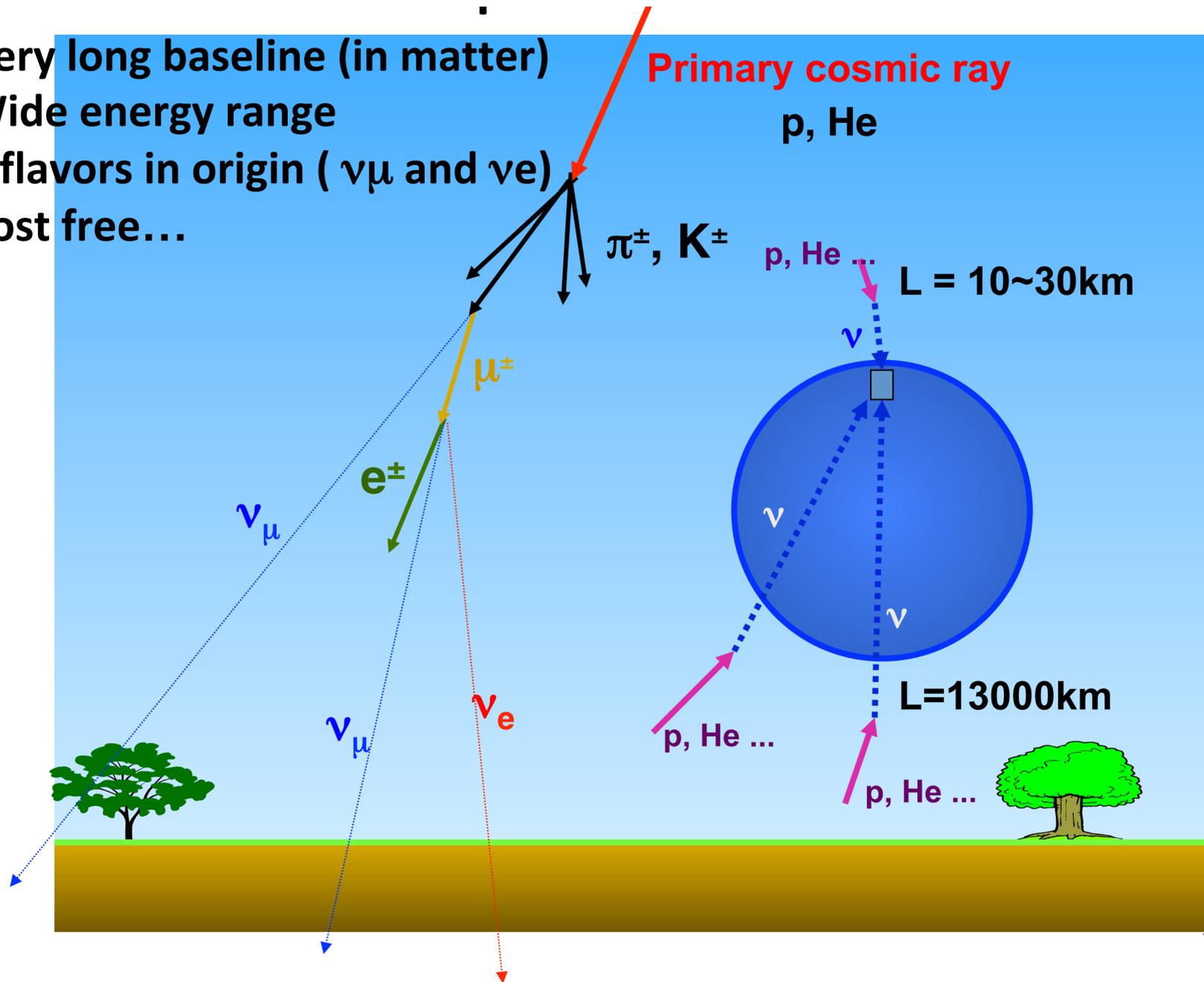
- Please do it well before your presentation.
A cloud folder: <https://nuss.nagoya-u.ac.jp/s/ob8LQ2xEW82Rd7d> PW: atmnu
- The presentation files will be copied to the indico page.

Questions during presentations

- Each presentation will have a question time (~ 5 min) at the end.
- Please use “raise hand” or “chat” on ZOOM.
The chair person will ask you to unmute and give a question.
- Slack workspace is available for further discussion
https://join.slack.com/t/atmnu2021/shared_invite/zt-koyxfztx-JU99AOW8ZBym7RkIZ5YMwQ

Atmospheric neutrinos

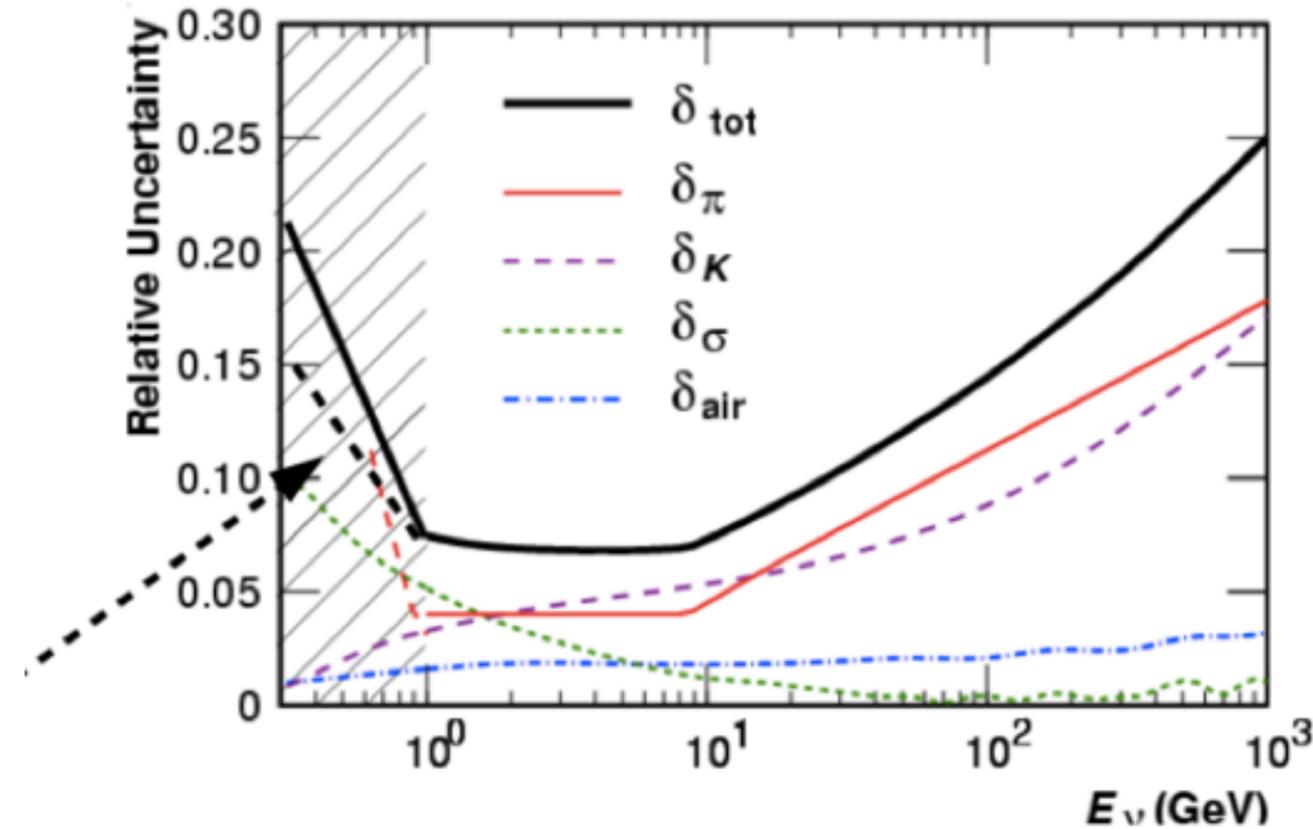
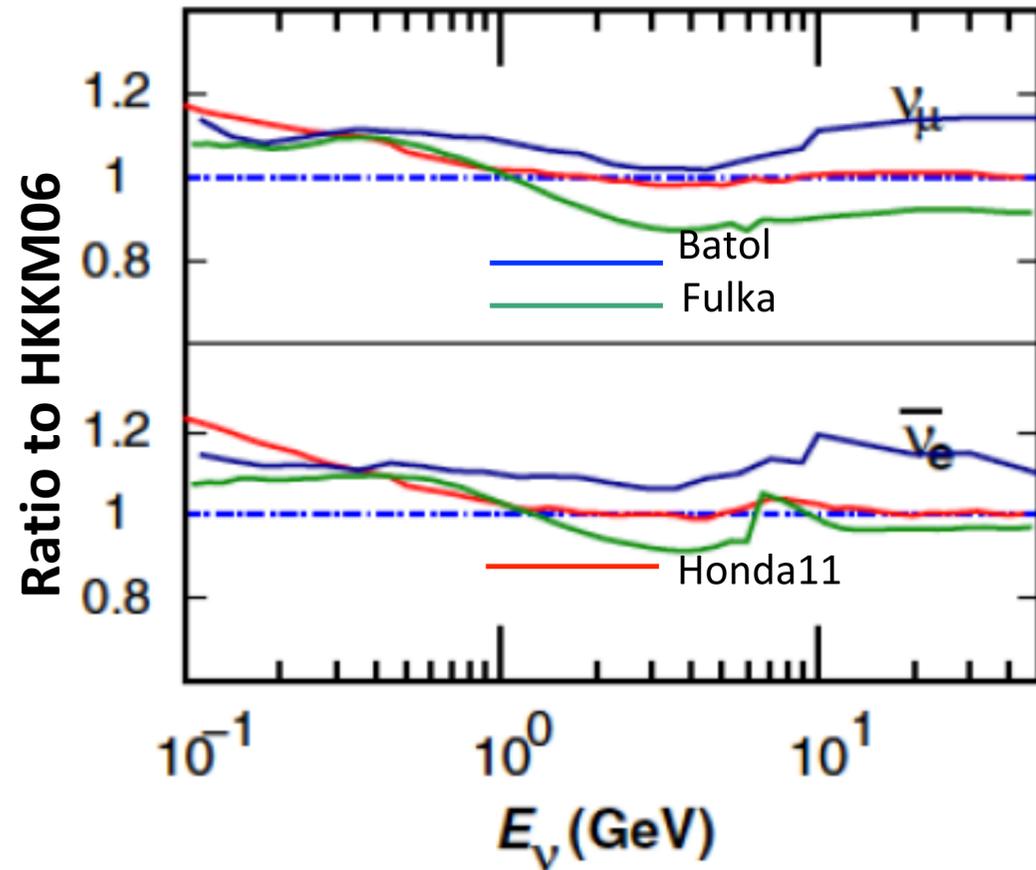
- Very long baseline (in matter)
- Wide energy range
- 2 flavors in origin (ν_μ and ν_e)
- Cost free...



- **Neutrino source for oscillation measurement**
 - 0.1 GeV - 10 GeV
- **Background in astronomical neutrino observations**
 - Supernova relic neutrinos (SK-Gd) < 100 MeV
 - Neutrinos from cosmic-ray sources (IceCube) > 100 TeV
- **Background in dark matter searches**
 - indirect searches 100 GeV ~ 1 TeV
 - direct search (neutrino floor)

Modeling of Atmospheric neutrino flux

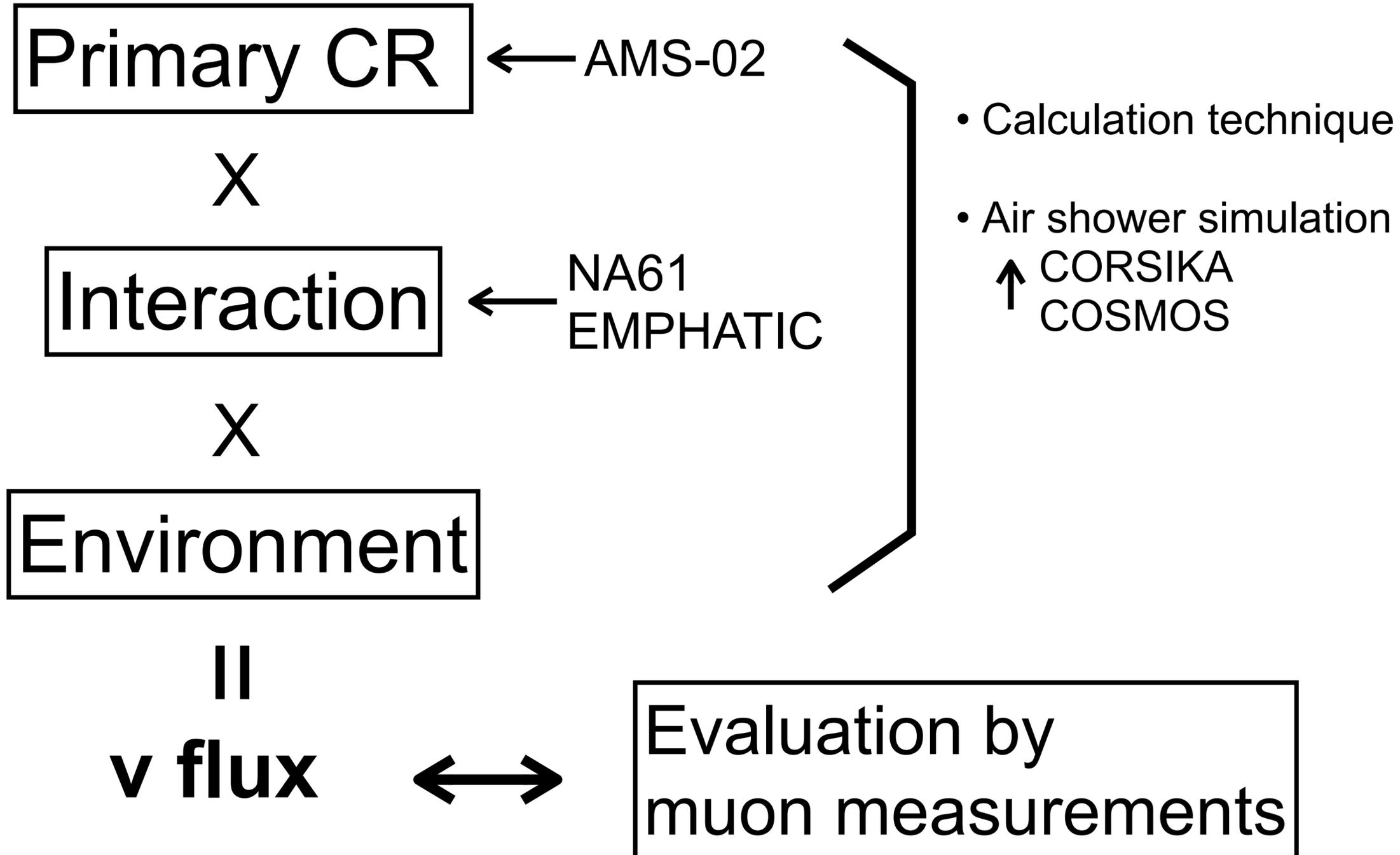
M. Honda et al.,
PHYSICAL REVIEW D 83, 123001 (2011)



- Increasing statistics to ~ 100 as ν events in HK
- SK-T2K combined analysis

- Improvement of the precision of atmospheric ν flux estimation.
- Common error matrix related to hadronic interaction for AS ν and beam ν oscillation analyses

How to model the flux



1st Workshop for Atmospheric neutrino production

20-20 Mar. 2019, Nagoya Univ.

Opening remark
of 1st workshop

Goal of meeting

- Put 2 communities (ν & AS) together to share the knowledge, demand, and future
 - How much precision needed/possible ?
- Update state-of-art neutrino flux codes with the newest and common knowledge and framework
 - Honda flux, Bartol flux, and newest air shower MC.
- Provide common treatment of ν -production systematics in LBL/ATM combined-analysis
 - i.e. T2K-SK combined oscillation analysis
- Brain-storming for what's new measurements
 - Accelerator / ground CR / airbourne CR
- Discuss to form a real-working group

	Mar 20 (Wed)	Mar 21 (Thu)	Mar 22 (Fri)
AM		Atm- ν flux modeling	CR measurements
		Atm- ν flux modeling	Accelerator measurements
PM	Intorduction & motivation	Air shower modeling	Future/brain-storming
	KMI colloquium	hadon interaction models	
Evening	Dinner		

Organization:

- Connection between atmospheric and beam neutrino fluxes for a SK+T2K joint analysis.
- Impact on low energy neutrino (<100 MeV) measurements
- Muon measurements

Today

16:00	Opening ONLINE	16:00 - 16:05
	SK+T2K joint analysis ONLINE	16:05 - 16:35 Christophe Bronner
	Atmospheric neutrinos as a background in supernova relic neutrino searches ONLINE	16:35 - 17:05 Yosuke Ashida
17:00	CP violation in sub-GeV atmospheric neutrinos ONLINE	17:05 - 17:25 Ara Ioannisian
	Implementation of accelerator data into Honda flux calculation ONLINE	17:40 - 18:10 Kazufumi Sato
18:00	Update of Bartol model ONLINE	18:10 - 18:50
19:00	(Accelerator-) data-driven hadronic model and implications for the atmospheric lepton fluxes ONLINE	18:50 - 19:20 Anatoli Fedynitch

Physics

Model Update

Tomorrow

16:00	Electron neutrino - oxygen nuclei interactions in Super-Kamiokande from low energy atmospheric neutrinos ONLINE	16:00 - 16:05 Baran Bodur
	Understanding Neutrino-nucleus cross sections in the few GeV region ONLINE	16:05 - 16:35
	Connection between atmospheric neutrinos and muons ONLINE	16:35 - 17:10 Honda Morihiro
17:00	Short break ONLINE	17:10 - 17:25
	Ground level cosmic ray measurements with the ADAMO detector: past experience and possible improvements Lorenzo Bonechi	17:25 - 17:40
18:00	Reconstruction electron and muon with momentum below 1 GeV using the BESS magnet ONLINE	18:00 - 18:20 Thi Hien Doan
	NA61/SHINE Status and Plans after Long Shutdown 2 ONLINE	18:20 - 18:40 Yoshikazu Nagai
	EMPHATIC experiment for muon flux measurements ONLINE	18:40 - 19:00
19:00	Discussion ONLINE	19:00 - 19:20
	Closing ONLINE	19:20 - 19:30

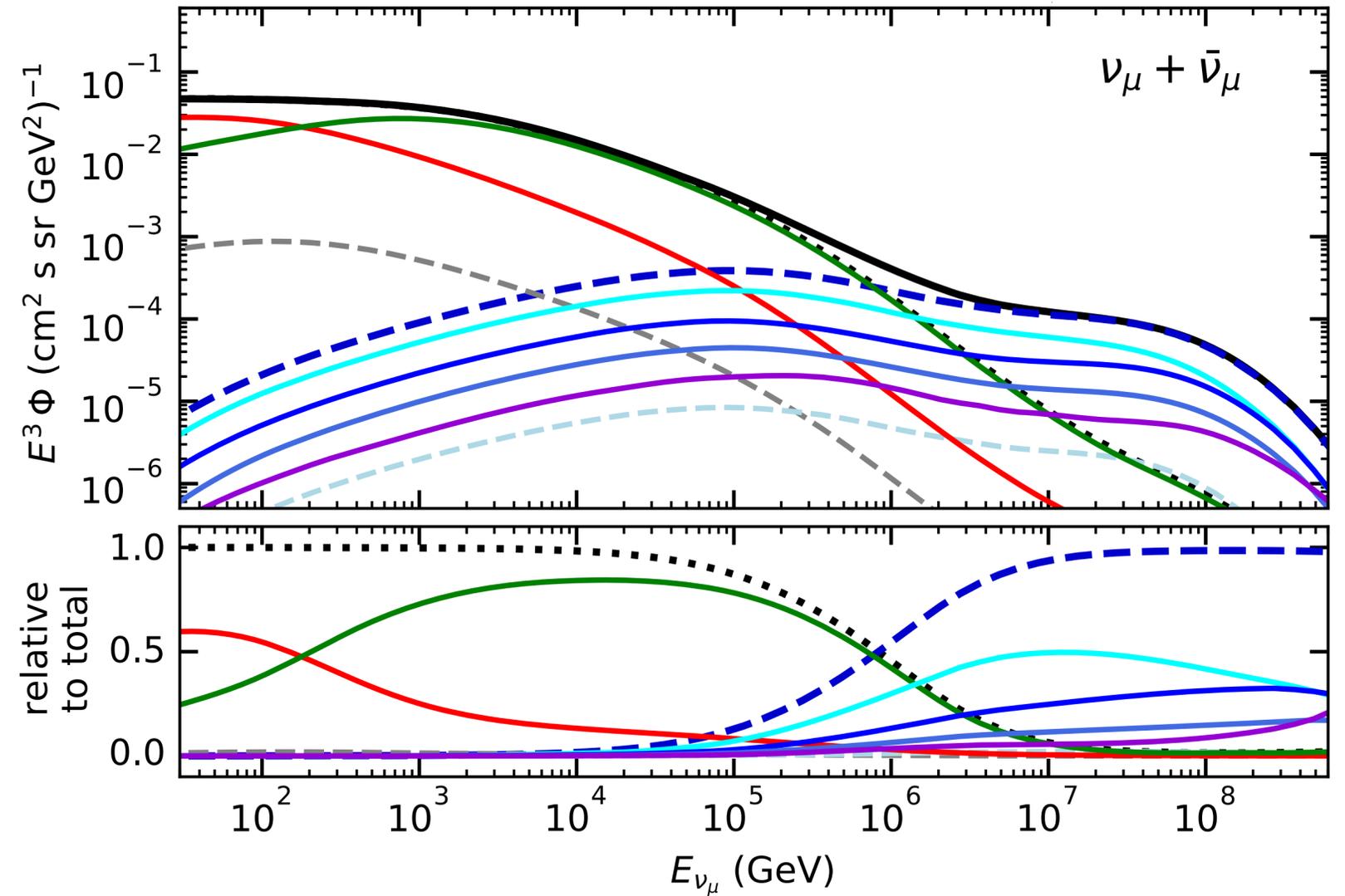
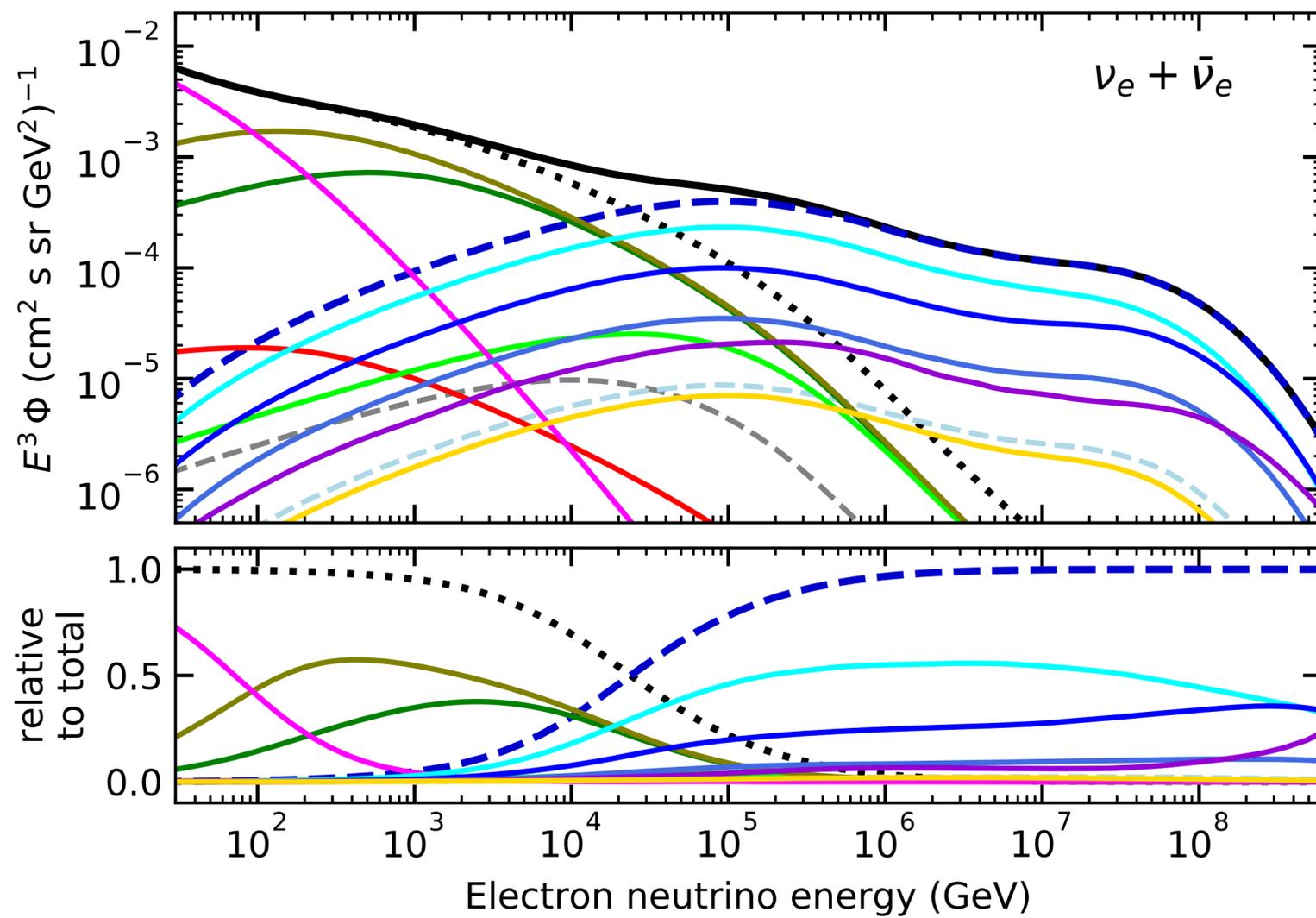
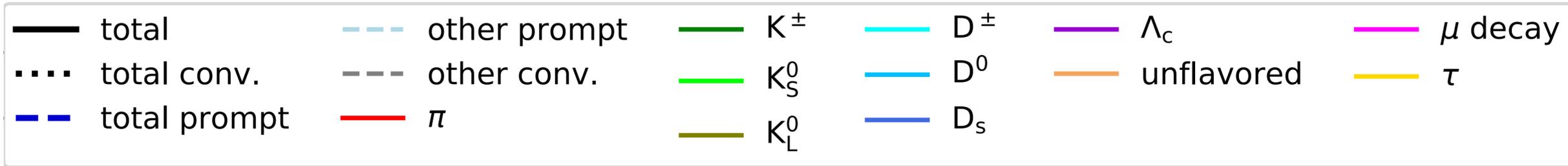
ν -O interaction

muon measurement

accelerator experiments

Let's start and enjoy discussions !!

Backup



Fedynitch et al. (2019)