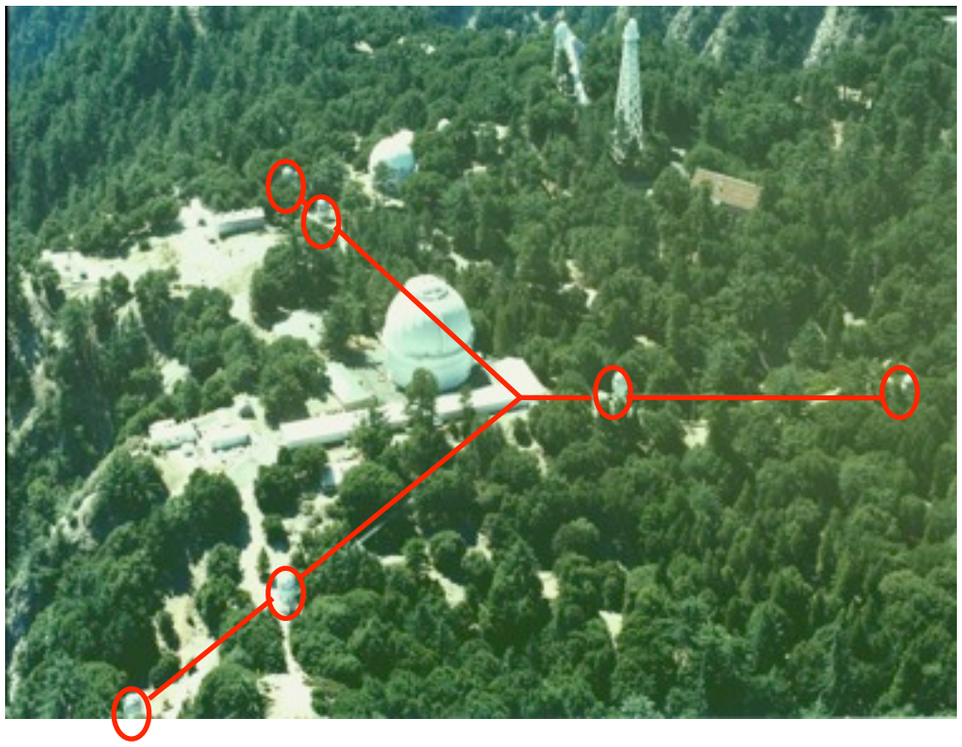
FLUOR instrumentation

V. Coudé du Foresto

l'Observatoire de Paris | LESIA

Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique

The CHARA interferometer

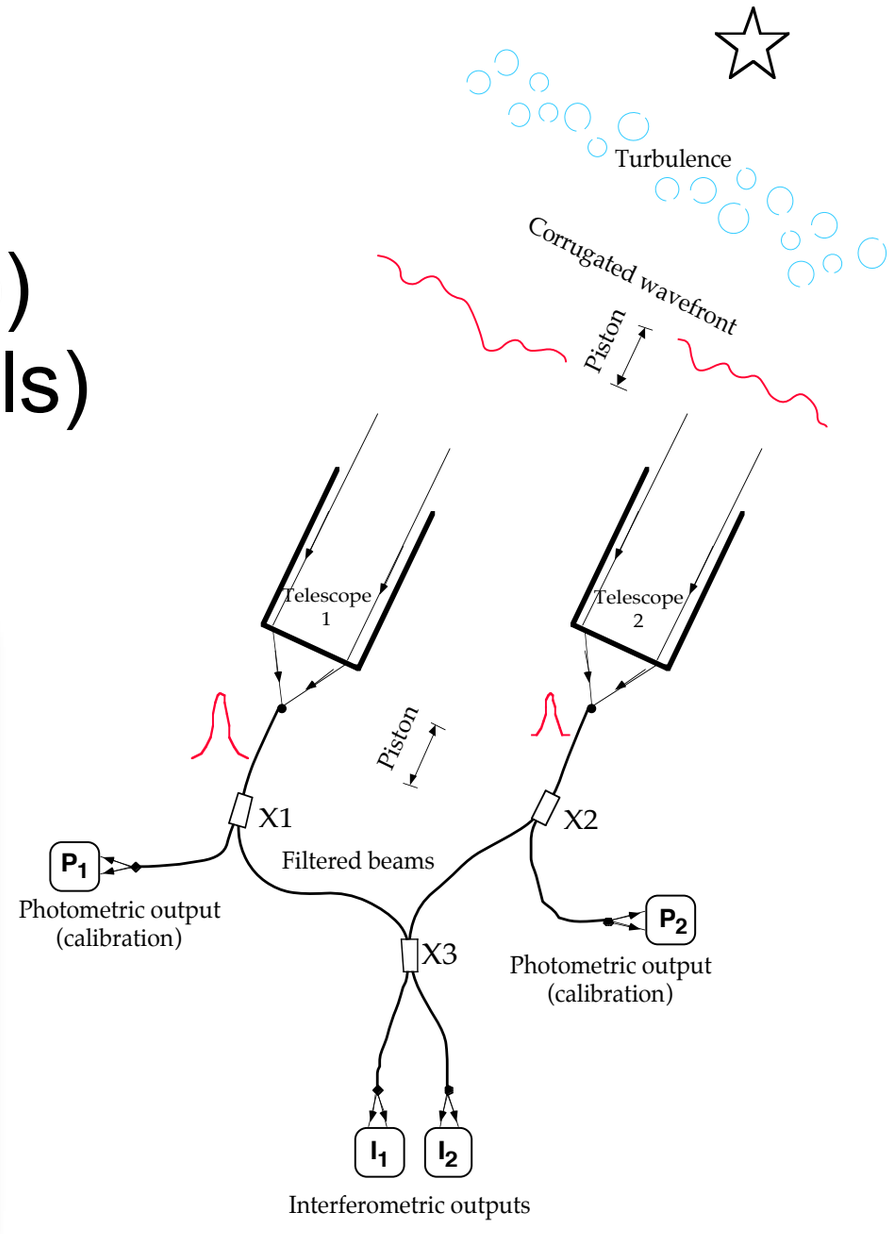


- 6 x 1m telescopes @ Mt Wilson
- Baselines 38 – 330m
- Collaboration under GSU
- 5 instruments:
  - FLUOR (LESIA)
  - Classic & PAVO (GSU)
  - MIRC (U. Michigan)
  - VEGA (Obs. Côte d'Azur)

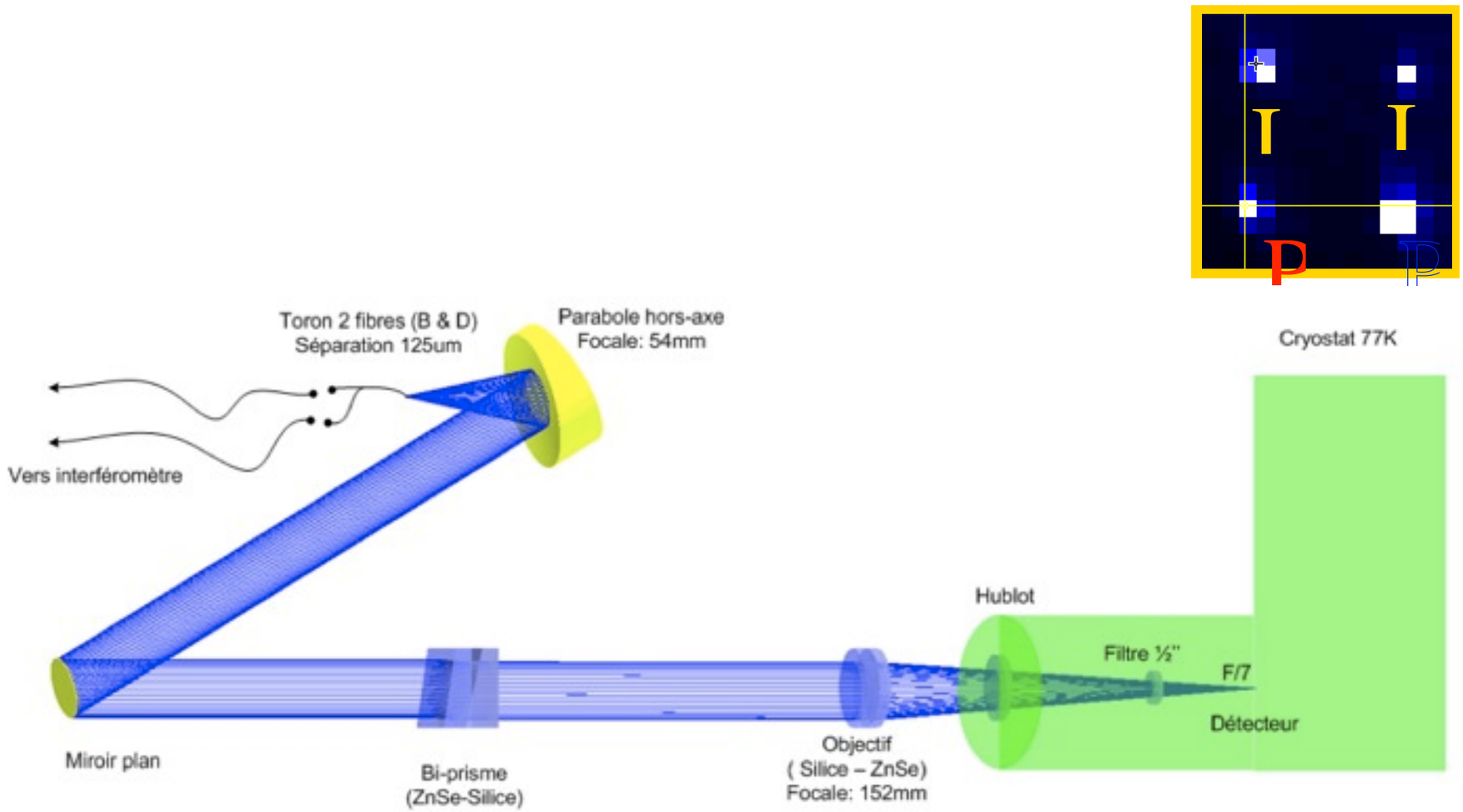
- The niche of CHARA/FLUOR :
  - High-precision visibility measurements (<0.5%)
    => observations with high dynamic range
  - Very long usable baselines (330m vs. 200m maxi on VLTI with ATs)
    => sub-mas in K band
  - Northern hemisphere location
    => complementary to Paranal

FLUOR specifics

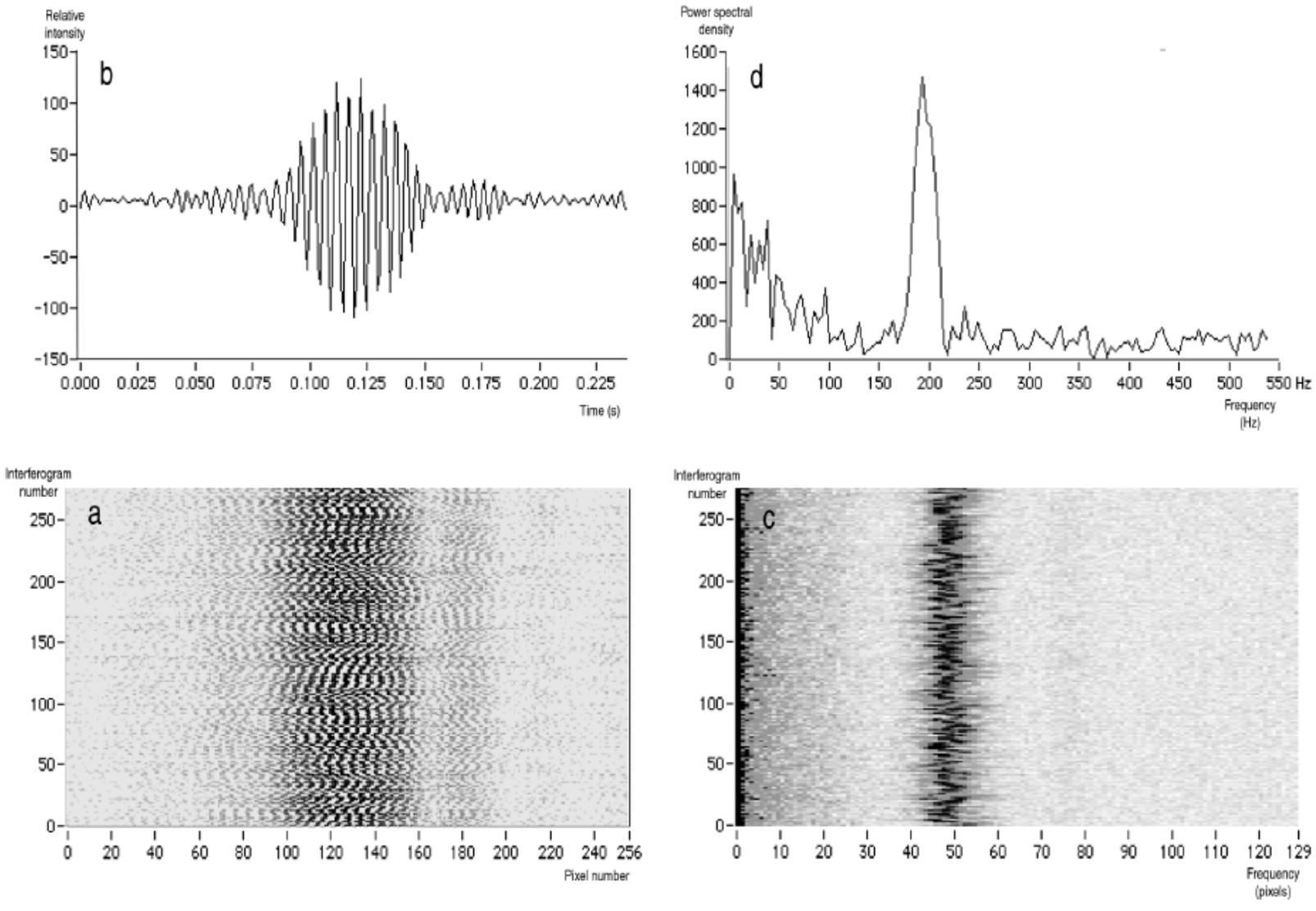
- Broad (so far) K band
- Two telescopes (no phase info)
- Four outputs (calibration signals)
- Temporal encoding of OPD



FLUOR output



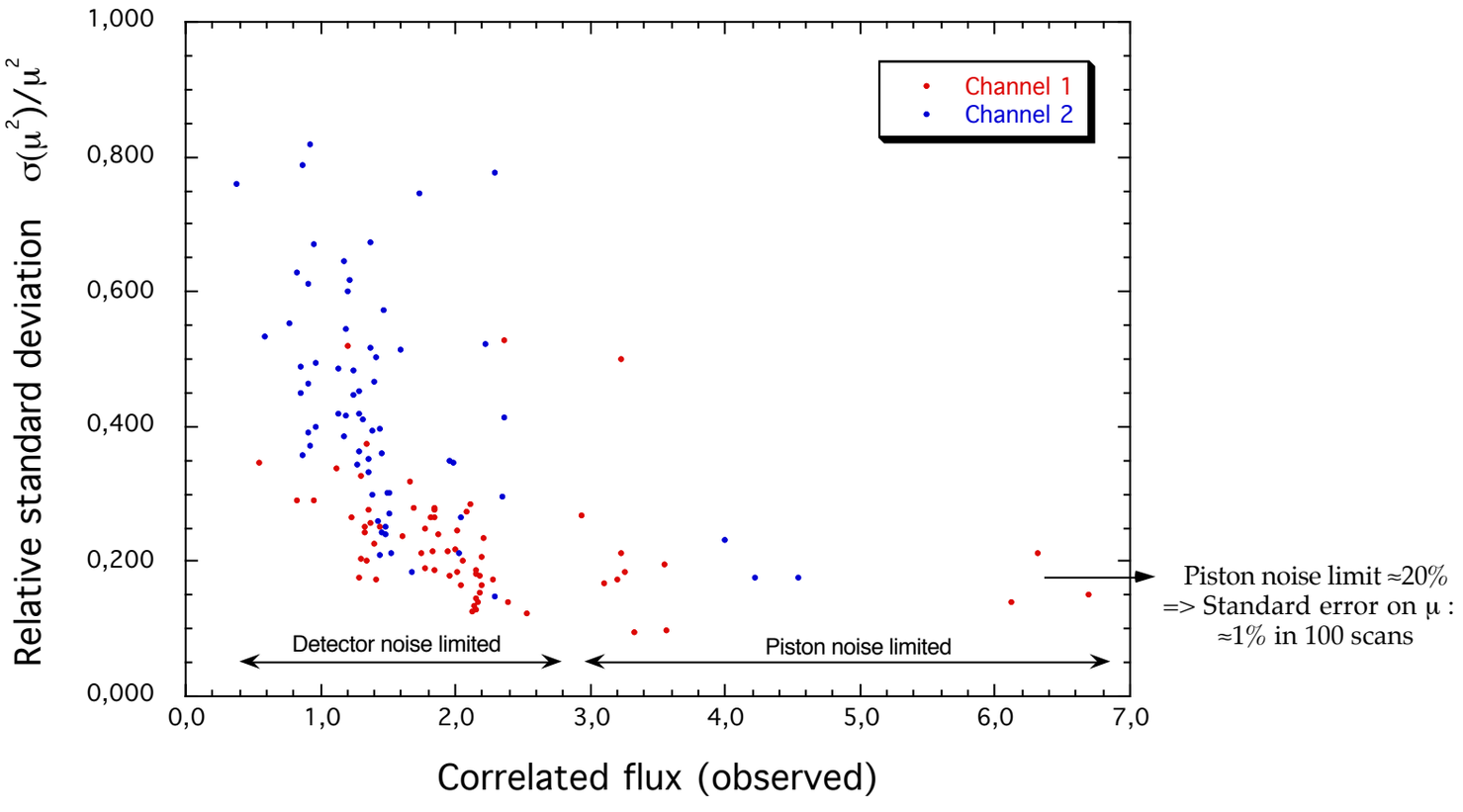
FLUOR data product



FLUOR typical performance

- Productivity : 4 – 6 sources / hour
- Limit magnitude : K ~ 4
- Typical accuracy : dV / V~ 0.3%

Both are linked!



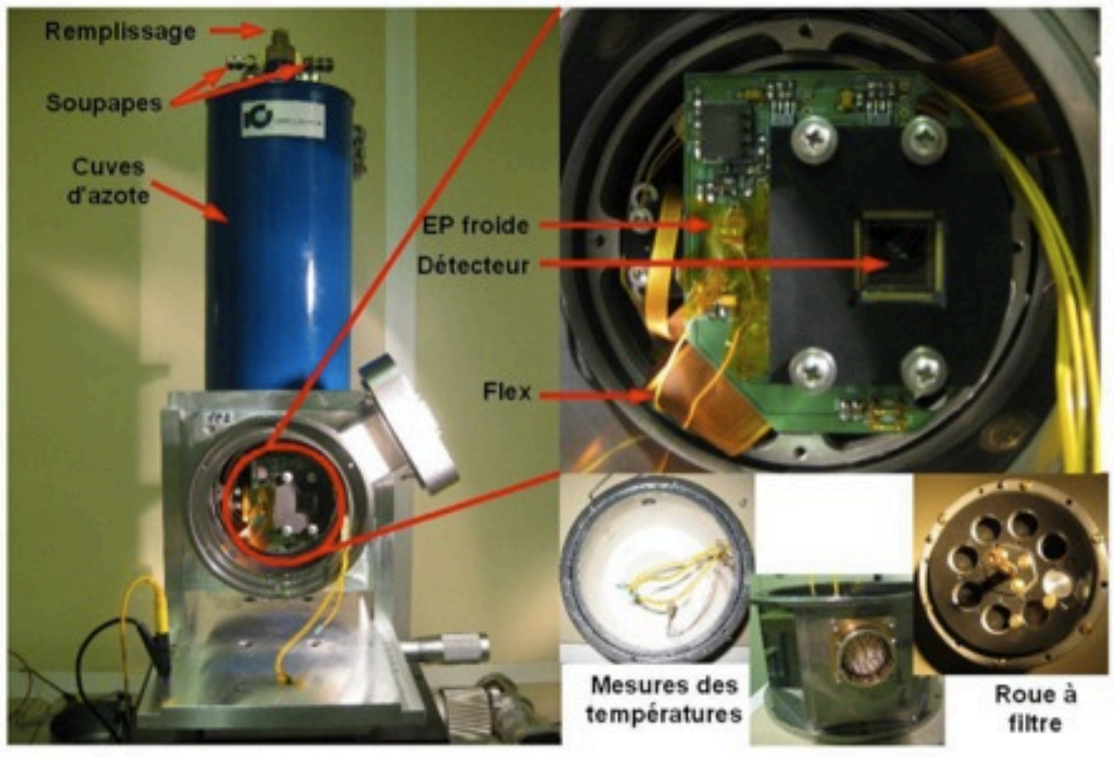
The JOUFLU motivations

- Some FLUOR elements (eg control s/w) date back from 1996:
  - => minimal integration in the CHARA environment since FLUOR was set up almost as such in 2002 to start asap scientific observations
  - => heavier maintenance takes a hit on productivity
  - => Low data throughput
  - => CHARA evolutions hard to follow
- New CHARA functionalities accessible to FLUOR only after better integration:
  - => Simultaneous observations with two instruments (e.g., FLUOR & Vega)
  - => Fringe tracking (Nic Scott's thesis)
  - => Pupil control
- FLUOR functionalities prototyped but not yet routinely accessible:
  - => Remote observations (from Meudon)
  - => Spectral resolution (Benjamin Mollier's thesis)

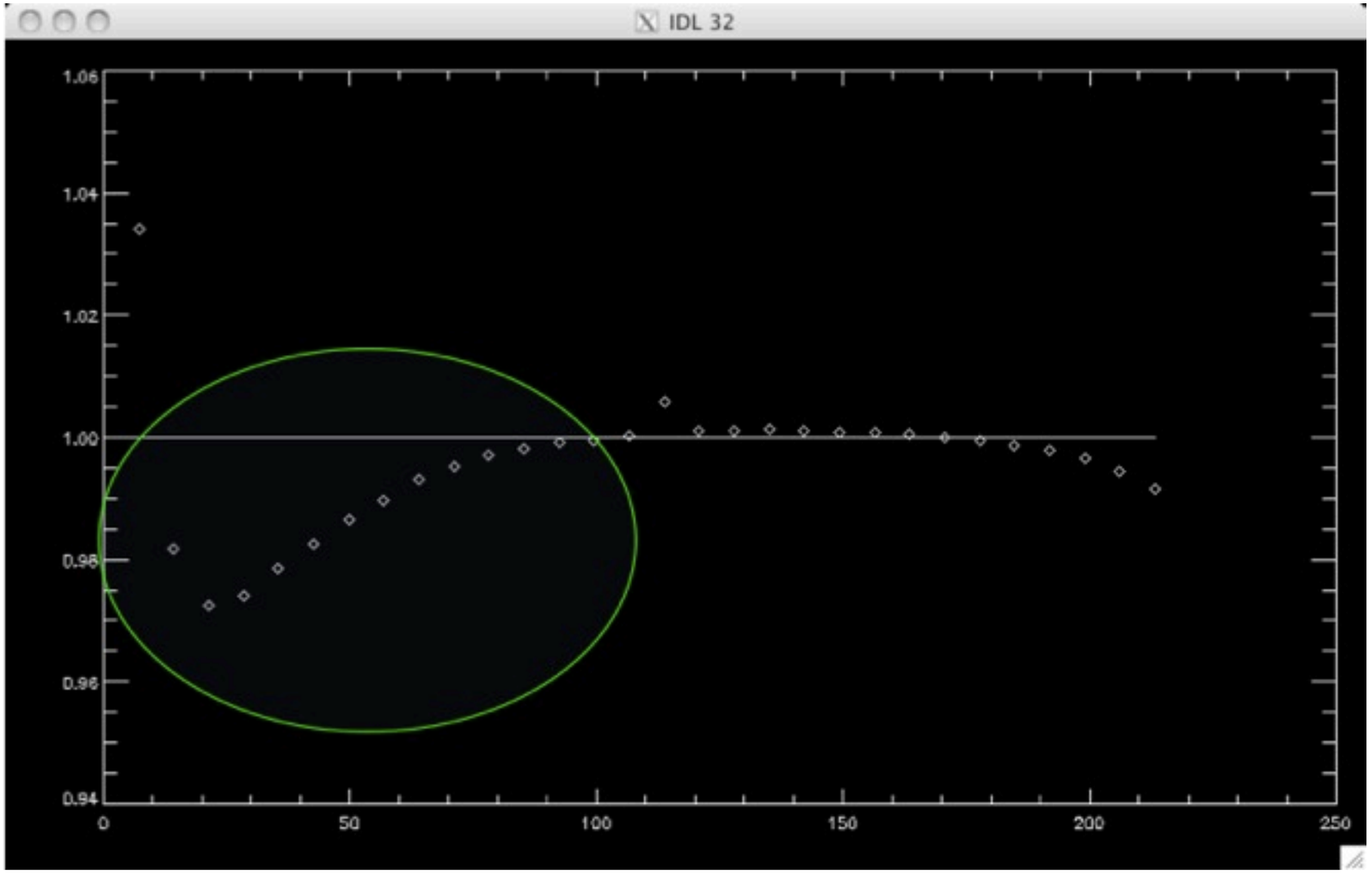
Main tasks

- **CONTROL**: control system overhaul
  - Client/server architecture under LINUX
  - Complete interoperability with CHARA
- **OPD**: remote control of internal OPD and increase OPD modulation range capability
  - Enable adjustment of internal OPD with other instruments
  - Enable a scan longer than the coherence length of one spectral canal in dispersed mode
- **ALIU**: remote control of routine instrument alignments
  - FLUOR setup and troubleshooting without lab intrusion (perturbates observations with other instruments)
- **OUT**: camera upgrade
  - Joint PERSEE (CAPER) and FLUOR (CALI) PICNIC camera development
  - Higher data throughput (serial port -> DIO), easier maintenance
  - Current camera CHARA can be reused for fringe sensor and/or IR tip/tilt

CALI views


Remplissage
Soupapes
Cuves d'azote
EP froide
Détecteur
Flex
Mesures des températures
Roue à filtre

The reset instability issue



Status of OUT

- CAPER built and validated on PERSEE bench
  - With PERSEE functionalities (limited windowing, slow acquisition etc.)
- CALI built and functional (though not yet optimized)
- Remains to be done:
  - Meudon validation of FLUOR functionalities
  - Packaging
  - Integration into CHARA environment
  - Solve/get around the RESET instability issue
- Engineer recruited (Émilie Lhome), will start ANR-funded position in April for 6 months


PERSEE