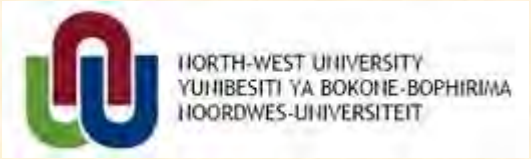
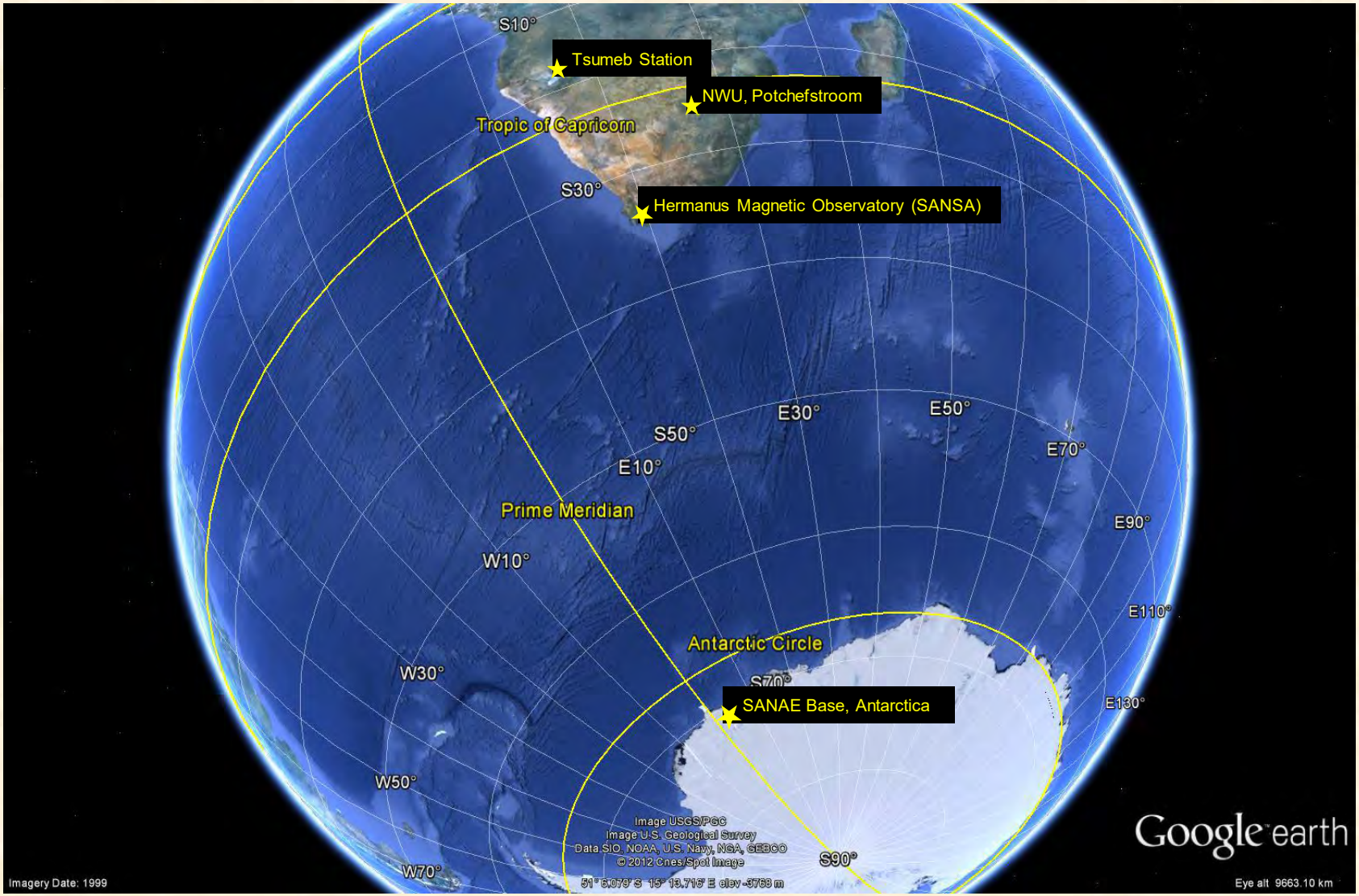
Neutron monitors

Helena Krüger
Harm Moraal
Anne Mans
Gert Benadé
Godfrey Mosotho

School of Physics/Centre for Space Research
North-West University
Potchefstroom Campus



Neutron Monitors: NWU Network

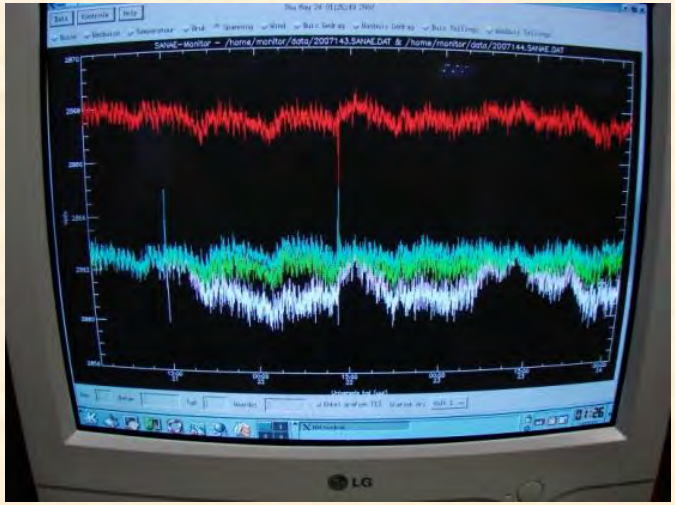


Tsumeb Geophysical Station, Namibia

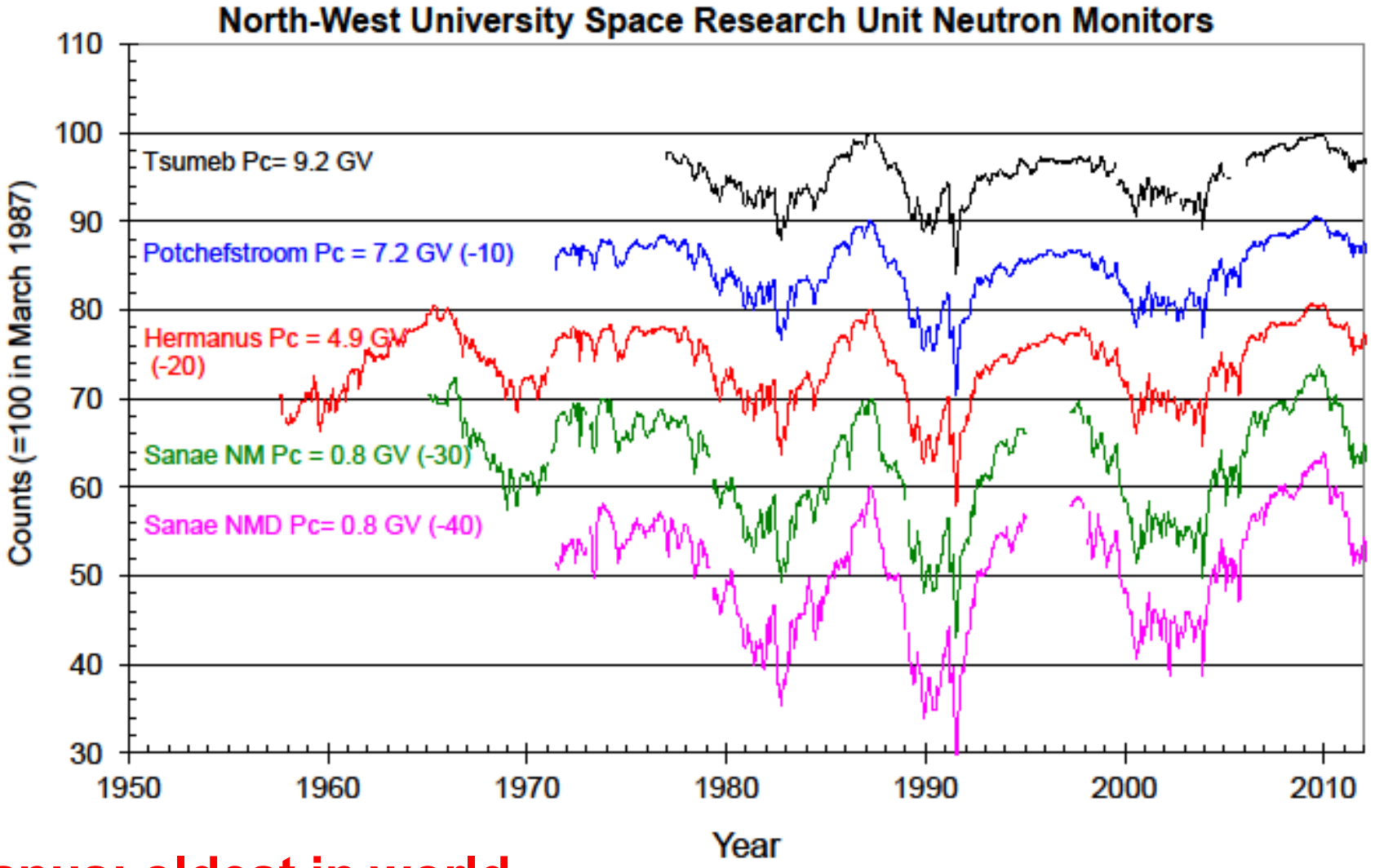
Space Physics,
North-West University, Potchefstroom

South African National Space Agency, Hermanus

SANAE Base, ANTARCTICA



Bigger variations at the Poles



rmanus: oldest in world

n future: to remain the longest and most stable baseline in worl

Mini neutron monitors

Polarstern

Poster
Gert
Benadé

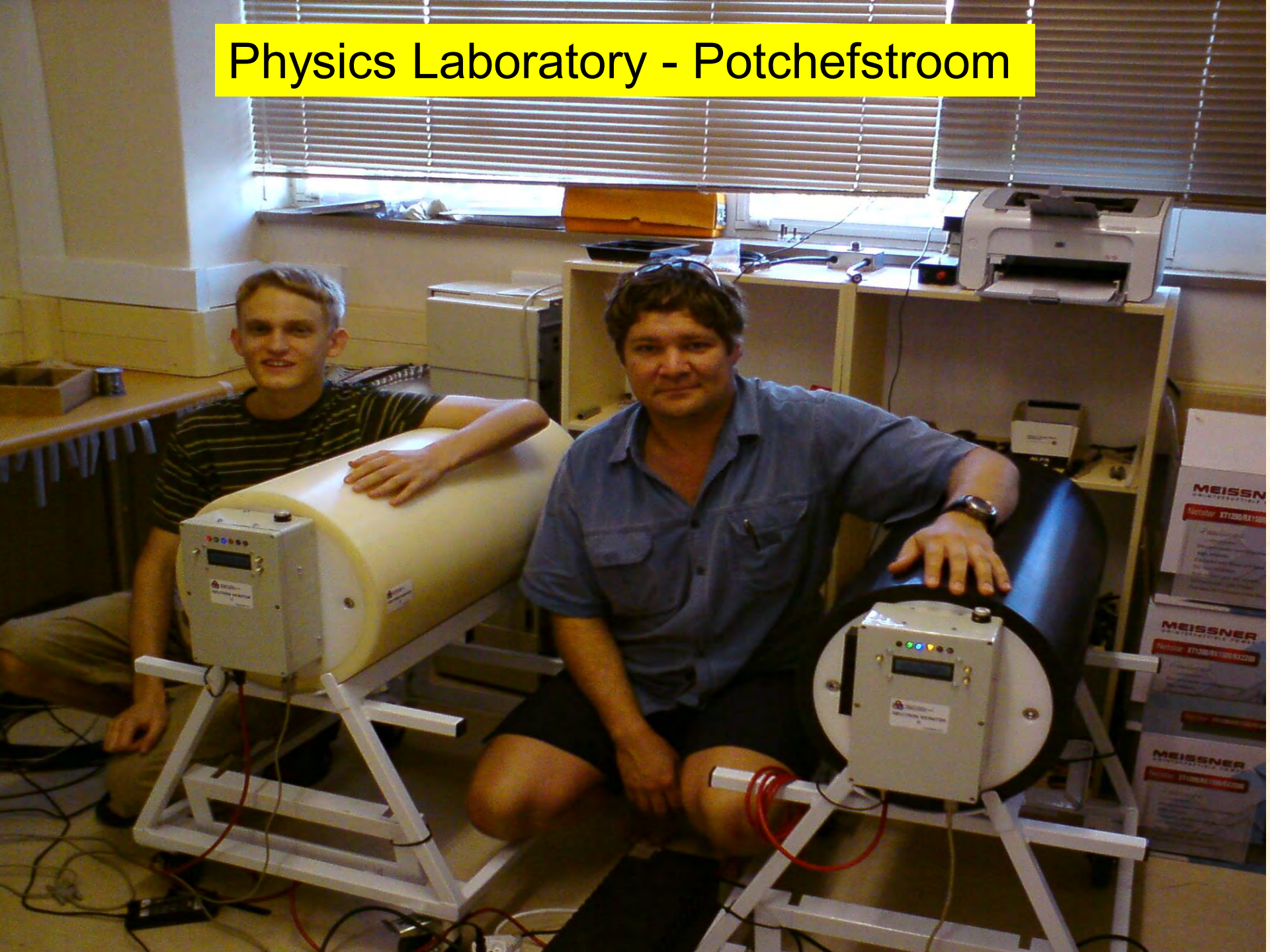
Calibration Monitor – 2001/2002

- A mobile calibration monitor was designed and built in 2001/2002.
- Design requirement:

  Fully transportable as a unit
- Weight = 400 kg
- Mobile calibration platform for fixed NMs worldwide.
- Several trips on U.S. Coast Guard ships: latitude surveys.
- Internal Hard Disk Drive with extra removable HDD as back-up device.

New Mini Neutron Monitors – 2011

- New mini NMs need to be:
  - Small – Easily shipped
  - Lightweight – No bulky electronics
  - Fairly inexpensive
  - Solid state reliability – No moving parts, utilizes flash memory, dedicated microcontrollers
  - User friendly interface – Easy to get understandable data
  - Data is stored on user-removable flash drive
  - Solid state electronics
  - Semi-autonomous instrument; it only need power and network connectivity


Physics Laboratory - Potchefstroom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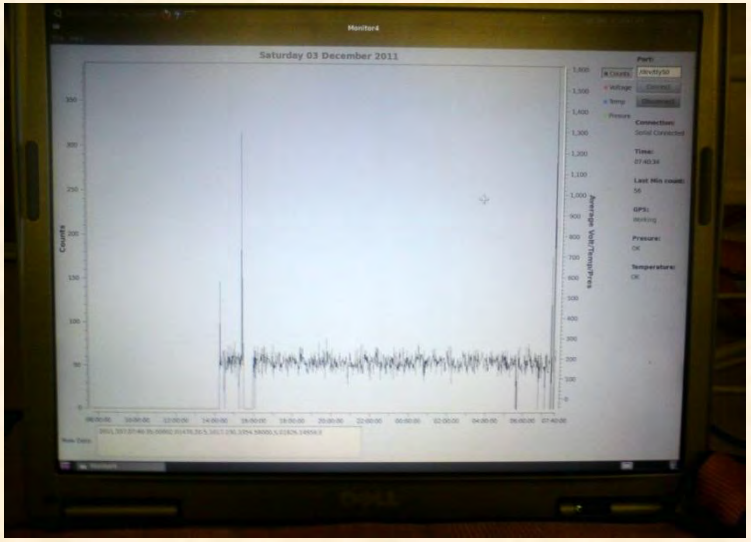
NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
NEUTRON MONITOR
4
NOVEMBER 2011

Polarstern, December 2011



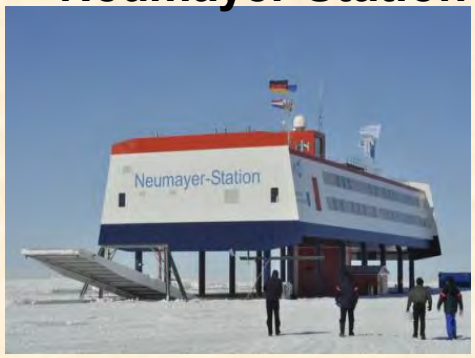
Mini Neutron Monitor – Recent projects

2011: Two mini NMs for Neumayer, Antarctica, and German research vessel, Polarstern

2012/2013: Upgrading the 2011 Mini NMs

2014: Delivered a mini NM to Mexico
Delivery of two mini NMs to Dome C, Antarctica

Neumayer Station



Dome C
3200m

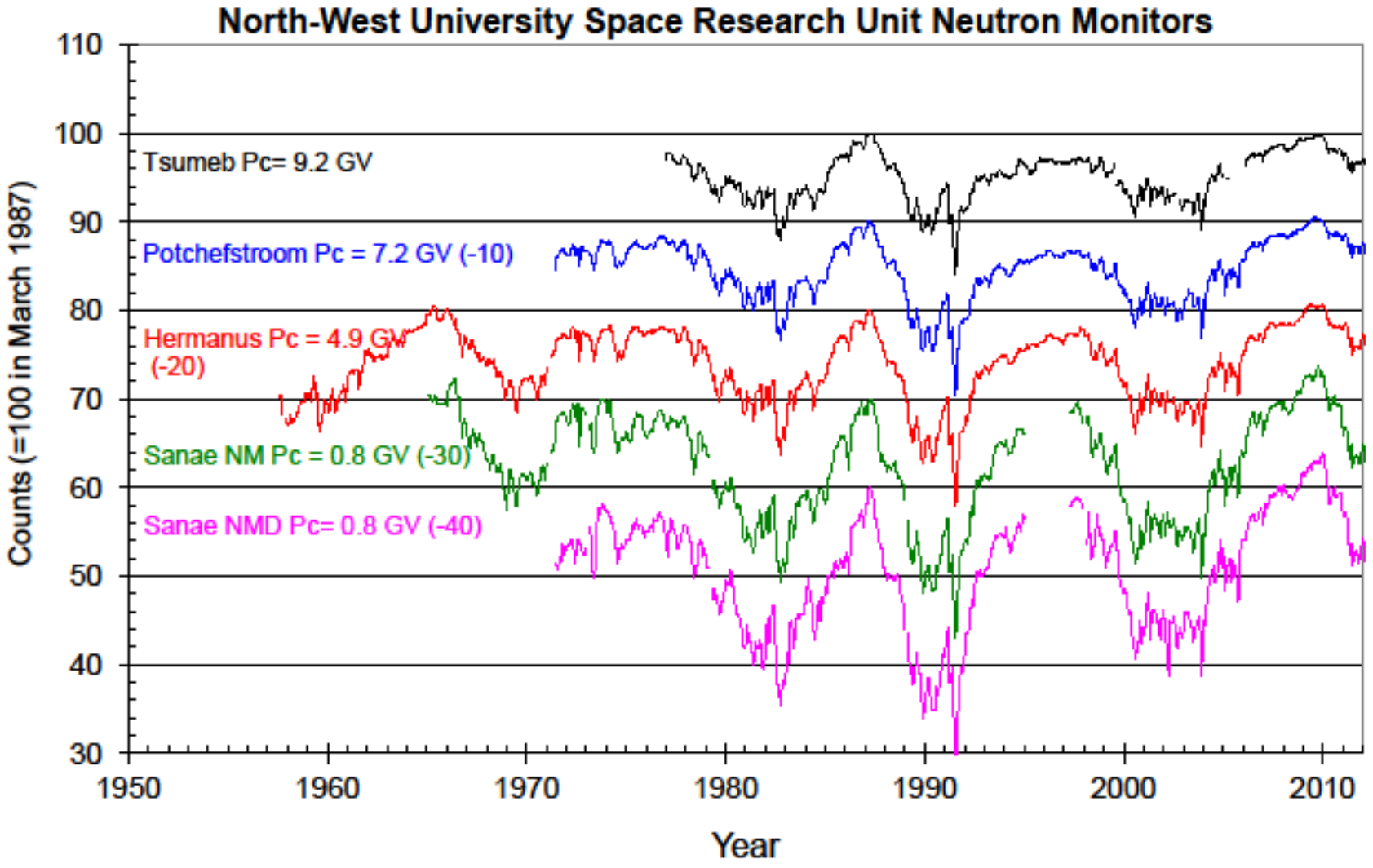
Mini Neutron Monitor - The Future

2014: Continued development and integration of system for long term upgrade of NWU NM Network.

Possible sites for new mini NMs:

1. Mount Denali (or Mt McKinley) in Alaska
2. Sulphur Mountain, Canada
3. Climax, Colorado, USA
4. Mount Washington, New Hampshire, USA.
5. Thailand - Princess Sirindhorn Neutron Monitor at Doi Inthanon
6. Several high-altitude unpowered sites on the Greenland and Antarctic plateaus

Bigger variations at the Poles

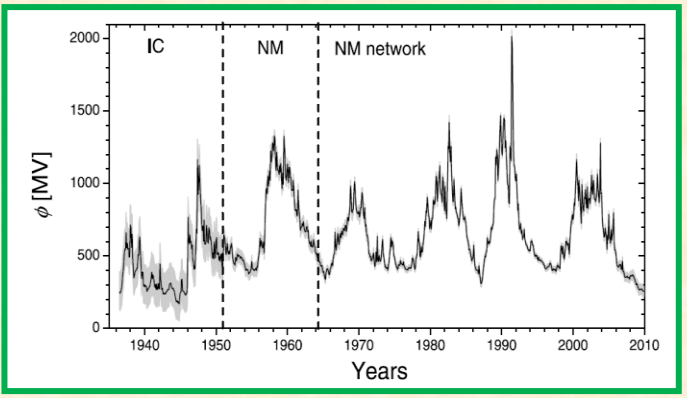


Rigidity P = energy/charge

Academic (theory)
Poster MG Mosotho

- Cosmic rays in the heliosphere experience so-called modulation.
- The modulation processes are described by a transport equation, which can be solved with simple analytical methods, or numerically.

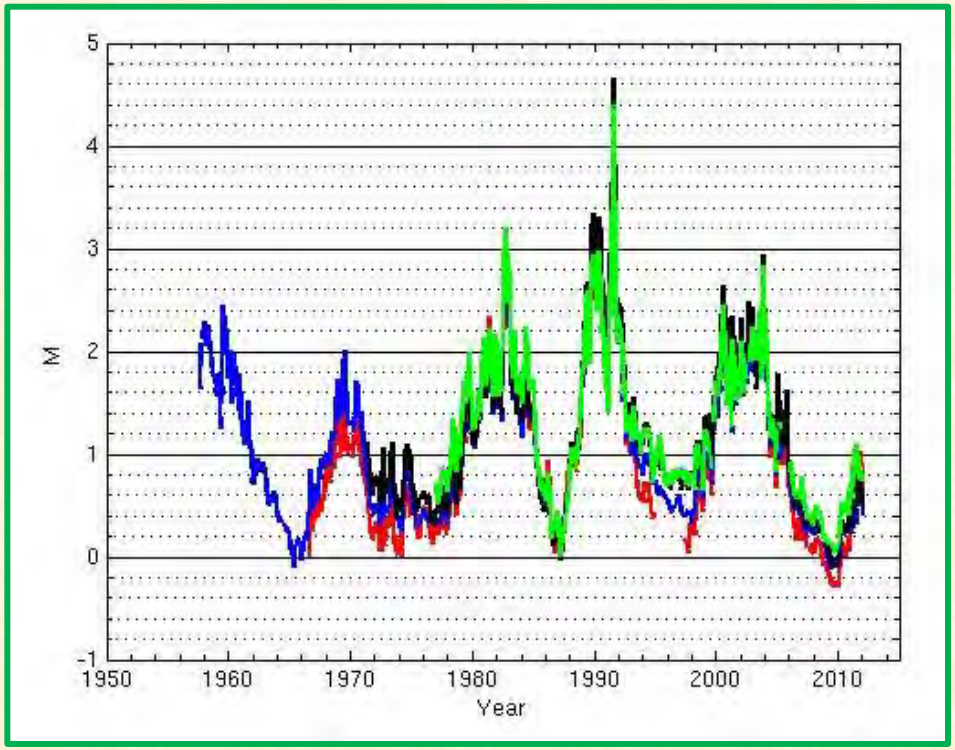
Usoskin et al. (2011)



Results

1. **Usoskin et al. (2011) : $\Delta\phi$ = 1.8 GV**
2. **Our work:**
   - **Convection-diffusion: $\Delta\phi$ = 1.54 GV**
   - **Force-field: $\Delta\phi$ = 1.50 GV**

Convection-diffusion



Force-field