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Institute of Physics of the Czech Academy of Sciences

https://novaexperiment.fnal.gov

Muon Radiography with the NOvA Near Detector

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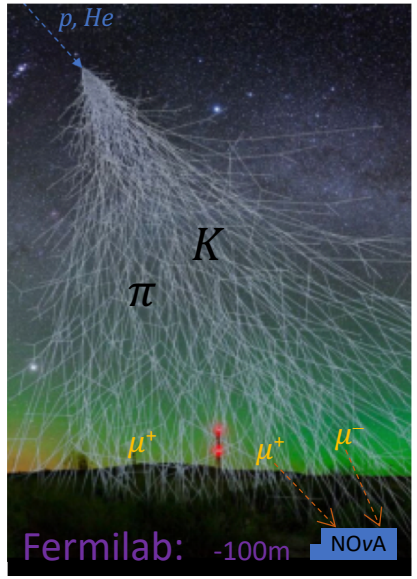
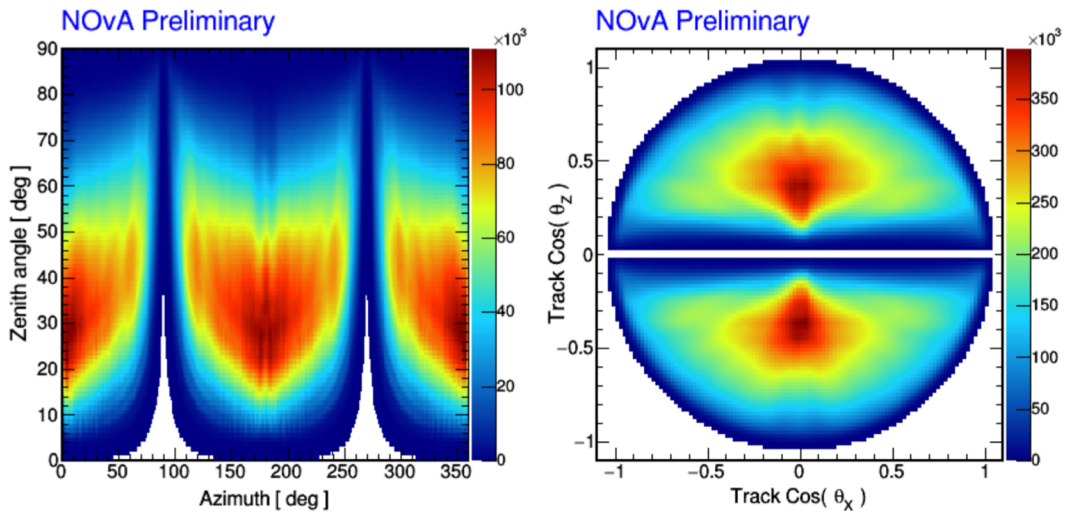
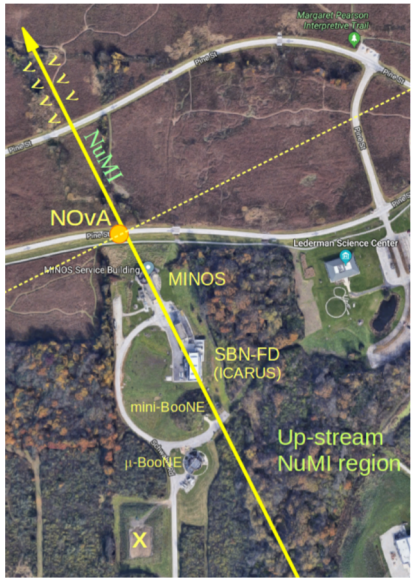
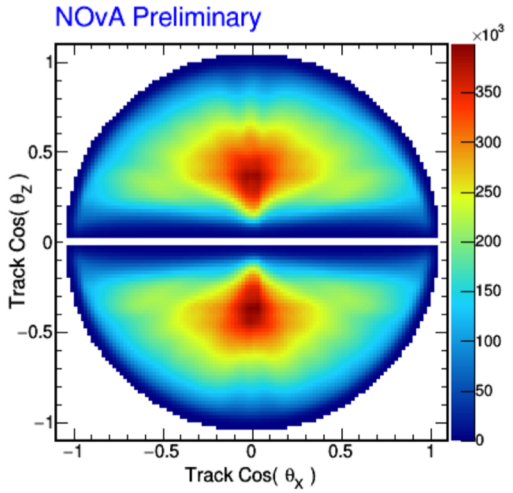




Fermilab

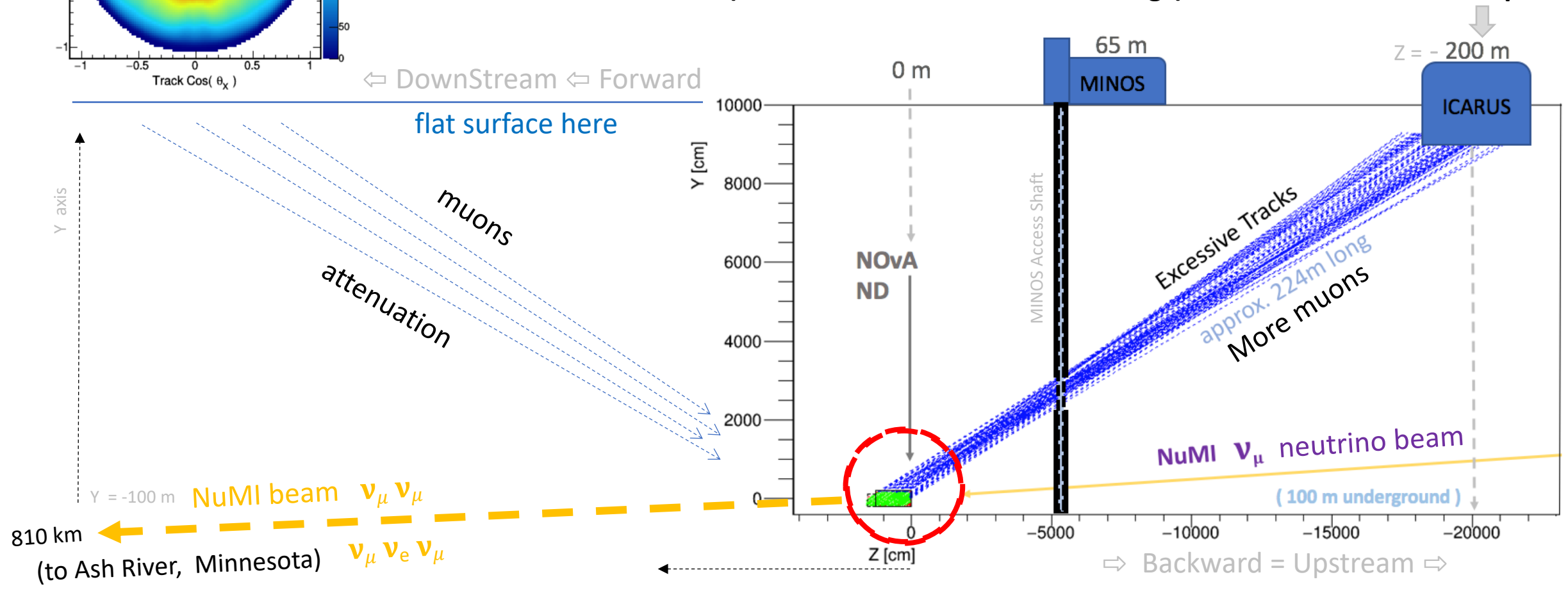


Downstream-Upstream Subtraction of μ-FLUX



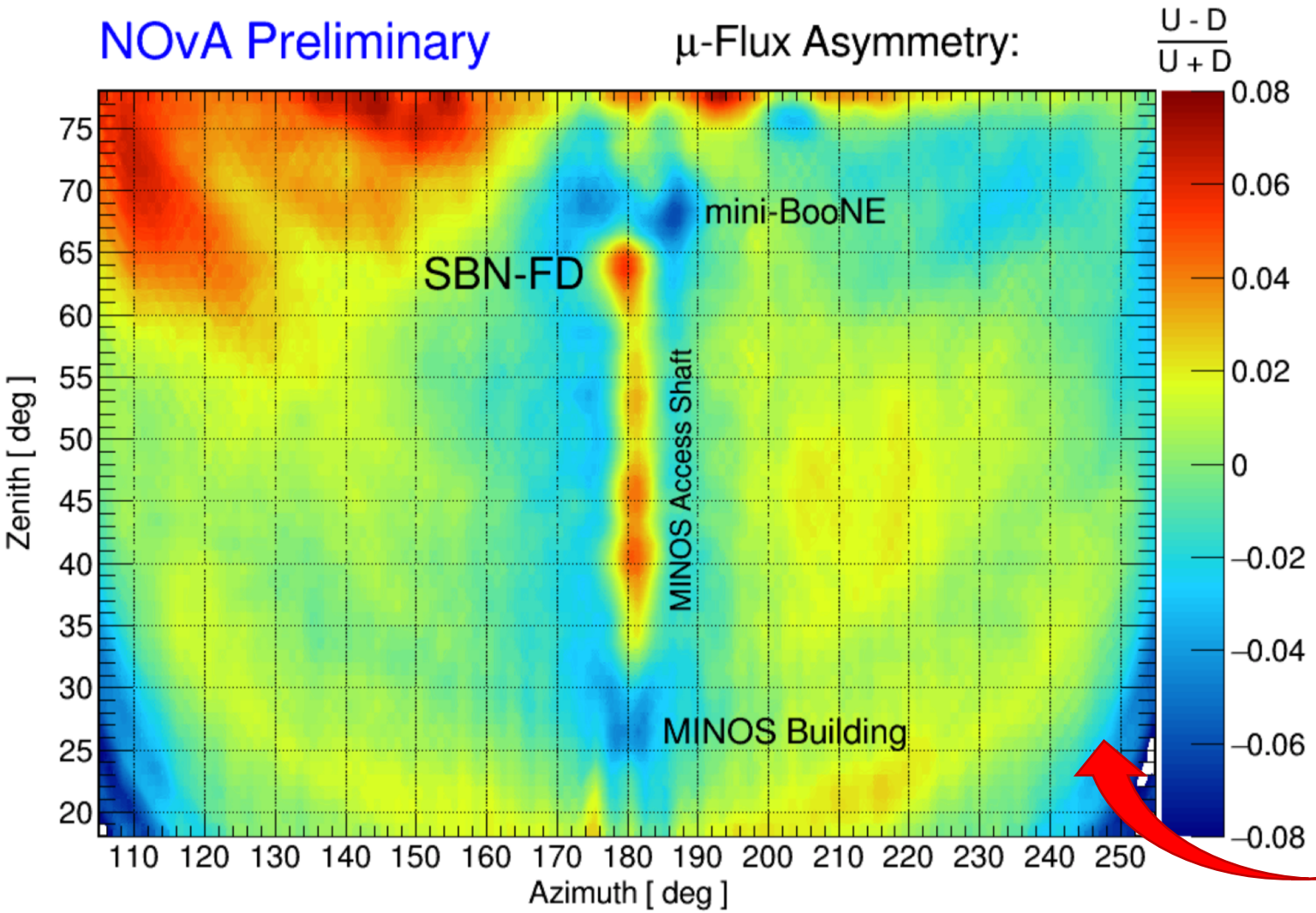
NOvA-ND acceptance is Forward-Backward (UpStream - DownStream) and Left-Right (L-R) symmetric: this allows one to subtract those corresponding μ-Flux angular regions, which have the same: Zenith angles (the same incomming *surface intensity* of the cosmic muons) and the same Attenuation ⇨ in the Flat-surface Approximation: e.g. (D−U) / (D+U) ratio

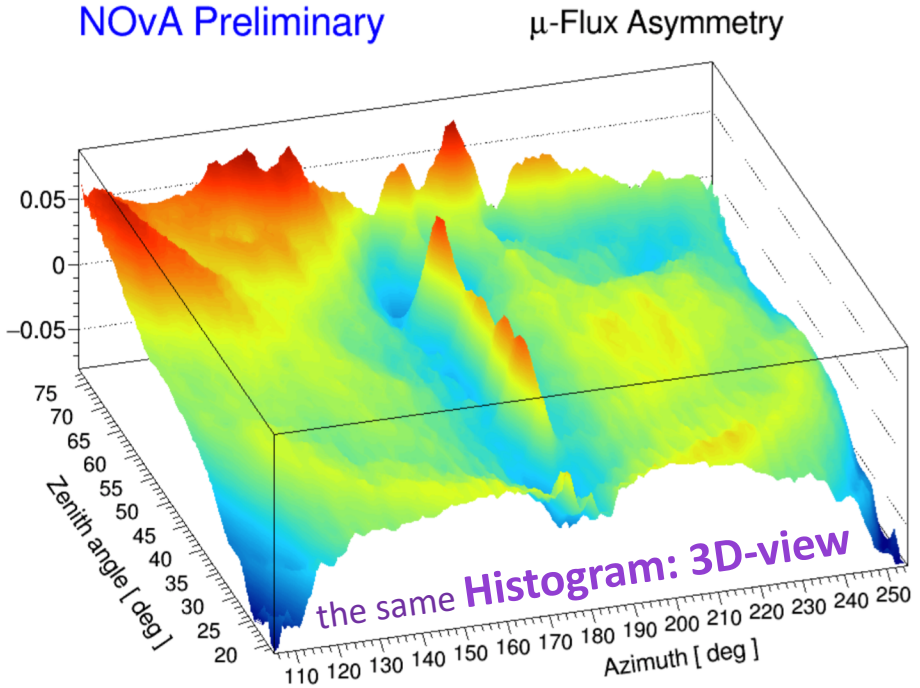
The overburden variations (non-flatness, excavation, buildings) should be visible as Bumps.



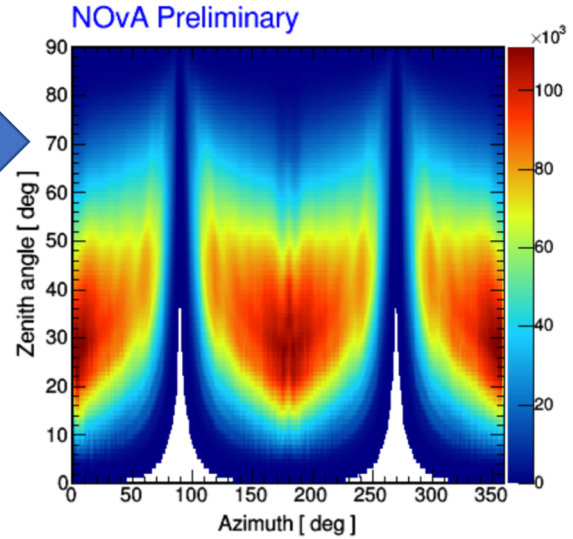
μ-Flux Differential Radiography (UpStream-DownStream)

Near Detector Cosmic Data: Apr. 2015 – Oct. 2016





Angular Muon Flux used to obtain the RADIOGRAPHY 2D-Distribution



Left-Right μ-Flux difference:

Obtained from NOνA-ND Cosmic Data: Apr. 2015 – Oct. 2016

- without **any Geant** (e.g. flat Overburden) **simulations**
- without Surface-level **(open-Sky)** muon-Flux **subtraction**

Using SYMMETRIES of: ND Acceptance, μ-Flux(θ,ϕ), Attenuation(θ,ϕ)