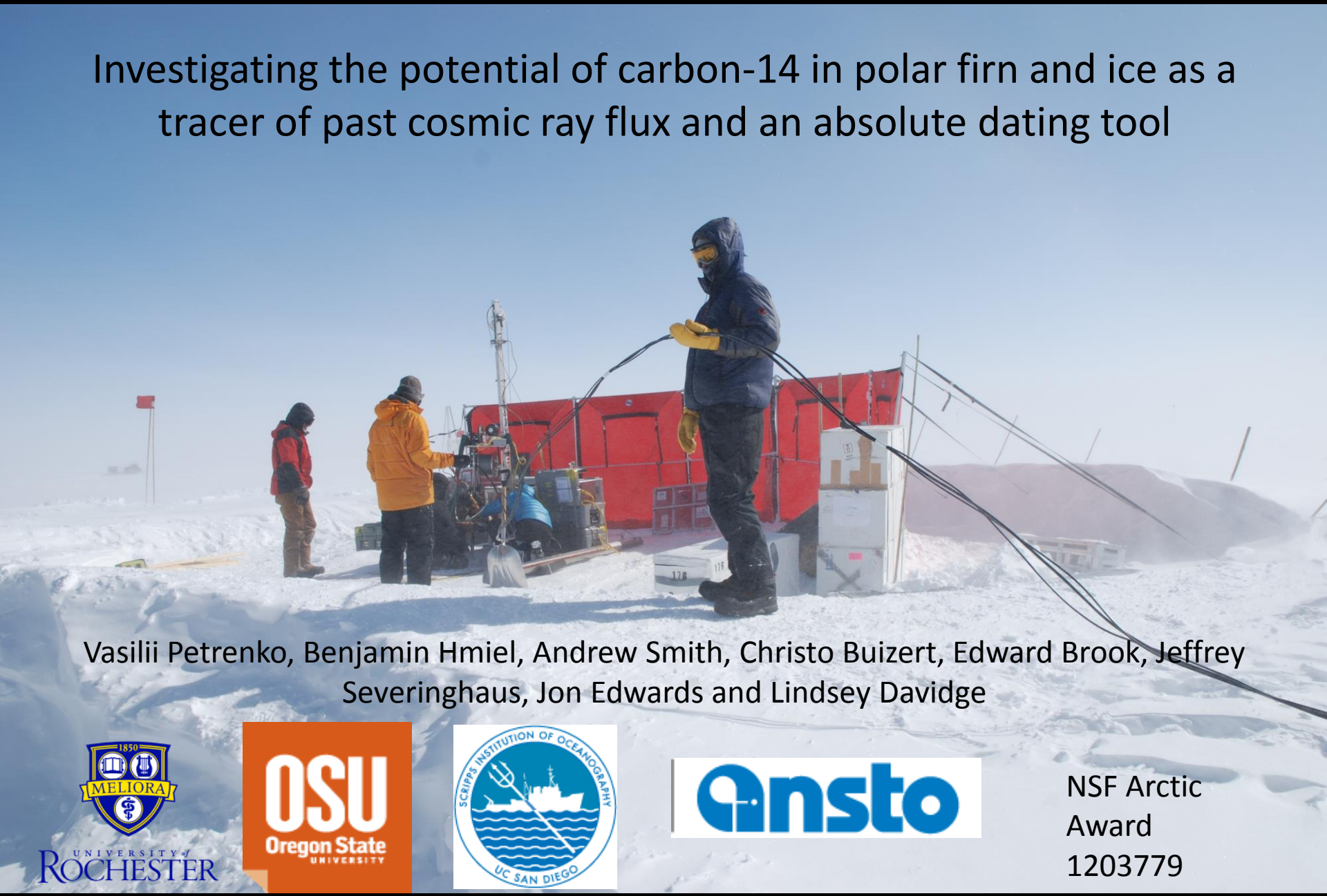
Investigating the potential of carbon-14 in polar firn and ice as a tracer of past cosmic ray flux and an absolute dating tool



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^{14}C IN GLACIAL ICE

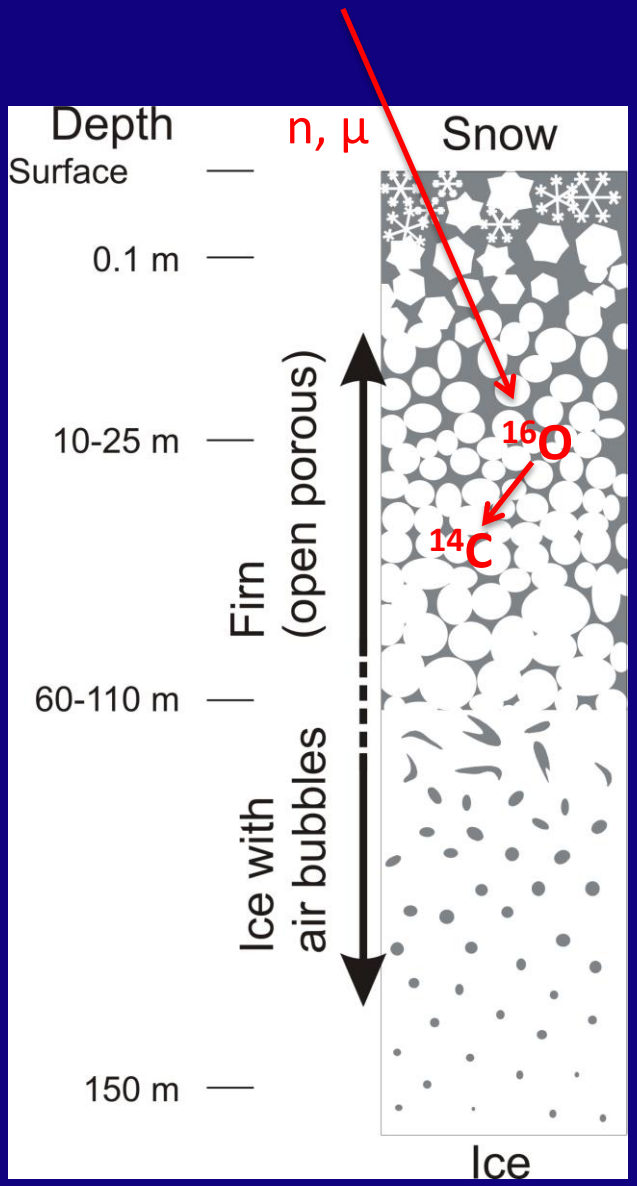

Figure: Center for Ice and Climate

Two main sources:

- trapped air (CO_2, CO, CH_4)
- In situ cosmogenic production

- Paleo-atmospheric component:
  - Fossil fraction of methane budget (clathrates, permafrost)
  - $\Delta^{14}C$ of CO_2 for absolute dating of glacial ice

- In-situ cosmogenic component:
  - Accumulation and ablation rates
  - Past cosmic ray flux
  - Past solar activity?

^{14}C IN GLACIAL ICE

Complication: the in situ cosmogenic and paleo-atmospheric components of ^{14}C are present in a combined form

Level of scientific understanding of in situ cosmogenic ^{14}C in ice is low:

- Production rates
- Retention / loss in the firn
- Partitioning between different phases: $^{14}CO_2$, ^{14}CO and $^{14}CH_4$

Work aims to improve understanding of in situ cosmogenic ^{14}C:

- Characterizing entire firn column
  - Air space
  - Ice matrix
- Greatly improved methodology
  - Larger sample sizes
  - On-site extraction