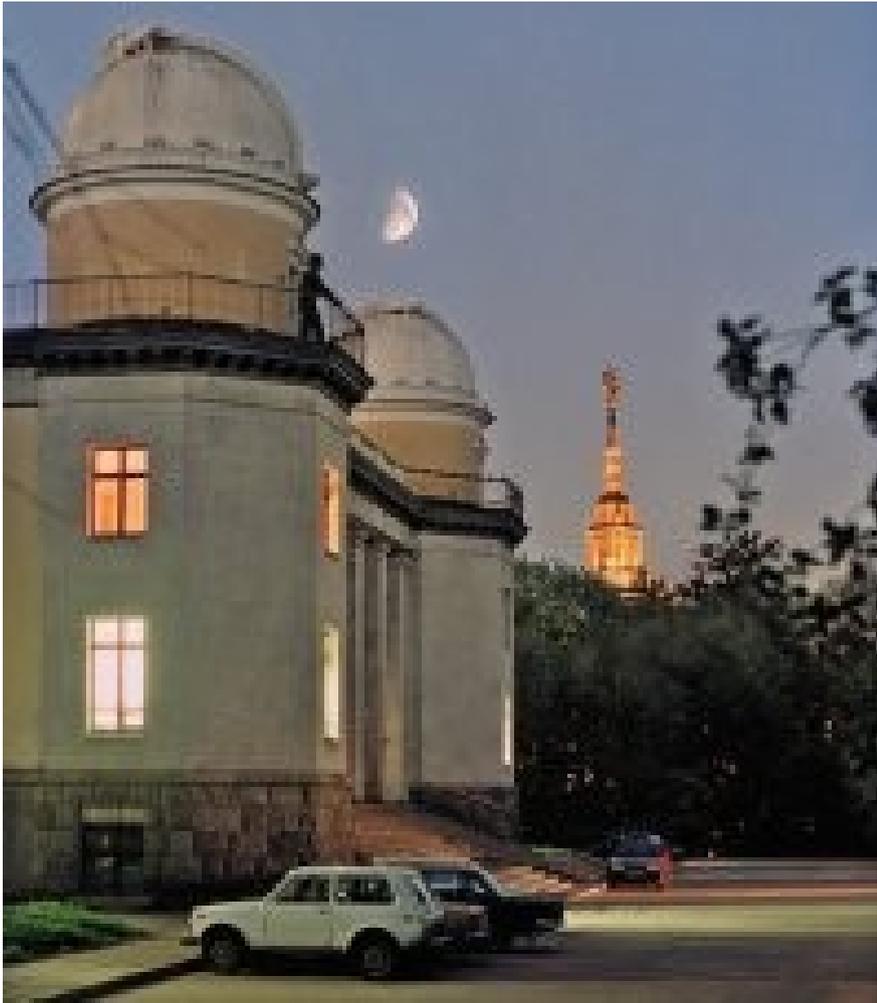


# Sternberg institute 2.5m telescope: aims, instruments and current state

*Sternberg astronomical institute of Moscow (Lomonosov)  
State University, RUSSIA*

*SITE2010 conference, Mt. Shatdzhatmaz, 9 oct 2010*

# Sternberg Astronomical Institute, Moscow State University



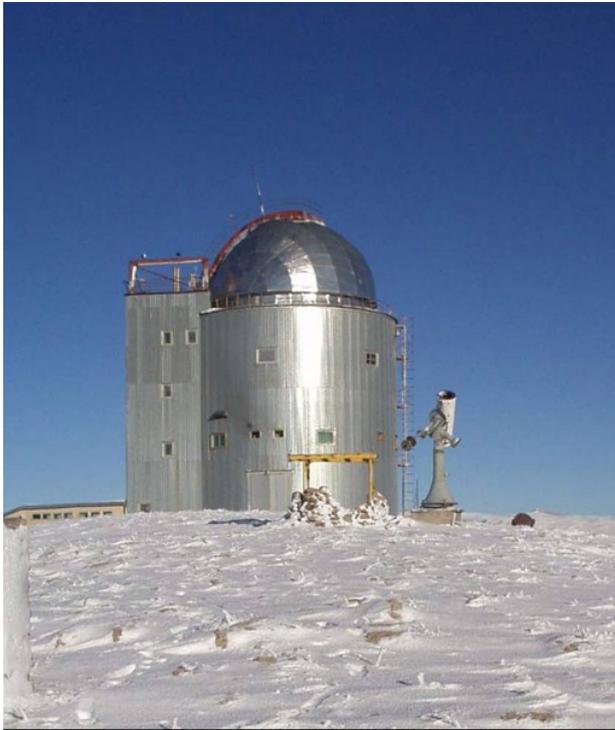
- ♦ Moscow State University: founded by M.Lomonosov, 1755, ca. 25,000 students, 20 subdivisions and faculties
- ♦ Sternberg Astronomical Institute: 1831 (Moscow obs.), ca. 200 scientists, 15 depts and labs.

# SAI (former) sites

- ◆ Crimean station
- ◆ (1958-2006-?)



- ◆ Maidanak observatory,
- ◆ Uzbekistan (1975-1993)



- ◆ Tian-Shan highland
- ◆ expedition, Kazakhstan, 1956-1994

# Caucasus Highland Observatory of SAI MSU

- ◆ **SAI CHO: the new site for the science and education in the field of stellar astrophysics:**
- ◆ **1. Development of modern and new observational techniques, long-term monitoring and survey programs.**
- ◆ **2. Students and post-graduate students training at the Astronomical dept. of the Physical faculty of MSU. Development of remote-controlled and service mode observations.**

# *Why here?*

We need:

- ◆ **Good accessibility for students and maintenance, land ownership of MSU**
- ◆ **Infrastructure (electricity, roads, staff)**
- ◆ **Satisfactory observing conditions (seeing, clear time)**

◆ So we have:

- ◆ **Karachai-Cherkessian Republic, near Kichi-Balyk**
- ◆ **7e4 sq.m., 20km to S from Kislovodsk, 800m from Pulkovo Solar station**
- ◆ **43° 44' N, 42° 40' E, 2112 m a.s.l.**

□ KGO  
■ GAO



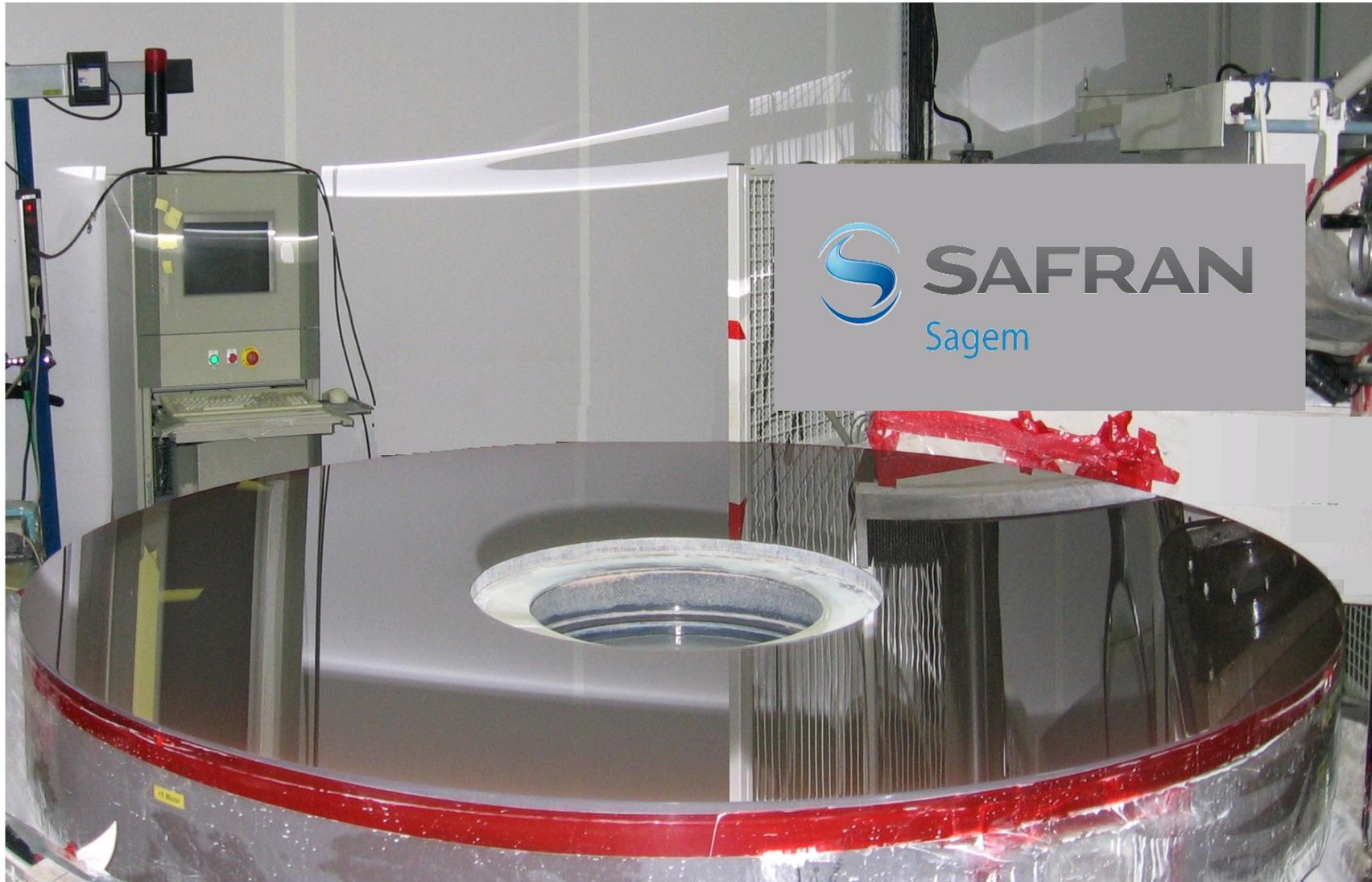
- ◆ **D 2.5m, RC f/8, M1: f/2.2, rms 30nm**
- ◆ **d(EE80)=0.4''**
- ◆ **Alt-Az, DD, 3°/s, ε5'', 5 foci (N1-4, C, <2min)**
- ◆ **C,N1: derotators, FOV 40' (WFC), AGU**
- ◆ **N2: optical prism derotation, FOV 15'**
- ◆ **N3,4 : “student ports” (on-axis small instruments)**

# Telescope construction

An aerial photograph showing the construction of a large telescope. In the foreground, a massive, dark, conical concrete structure is under construction, with a white spherical cap at the top. Behind it, a large, rectangular, light-colored building with a flat roof is visible, likely a workshop or assembly hall. The site is surrounded by green fields and some trees. A road and a fence are also visible in the background.

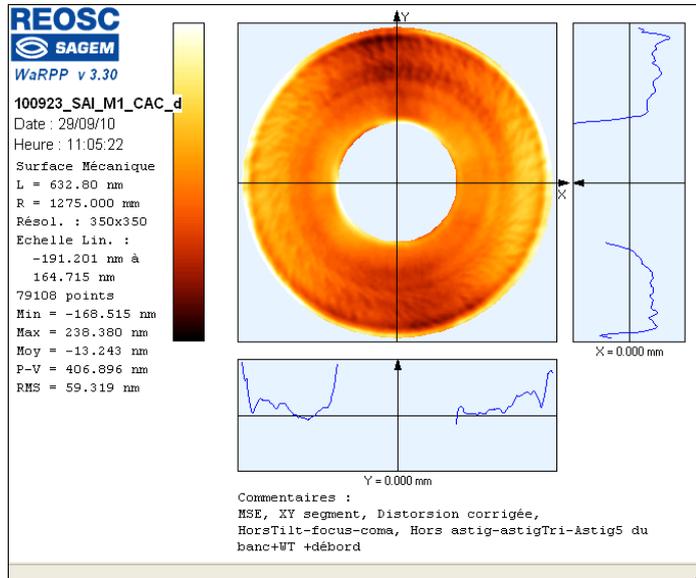
- ◆ **Budget allocation: November 2005**
- ◆ **Tender winner: SAGEM-REOSC via MAVEG GmbH**
- ◆ **Mechanics: NIAOT (China)**

# Optics at REOSC plant

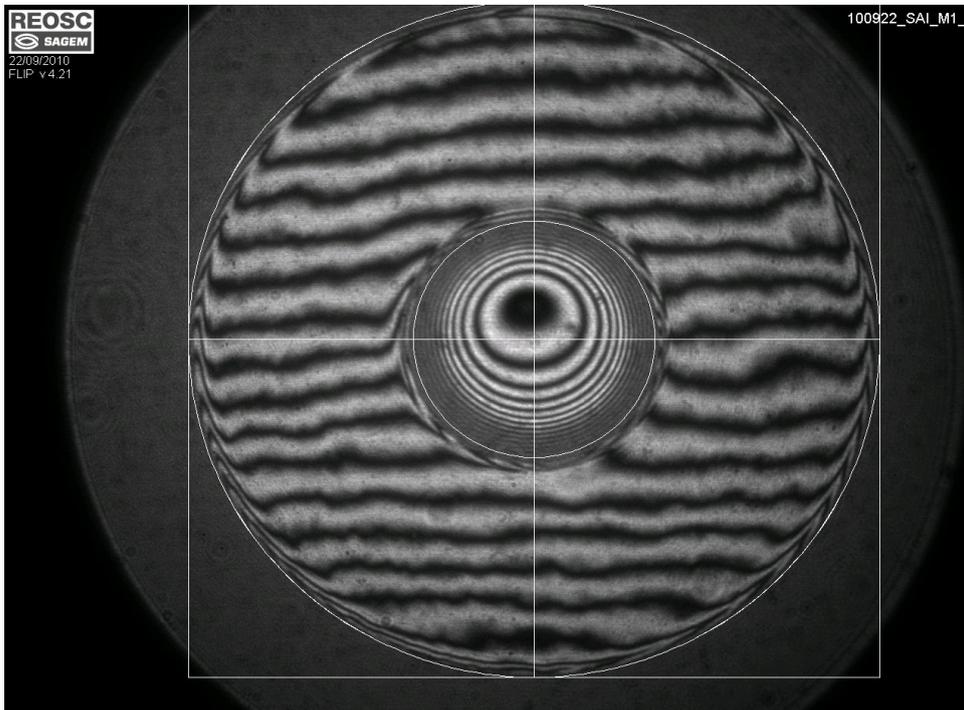


- Schott (Zerodur) blank
- Mechanical diameter: 2550mm, Central hole: 940mm, Thickness: 175mm
- Weight: 2500kg
- Radius of curvature: 11 000mm, Conic constant: -1.065646

# M1 testing results: 23/09/2010

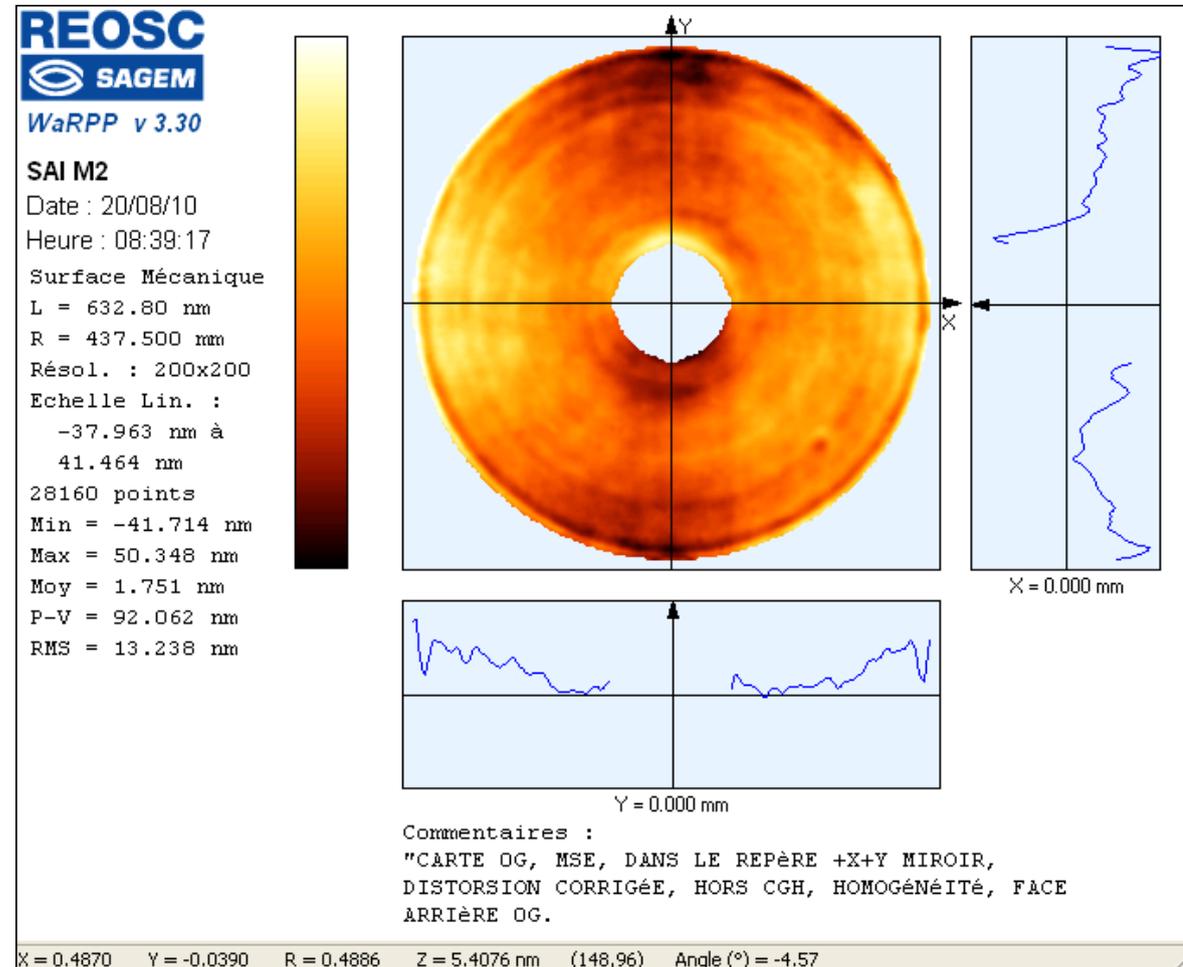


- Current WFE:
  - 118.6nm WFE RMS.
    - Including 78.4nm of astigmatism
    - Including 42.2nm of high frequency (Zernike>36)
  - EE80% : 0.65arcsec
- In conclusion, the primary mirror will soon be within specification. Delivery is expected in spring 2011.



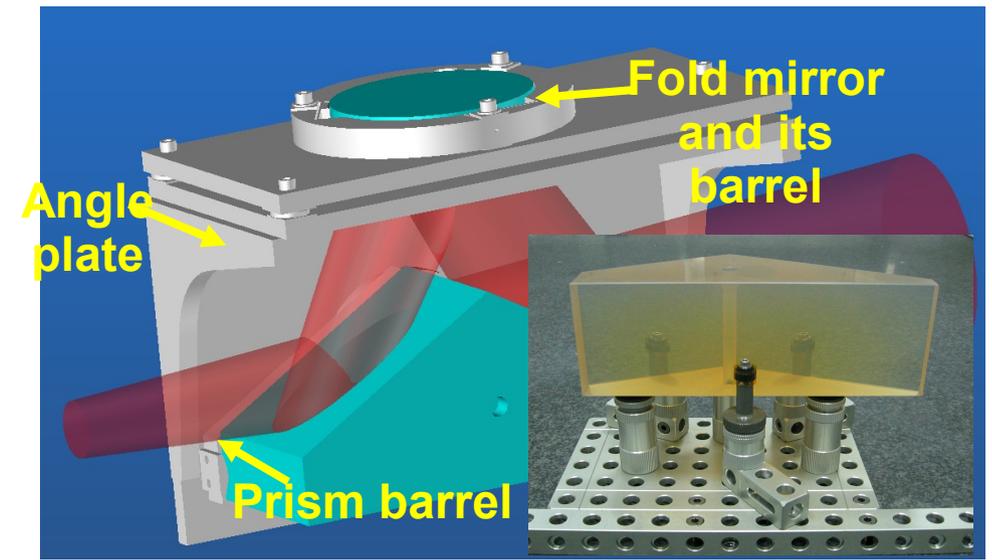
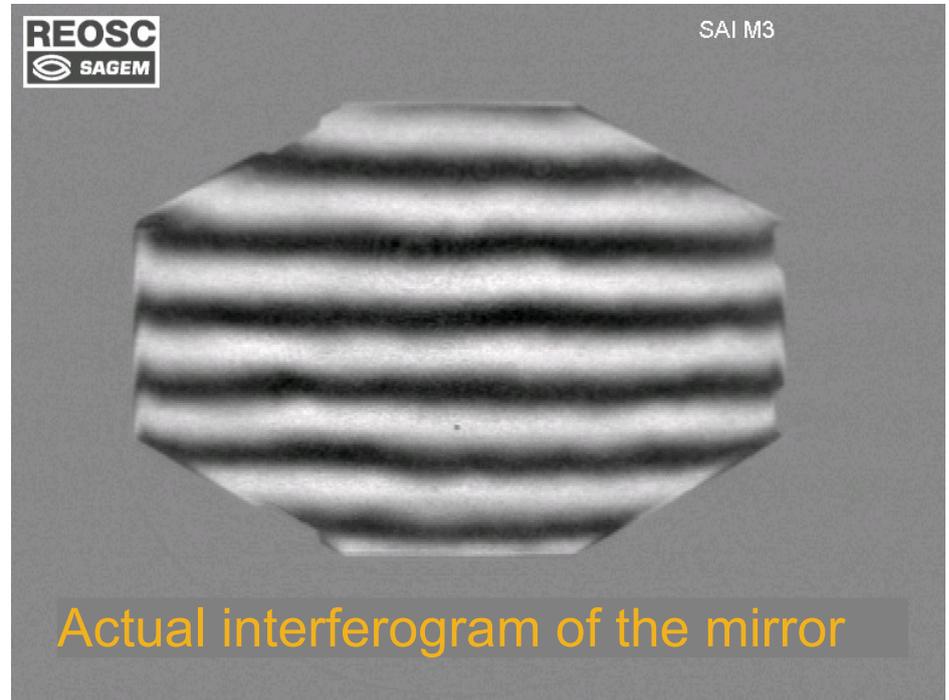
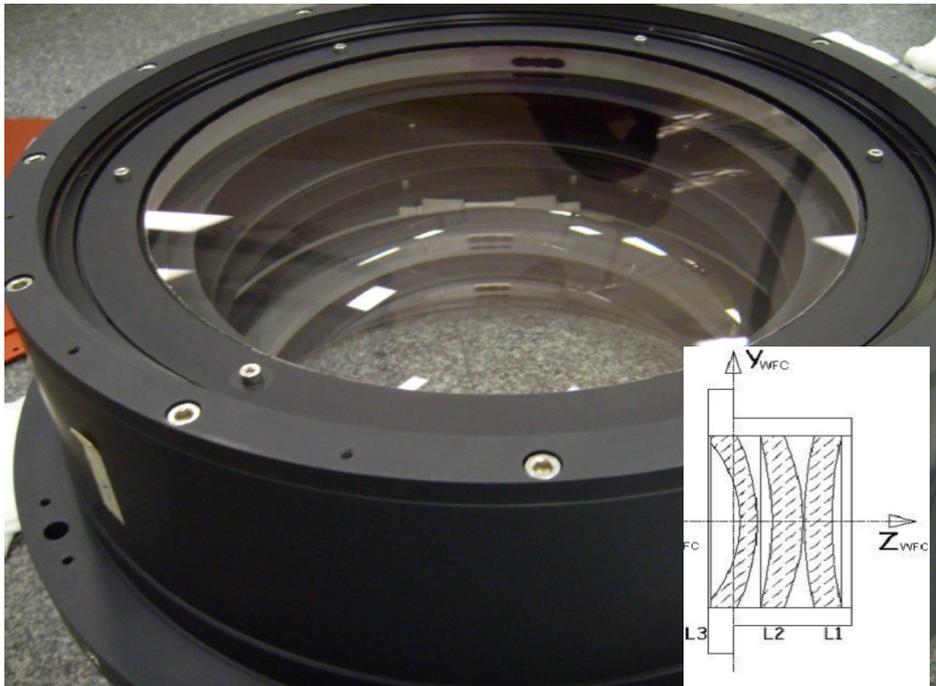
# Secondary mirror

- Main characteristics of the mirror
  - Material: Silica
  - Mechanical diameter: 875mm
  - Optical diameter: 826mm
  - Thickness: 80mm
  - Weight with the cell: <200kg
- Radius of curvature: 4581.46mm
- Conic constant: -3.6642
- Current WFE: 26nm RMS
- EE80%: 0.07arcsec
- M2 is within specification.



# M3, WFC & optical derotator

M3: sitall, 694 x 494 mm  
opt.derot: zerodur, FOV 5'  
WFC: 3 lens, silica





# Mount state

Az table, fork, tube, M2/3 units, AGU, derotation: finished

TCS: still in development

FAT: winter 2011, delivery: may 2011

Photo: courtesy of SAFRAN/SAGEM/NIAOT

# Instrumentation:

5 focal stations (ASM-assisted selection):

- ◆ 4Kx4K CCD-camera (*NOTSA, near completion*)
- ◆ Long-slit high-efficiency ( $E > 50\%$ ) spectrograph R1500..10000, 350-1000nm (*NOTSA-SAI design*)
- ◆ fibre-fed echelle-spectrograph R40000 (*SAI-SAO*)
- ◆ NIR JHK R1500 spectroimaging camera (*MKIR, near completion*)
- ◆ Adaptive optics, lucky imaging and speckle cam (*SAI*)

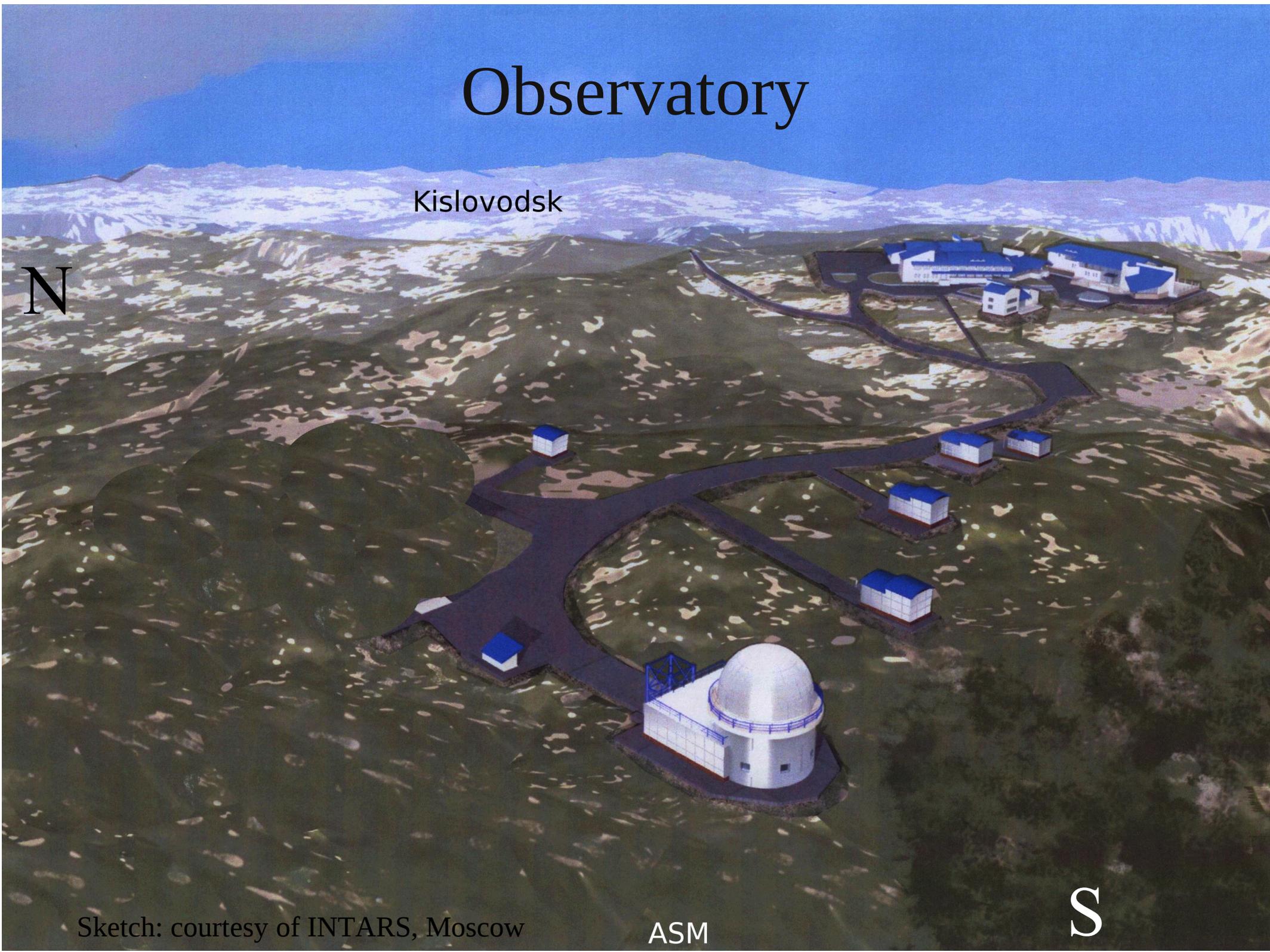
# The scientific tasks for 2.5M

- ◆ Spectroscopic and photometric monitoring of peculiar objects (microQSO, cataclismic vars, AGN)
- ◆ optical follow-up observation of GRB and OT
- ◆ precise stellar radial velocities, stellar multiplicity studies

# Observatory

Kislovodsk

N



Sketch: courtesy of INTARS, Moscow

ASM

S



## Site characteristics (ASM, 2007-09):

- ◆ Median seeing:  $\beta_0$  0.93",  
 $\beta_{\text{free}}$  0.51"
- ◆ Clear time fraction: 46% (ASM safe side)
- ◆ Temperatures: -15 .. +20
- ◆ Wind: 2.3m/s med
- ◆ Night-time wind: W, NE
- ◆ PWV: 4 (winter), 20 (summer)
- ◆ Median  $\tau_0$ : 2.6ms,  $\theta$ : 2.1"



Thanks for your attention!

