Italian-American Research Collaboration

Amundsen-Scott Station

December 2002 – January 2003

The MOF at South Pole

LIGO-G040562-00-R

A collaboration between

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  - Phd Wolfgang Finsterle
  - Allister Knox
  - Cinthya Gebienk

- **University of Roma "La Sapientia"**
  - Prof. **Alessandro Cacciani**
  - Paolo Rapex
  - Vincenzo Di Martino
  - Berenice Subrizi

Experiment Objectives

- *Seismically map the sound speed of the sun's lower atmosphere using high-frequency sound waves*
- *Improve the models for the sun's atmosphere*
- *Space Weather : early warning to explosive phenomena (flares, CME, …)*

Experiment Description

The velocity and intensity signals are detected at two different heights in the solar atmosphere

(two Magneto-Optical Filters tuned to the solar K and Na absorption lines)

The instrument has been given the name

M O T H

Magneto Optical filters at Two Heights

Experiment Description

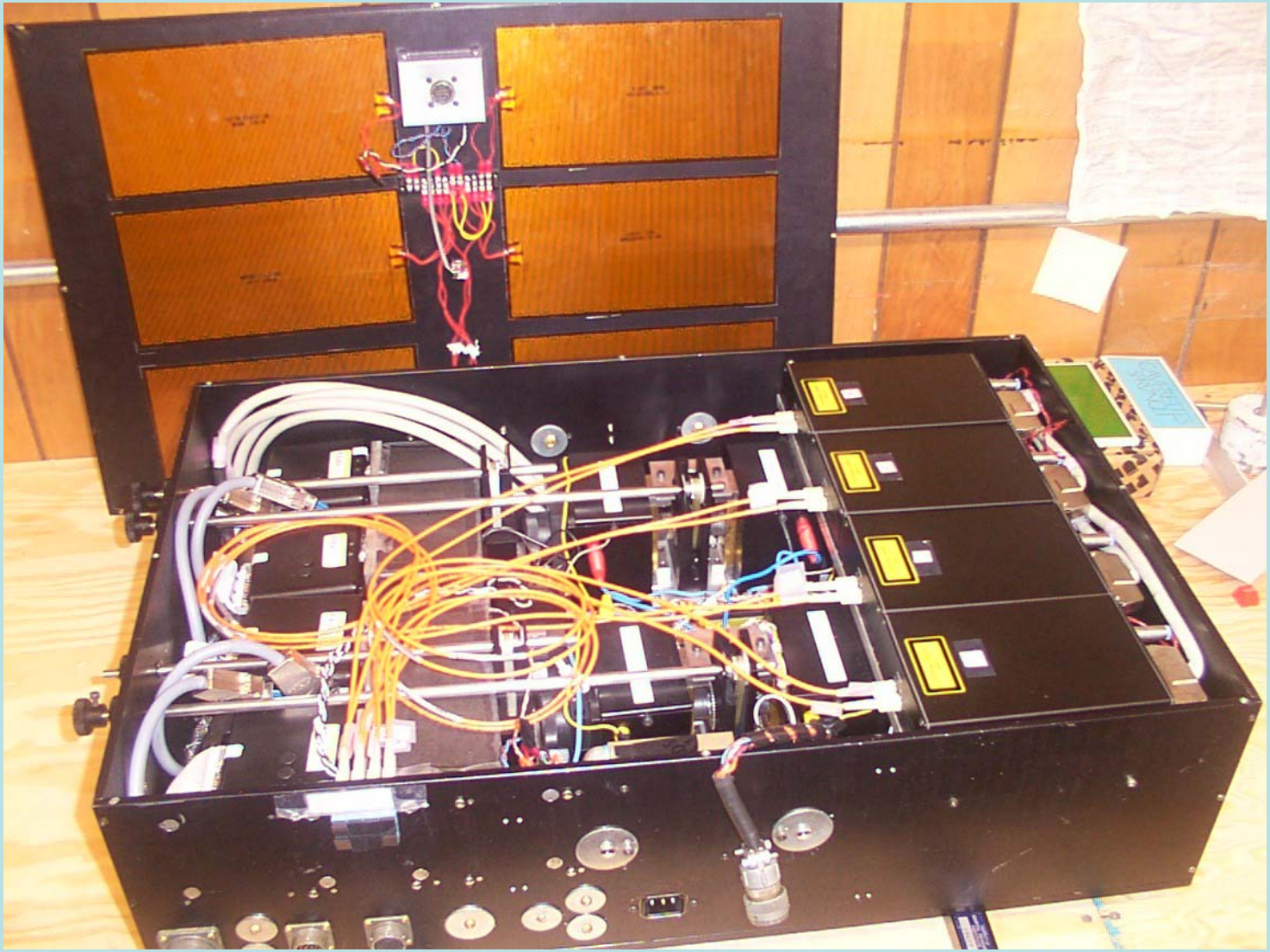
- 2 MOFs tuned to the K (7699 A –D1) and Na (5890 A – D2) lines
- Acquisition of separate and simultaneous images in the Red and Blue flanks of the above absorption lines
- 2 compact Telescopes (48 mm diam)
- 4 x 12-bit digital Cameras, running at 16 frames/s
- 10 s integration time for each recorded 16 bit image
- 1 TeraByte Raid Hard Disk recording System

South Pole Remote site

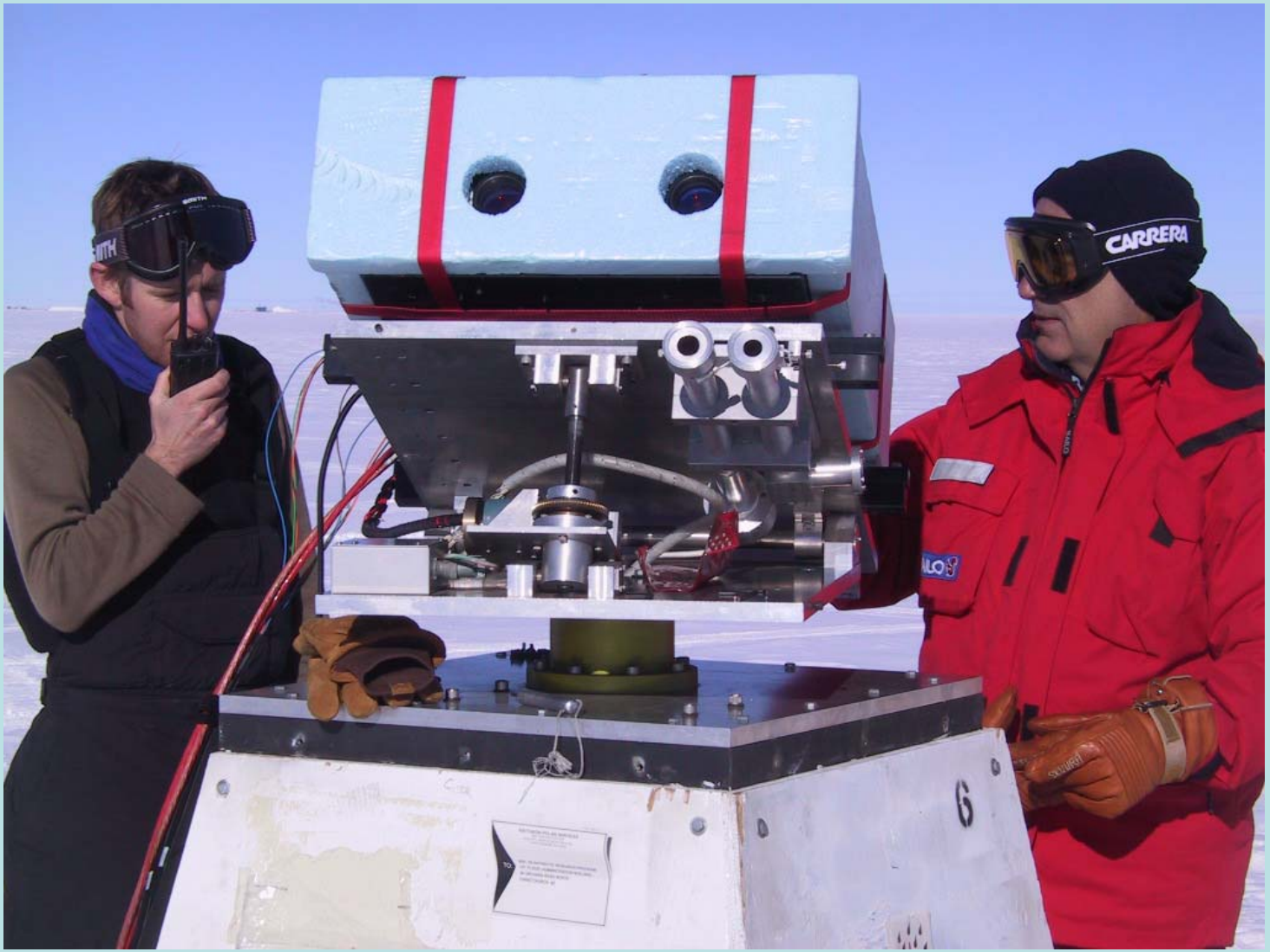
External Instrument Positioning

The buried Control Room

The MOTH

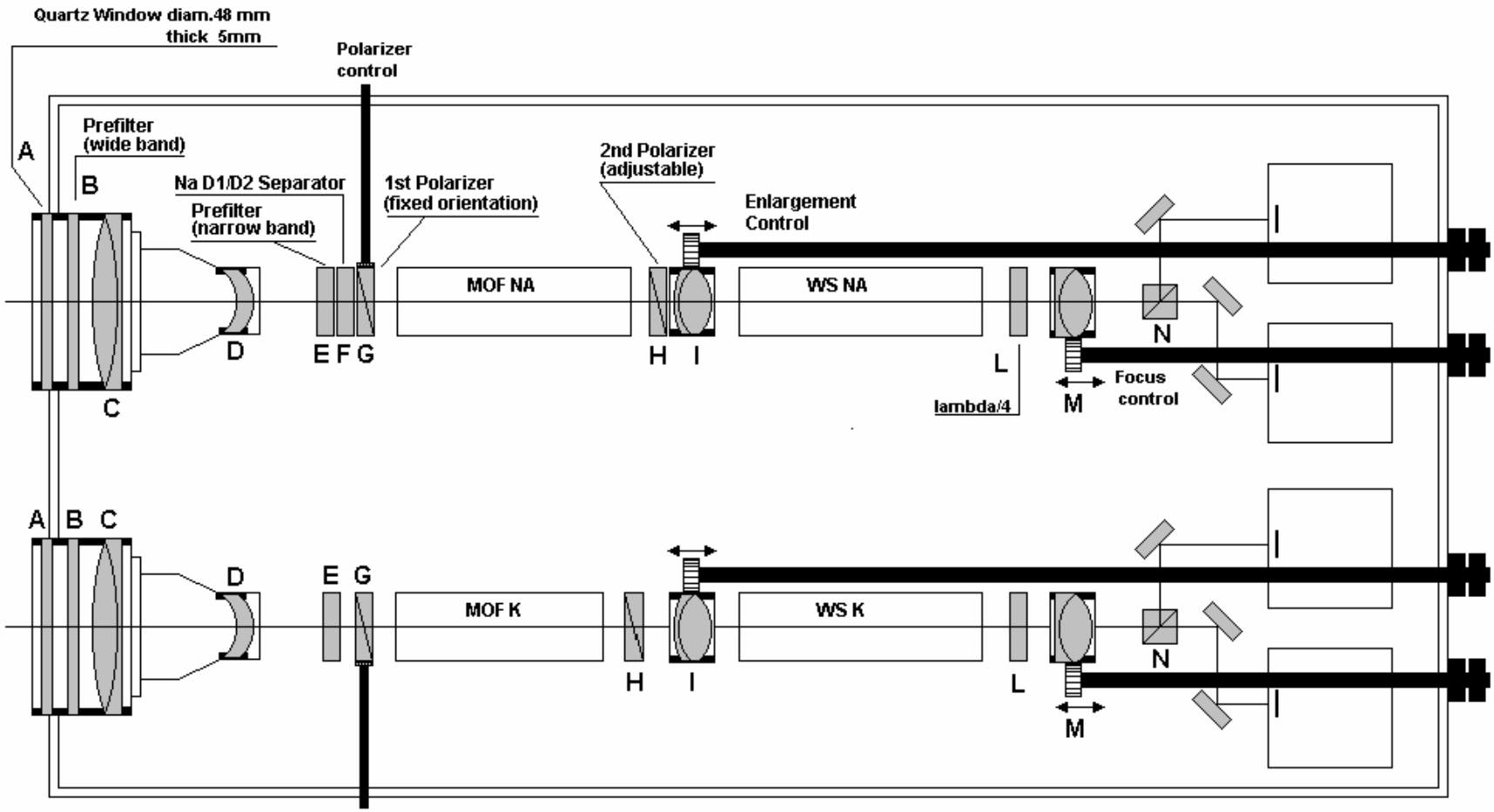


Aligning and Focusing

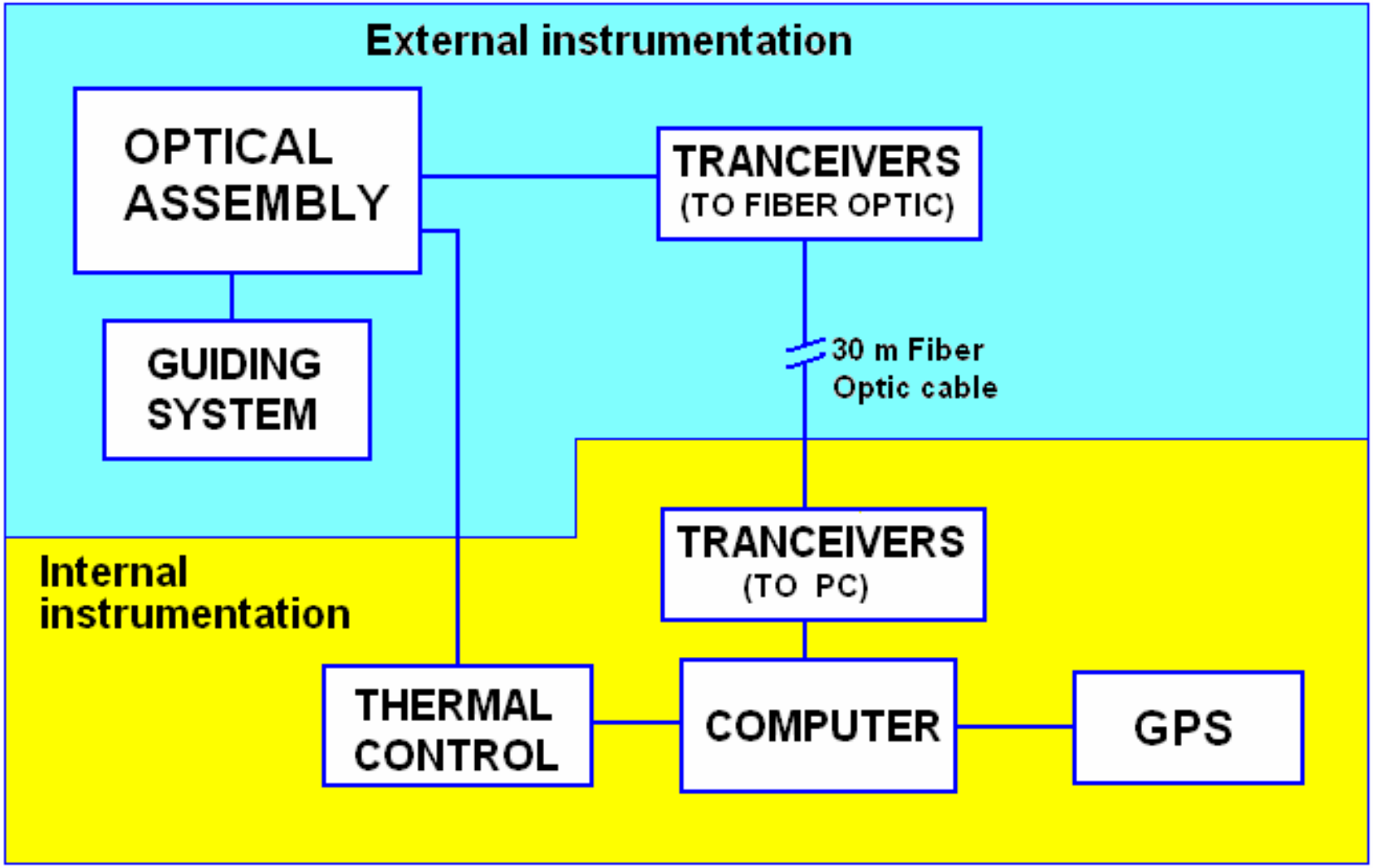


Hunting the Sun …

The MOTH 's Optical Layout

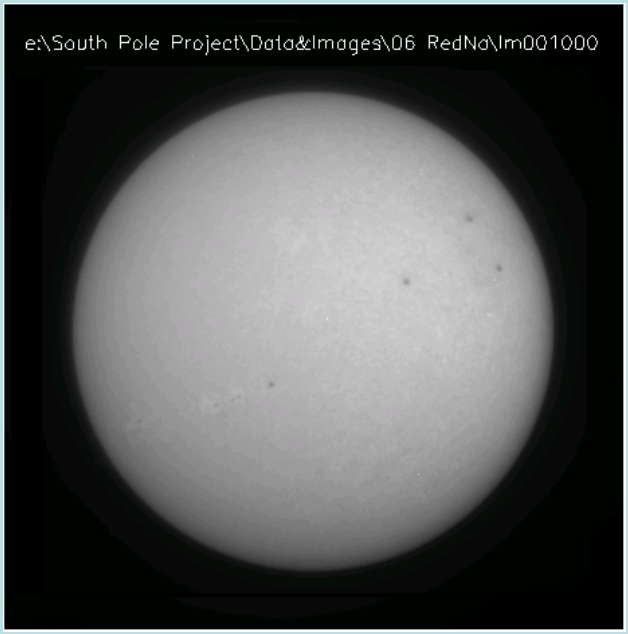


The System Layout

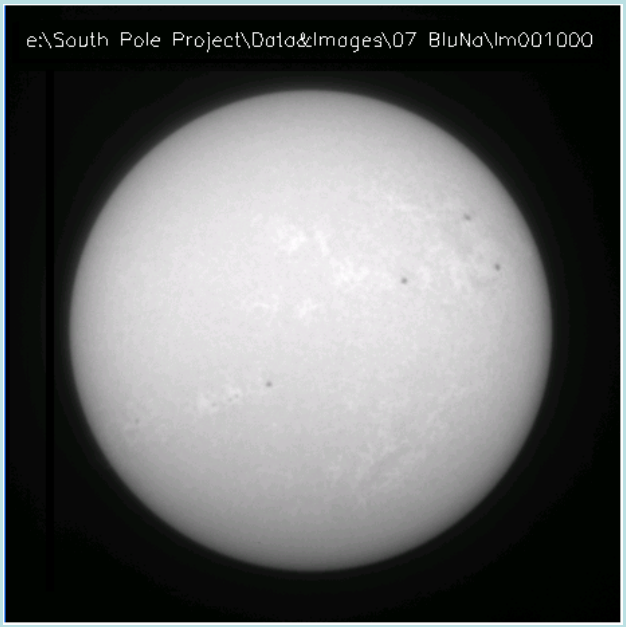


First results

Sodium



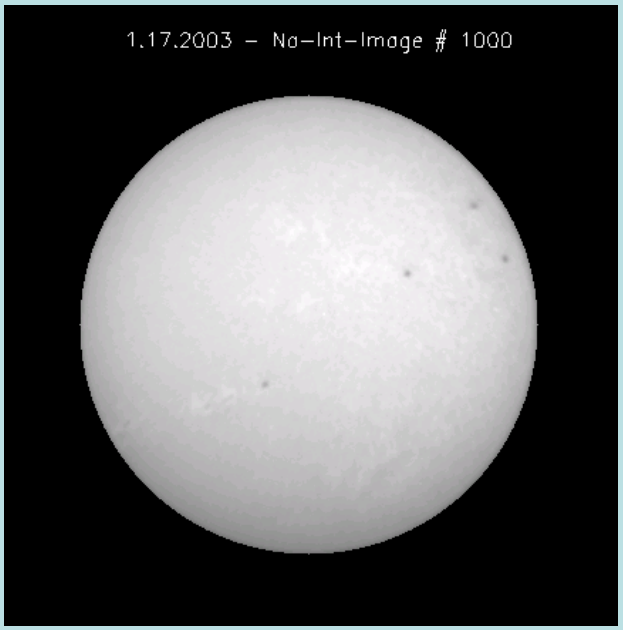
Red

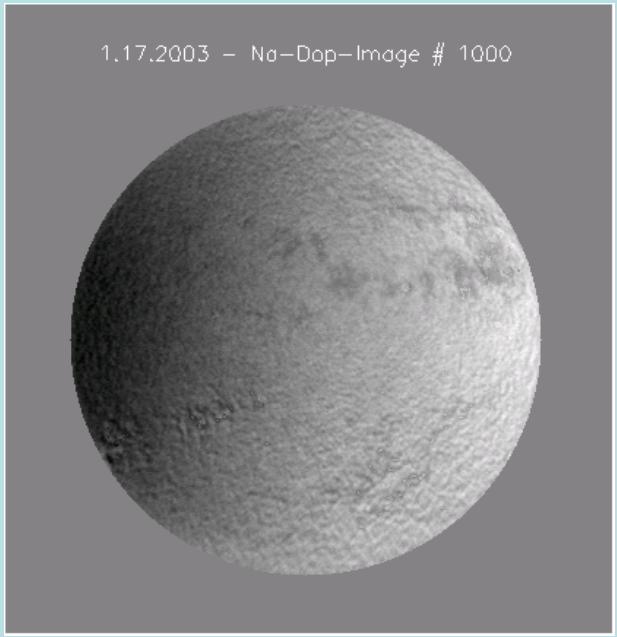


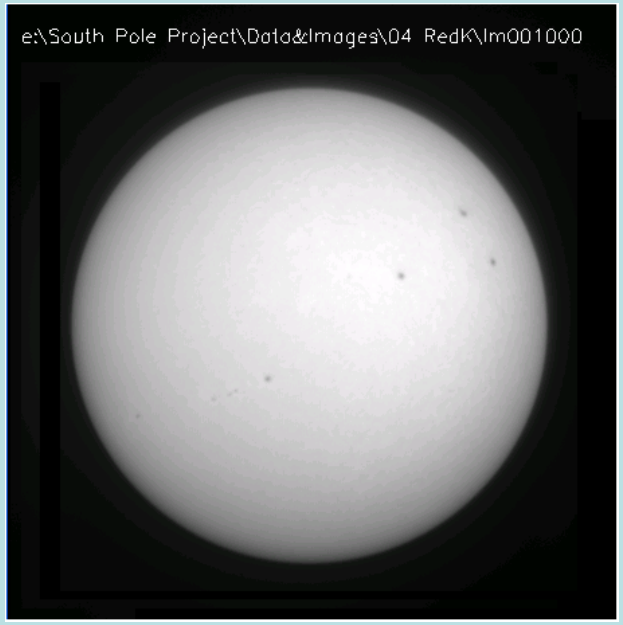
Blu

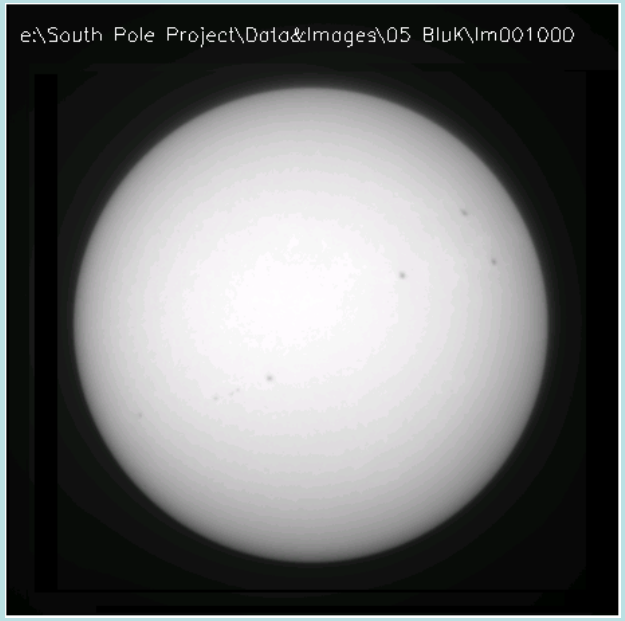
$$Red + Blu$$

$$\frac{Red - Blu}{Red + Blu}$$









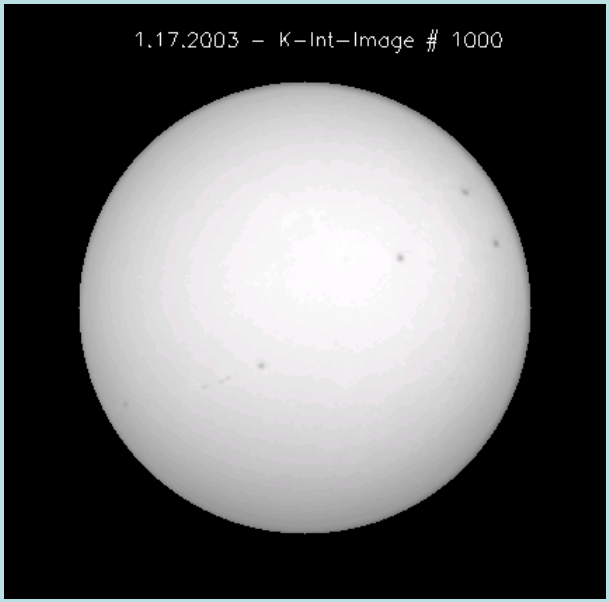
Potassium

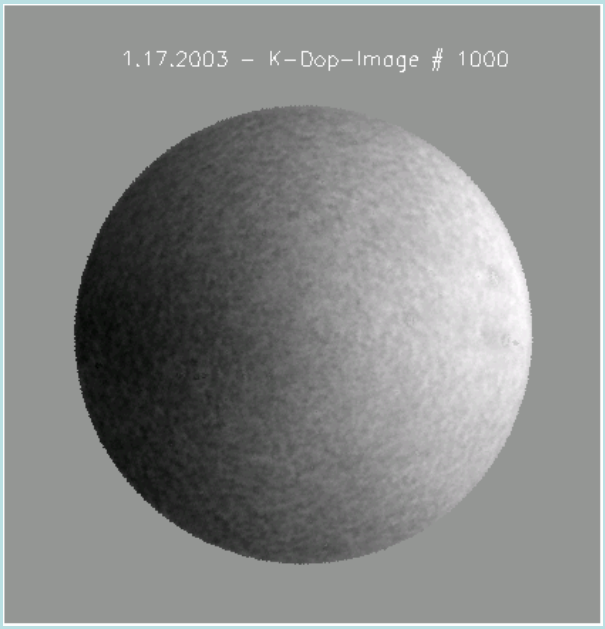
Red

Blu

Red + Blu

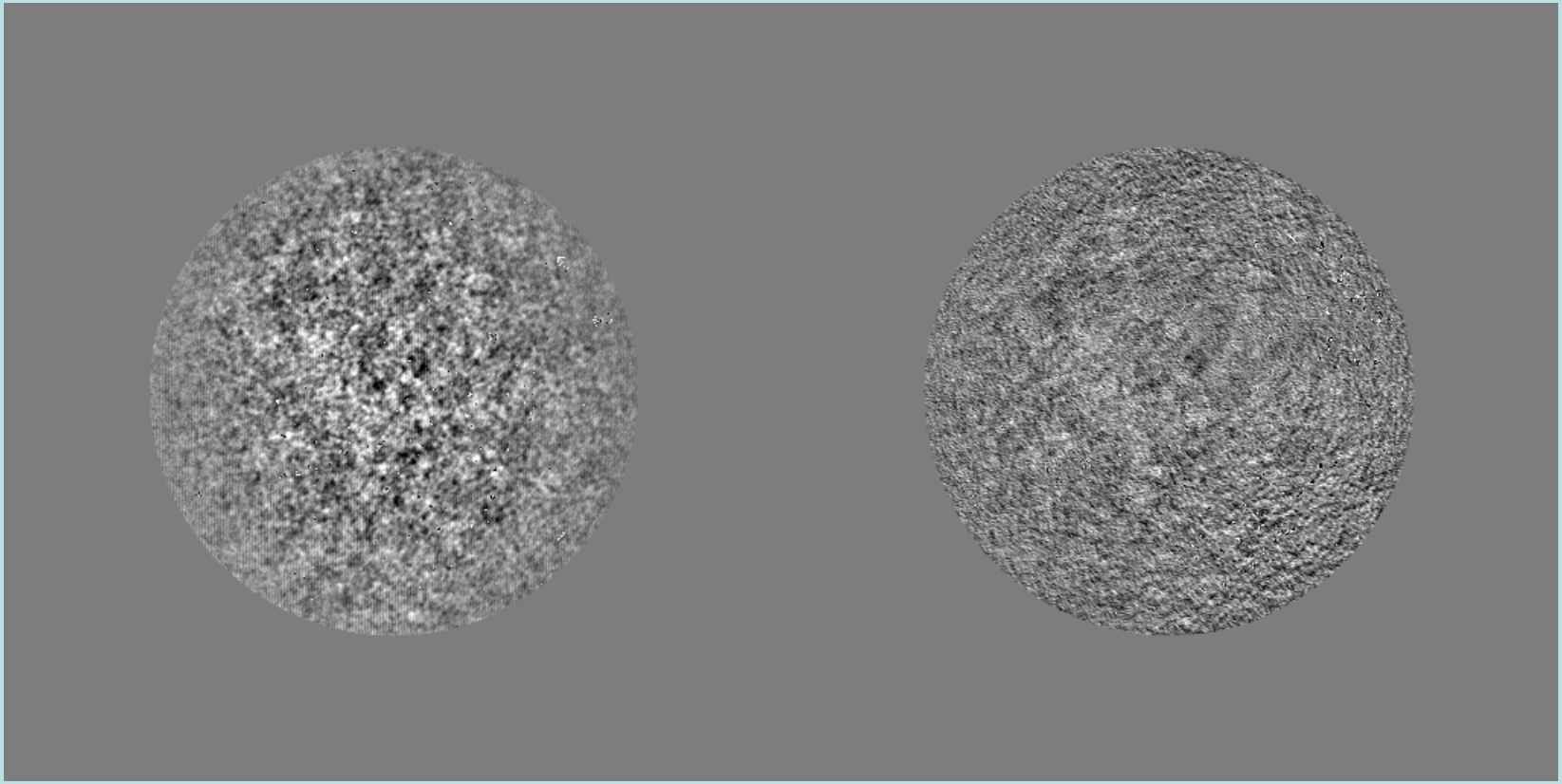
$$\frac{Red - Blu}{Red + Blu}$$



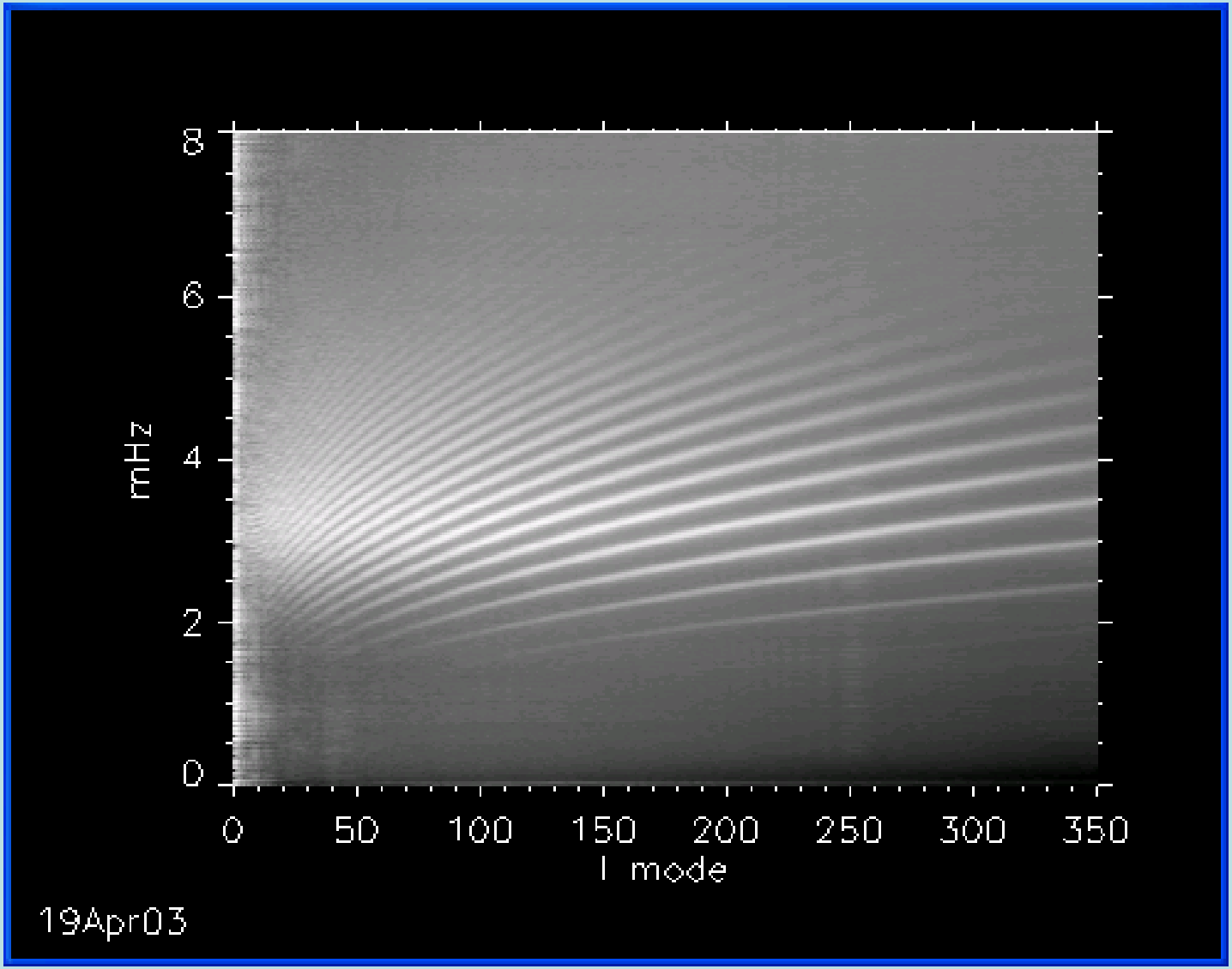


Potassium *Sodium (D2)*

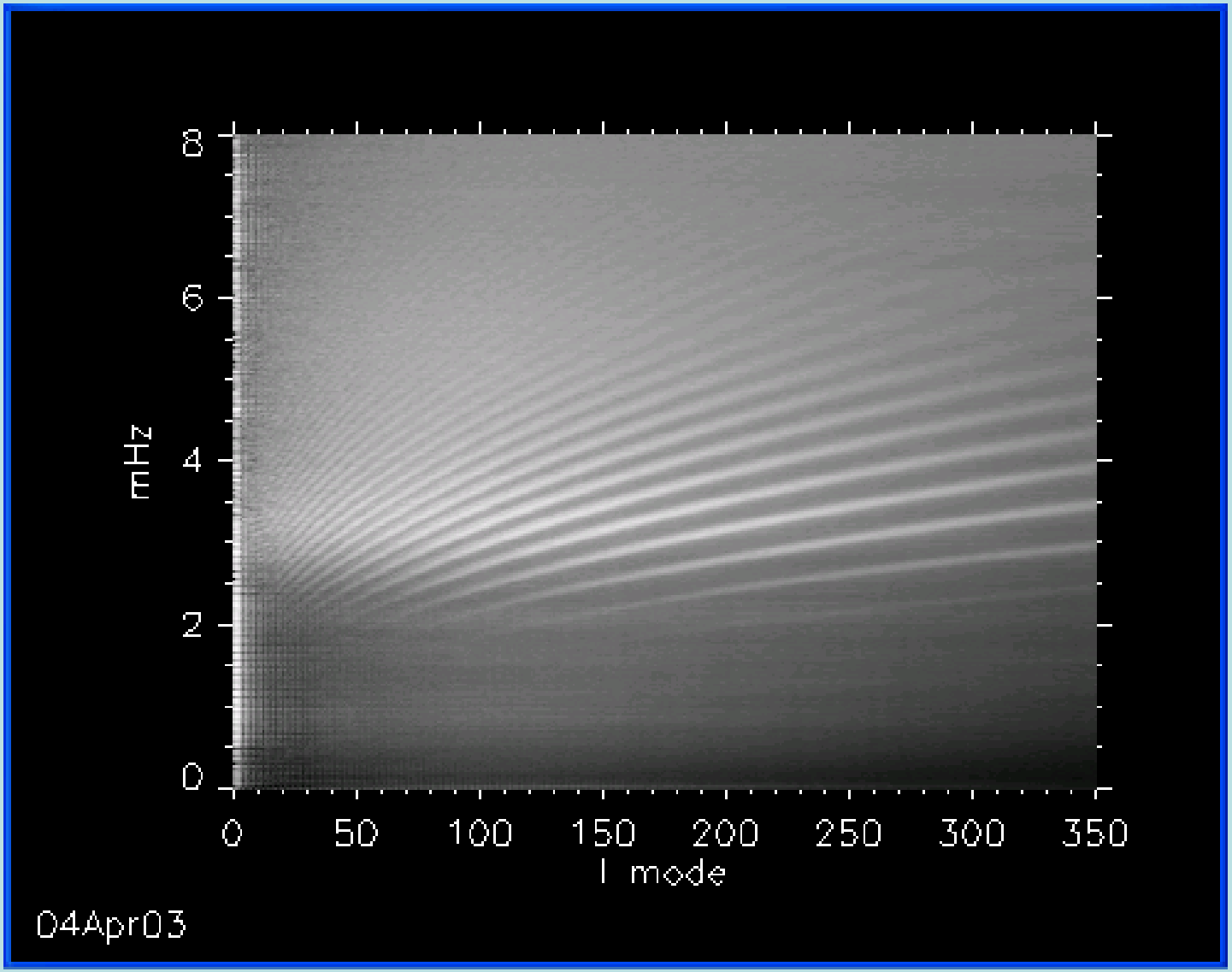
Velocity Signals



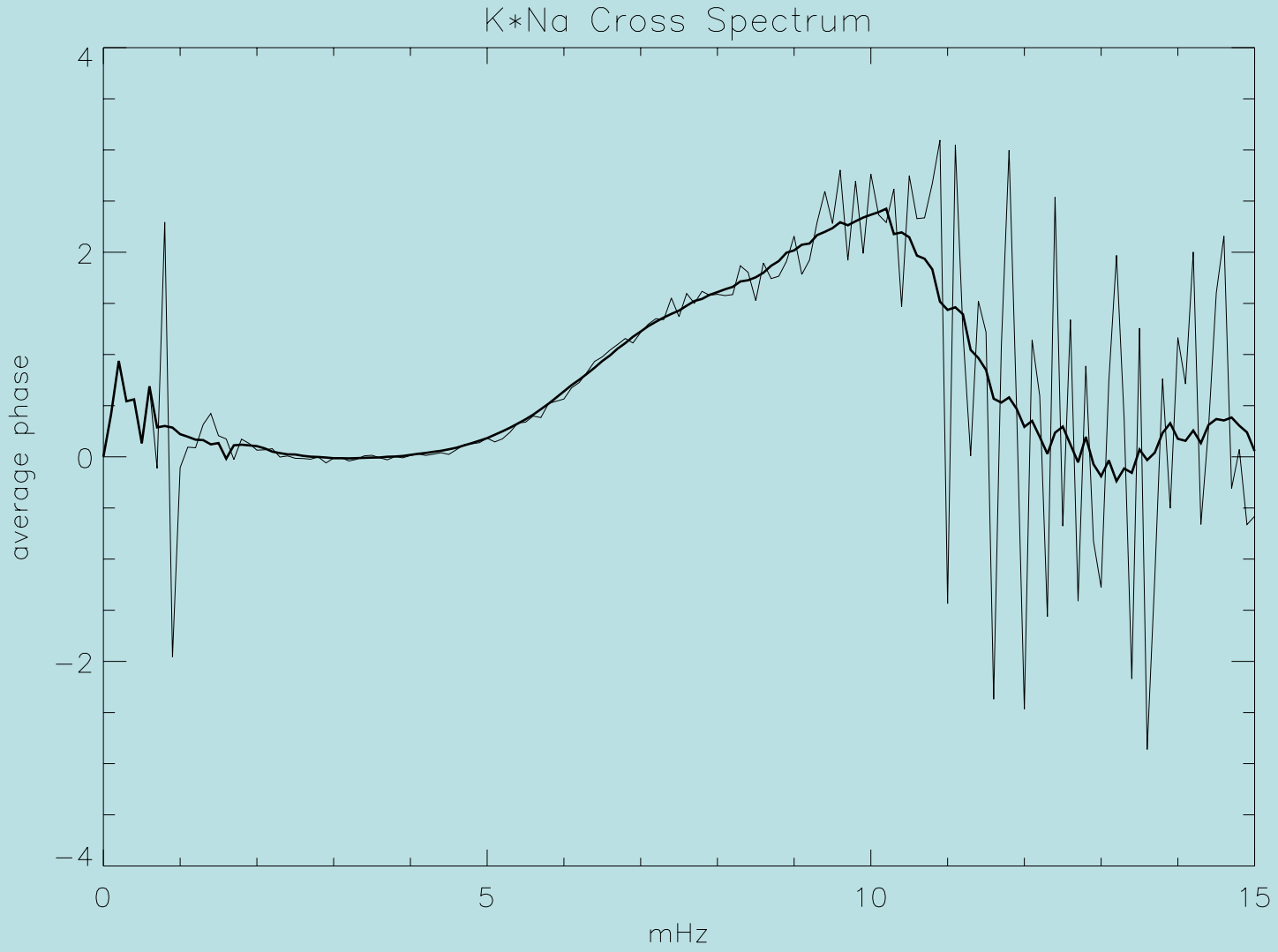
Potassium Log Power Spectrum - m corrected



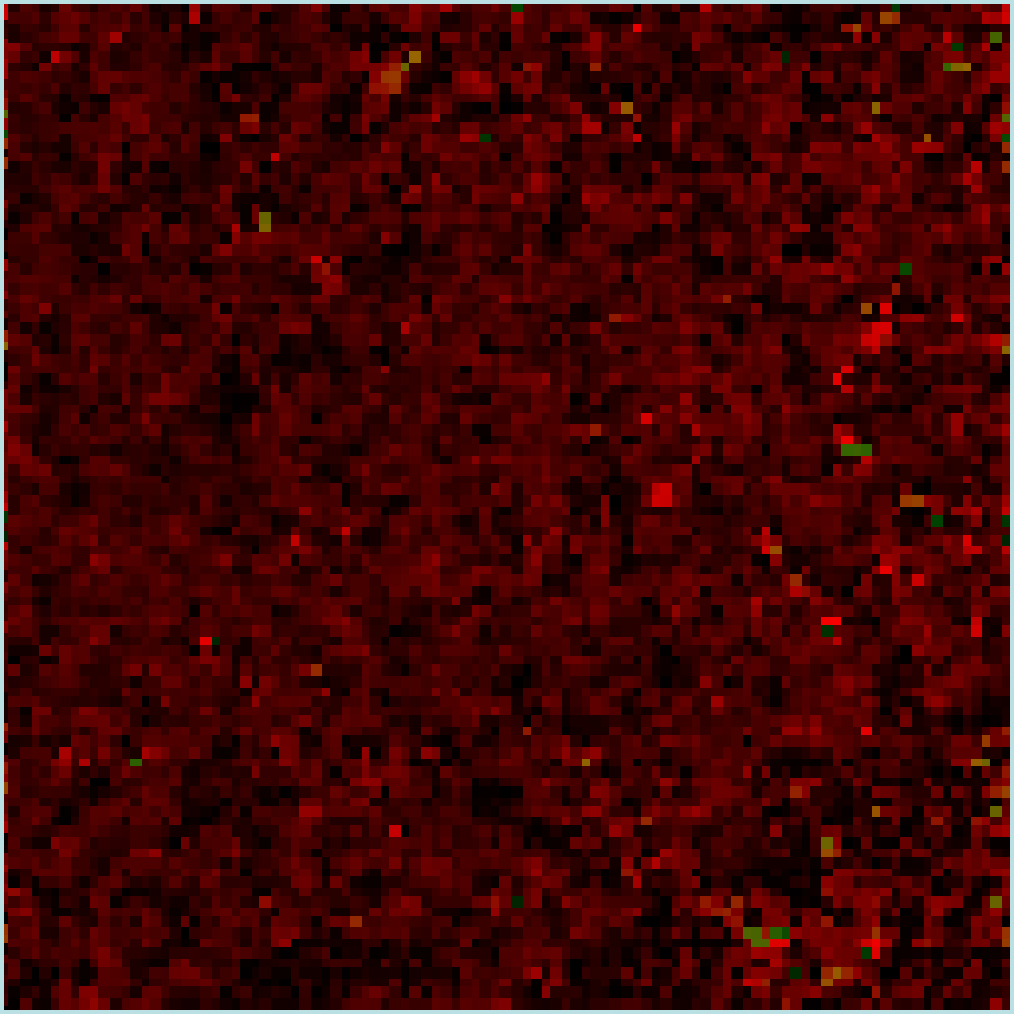
Sodium Log Power Spectrum - m corrected



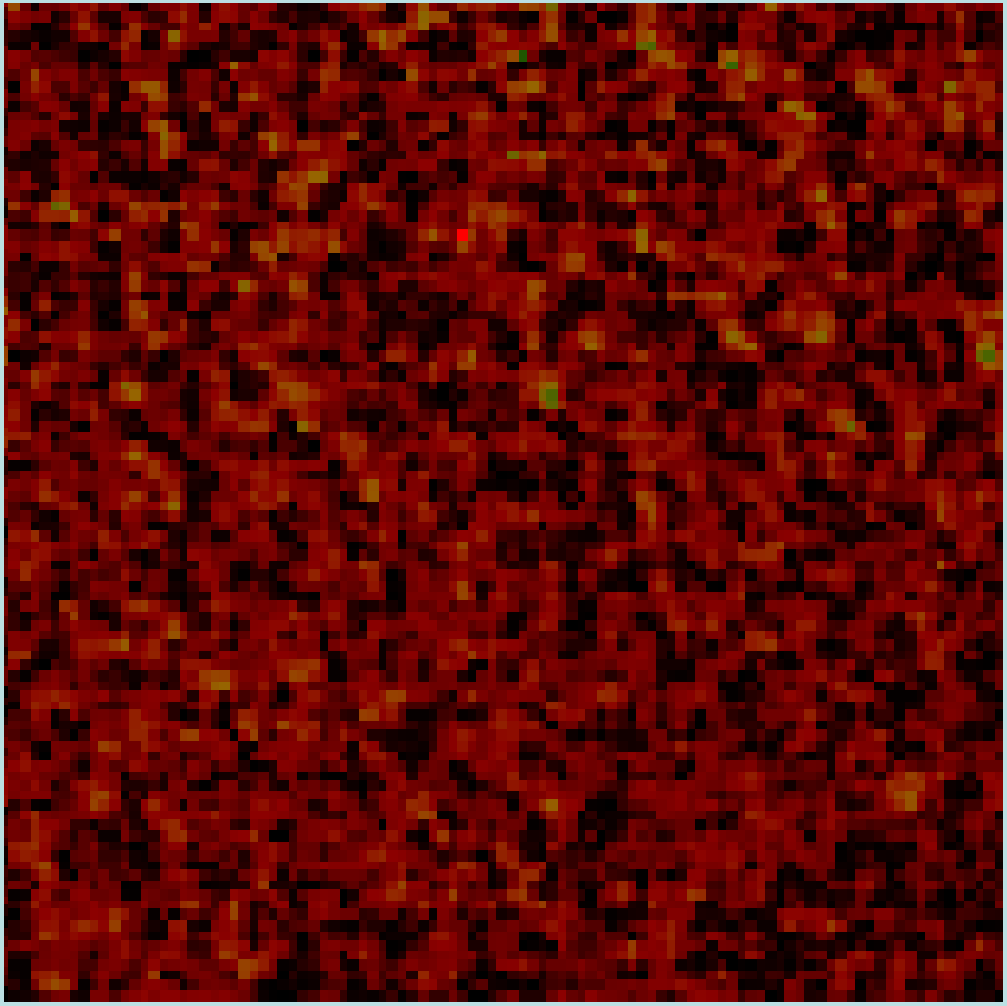
Na-K average Cross Spectrum



Time Lag Map @ 7 mHz (average: 27 seconds)



Time Lag Map @ 3 mHz (average: 0 seconds)



Acknowledgements

- *NSF (National Science Foundation)*

- *Enea PNRA (Progetto Nazionale Ricerche Antartide)*