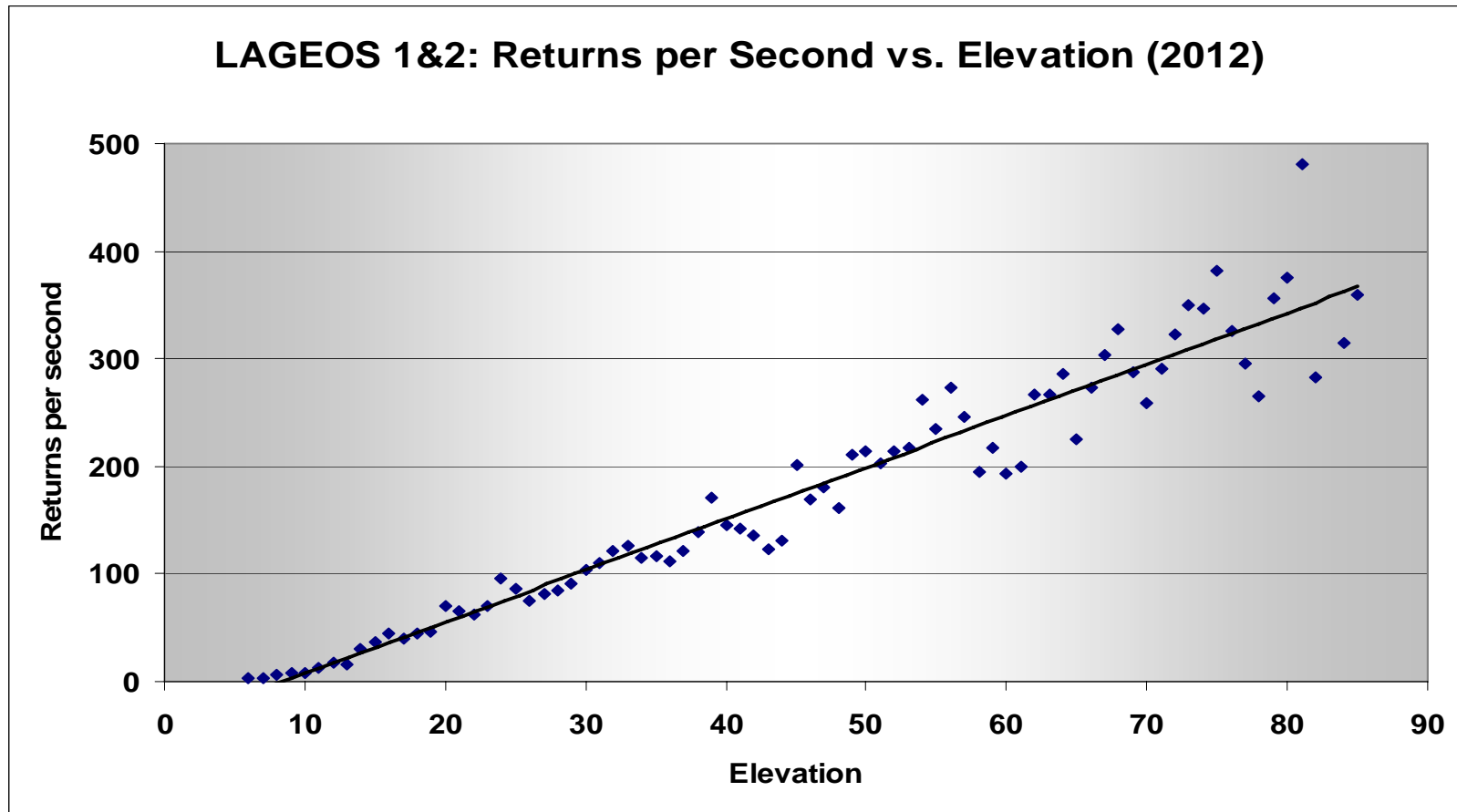


# Graz Experience with HEO SLR

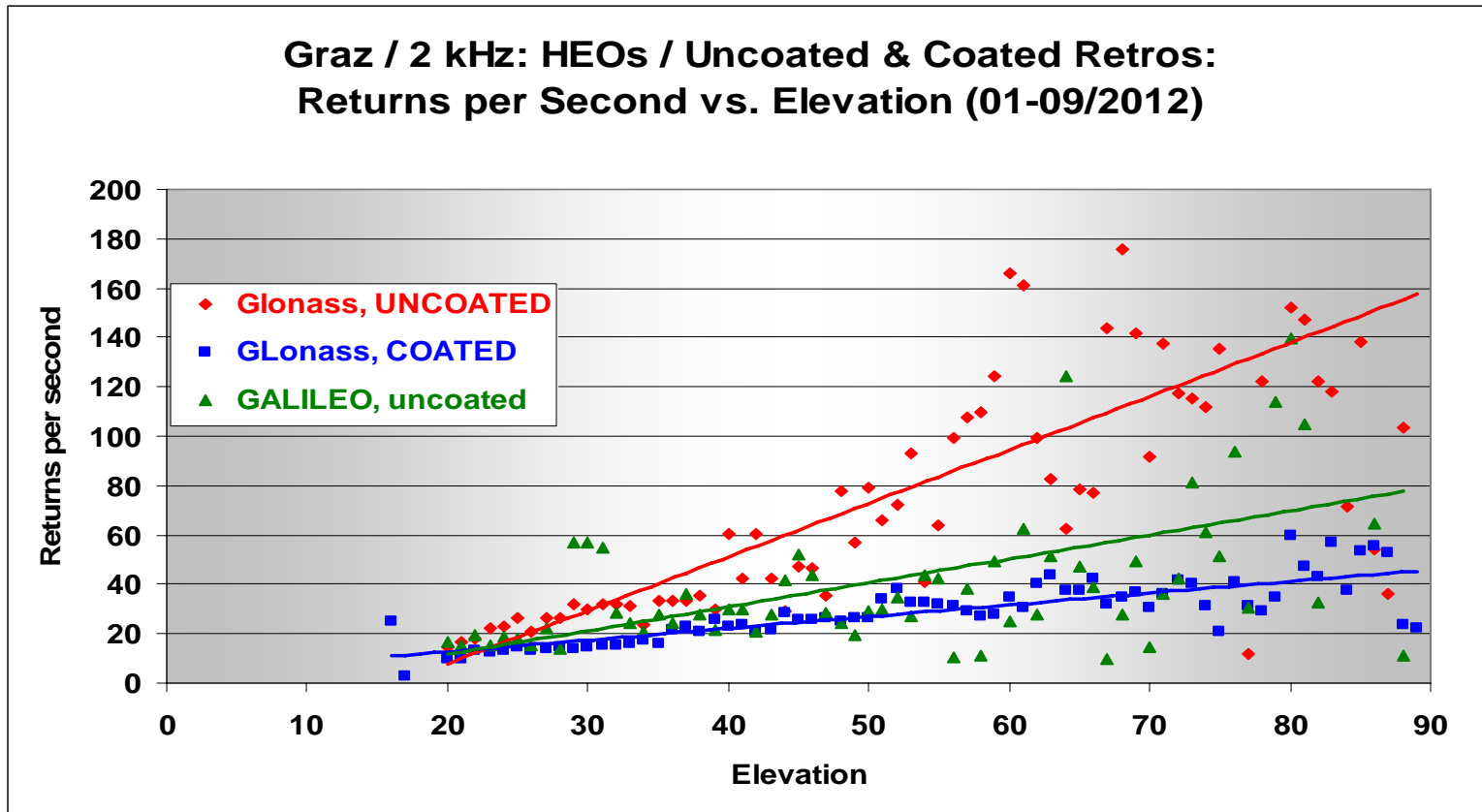
Georg Kirchner, Franz Koidl  
Institute for Space Research  
Austrian Academy of Sciences

## *Overview*

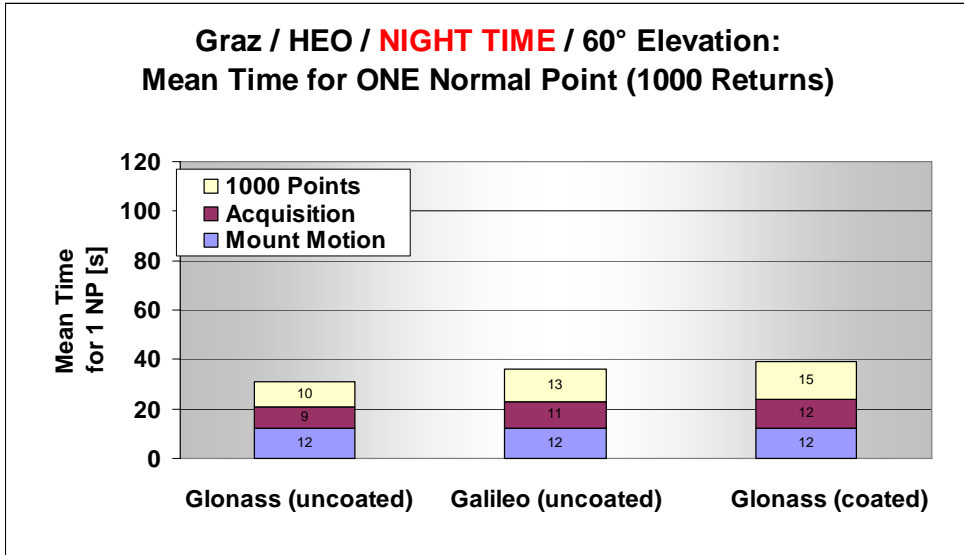
- Mean Return Rates for LAGEOS, Glonass (Coated vs. UnCoated retros), Galileo
- How to maximize return rates at Graz 2 kHz station
- How long do we need to get ONE Normal Point from HEO satellites?
- Conclusion



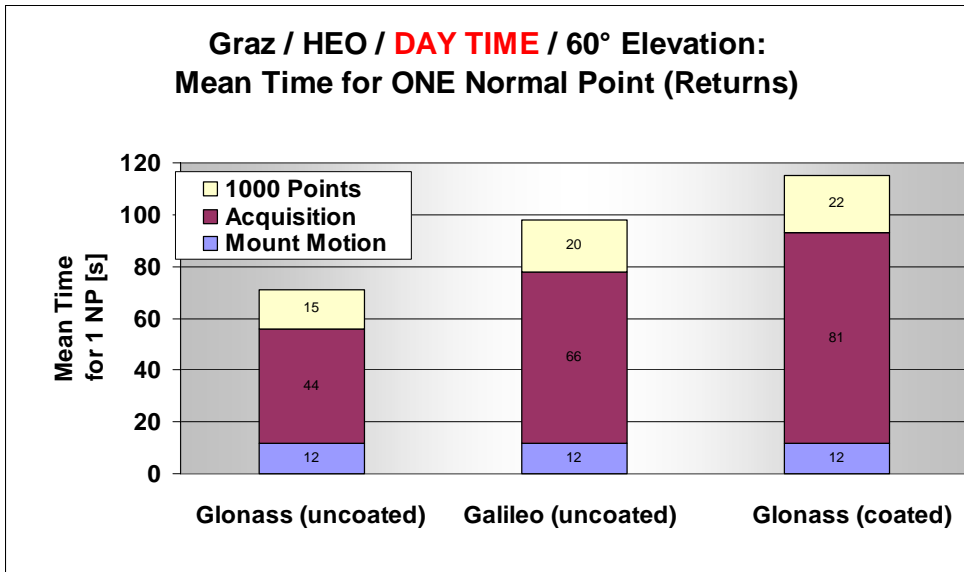
- All passes of LA1 & LA2 / 2012; day and night
- 1 NP needs  $< 5$  secs @  $60^\circ$  elevation (after acquisition)



- All HEO passes 2012; day and night averaged; Time for 1 NP (1000 valid returns):
  - Glonass, uncoated retros, 60° Elevation: < 12 secs (after acquisition)
  - Glonass, coated retros, 40° Elevation: ≈ 50 secs (after acquisition))

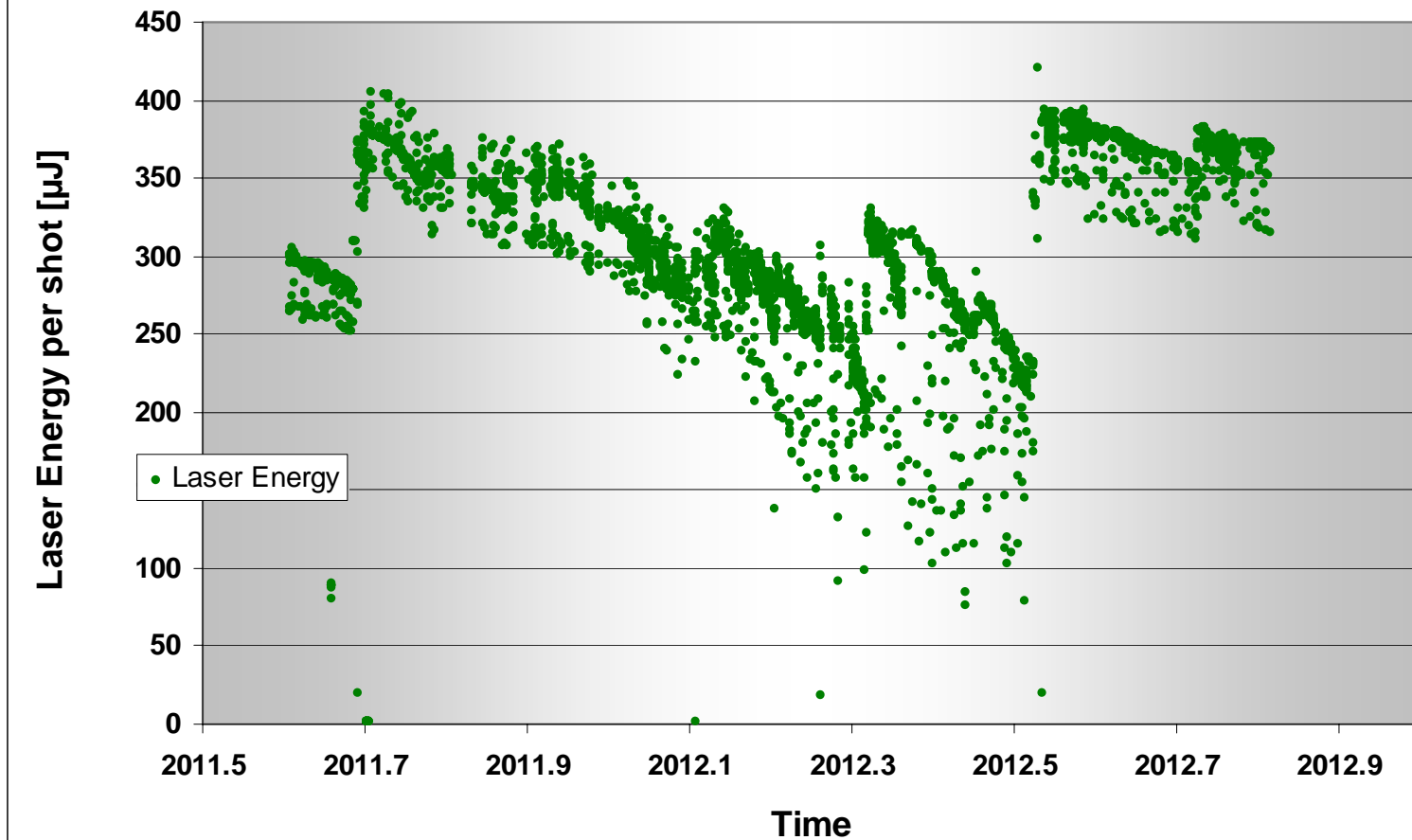


- Night: < 1 minute for 1 NP (1000 pts)
- Day: Longer acquisition times; sometimes no results at all ☹️
- In any case:  $\ll$  5 minutes; thus we can get several NPs (of different HEOs) in ONE 5' slot (up to 4 or 5 NPs)
- Mount: Needs  $\approx$  12 seconds

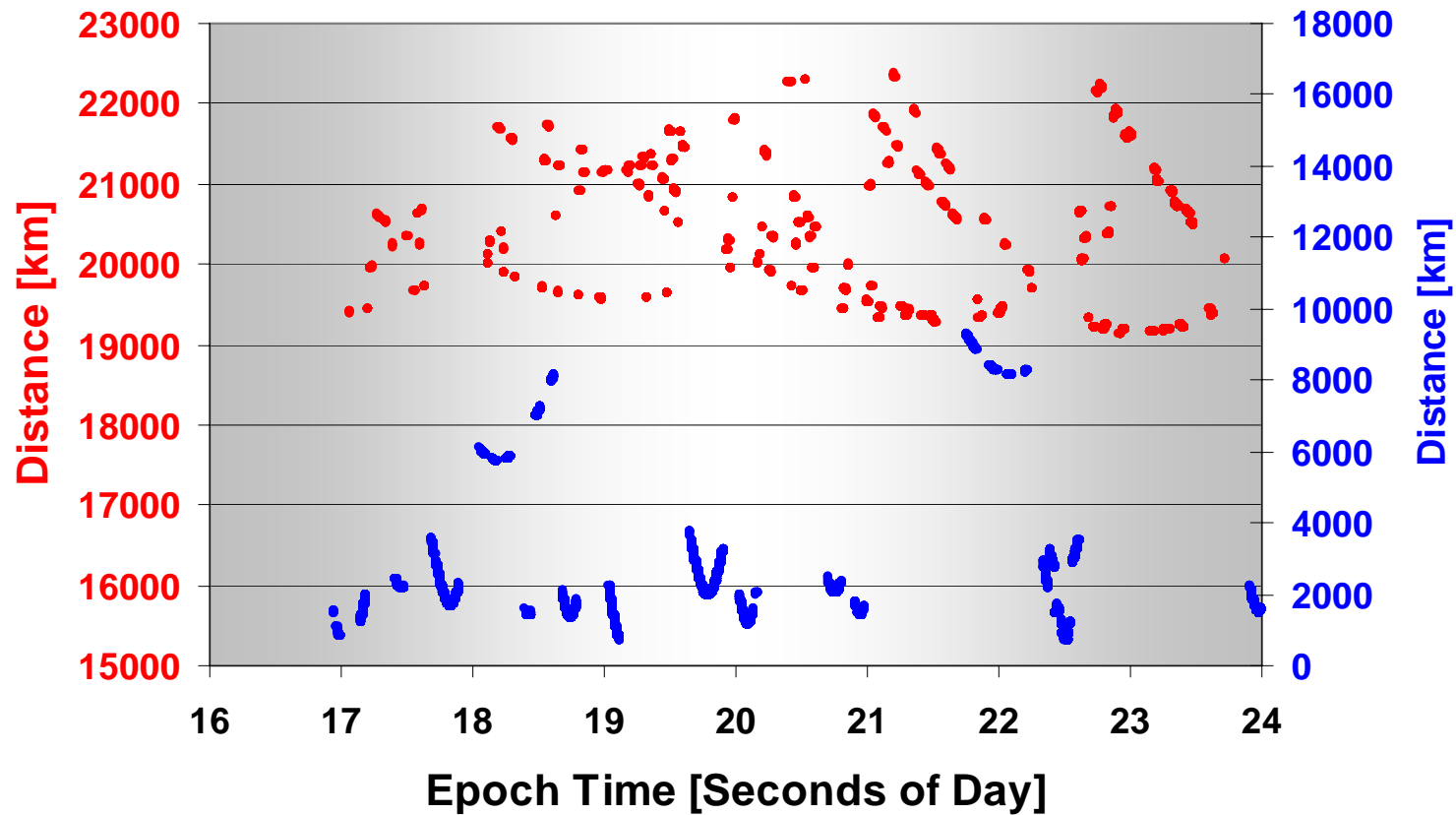


- We minimized optics wherever possible;
  - We removed e.g. on the laser table 1 beam expander & 4 mirrors (beam now expands naturally after few meters);
  - The detection package includes only the absolute minimum mirrors / lenses etc.;
  - The daylight filter is automatically removed during night passes;
- We cleaned our Coudé mirrors from the dust of the past years 😊
- Last year we replaced our dichroic mirror, to remove severe polarization dependency;
- We try to get 1000 *valid* returns for a standard Normal Point; then we switch to the next pass;

## Graz HQ 2-kHz Laser: Energy



**Graz Pass Switching: Day 295/2012:16:57-24:00 UTC**  
**20 LEO, 14 HEO: 34 Passes in 7.1 hours**





Thank You