

**LABORATORI NAZIONALI DEL GRAN SASSO**

**SEMINAR ANNOUNCEMENT**

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***“Atmospheric Physics  
Underground: MINOS and  
Beyond”***

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*The Main Injector Neutrino Oscillation Search (MINOS) is a long baseline neutrino oscillation experiment with a neutrino source and Near Detector at Fermi National Accelerator Laboratory in Batavia, IL, and a Far Detector at the Soudan Underground Mine State Park in northern Minnesota. The Neutrinos at the Main Injector (NuMI) beamline has delivered over  $10^{21}$  Protons on Target and the detectors have accumulated hundreds of millions of cosmic ray muons since commissioning in 2005. The cosmic ray muons are subject to a seasonal modulation. Observed since the 1950's, the seasonal effect on underground muons is a well studied phenomenon. The interaction height of incident cosmic rays changes as the temperature of the atmosphere changes, which affects the production height of mesons. The seasonal effect is useful for both particle physics and meteorological studies. Recent techniques in exploiting this effect will be discussed, their application to the MINOS far detector data will be shown, and their utility for current and future detectors will be explored.*

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