



# On The Rotation Axis of LAGEOS A New Approach

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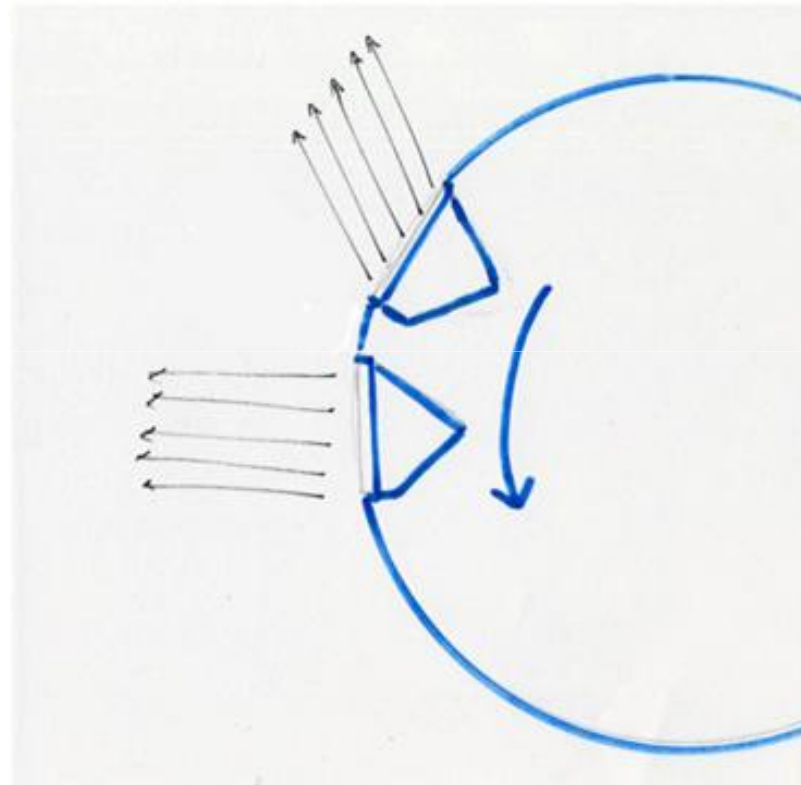
University of Maryland, College Park

# OVERVIEW



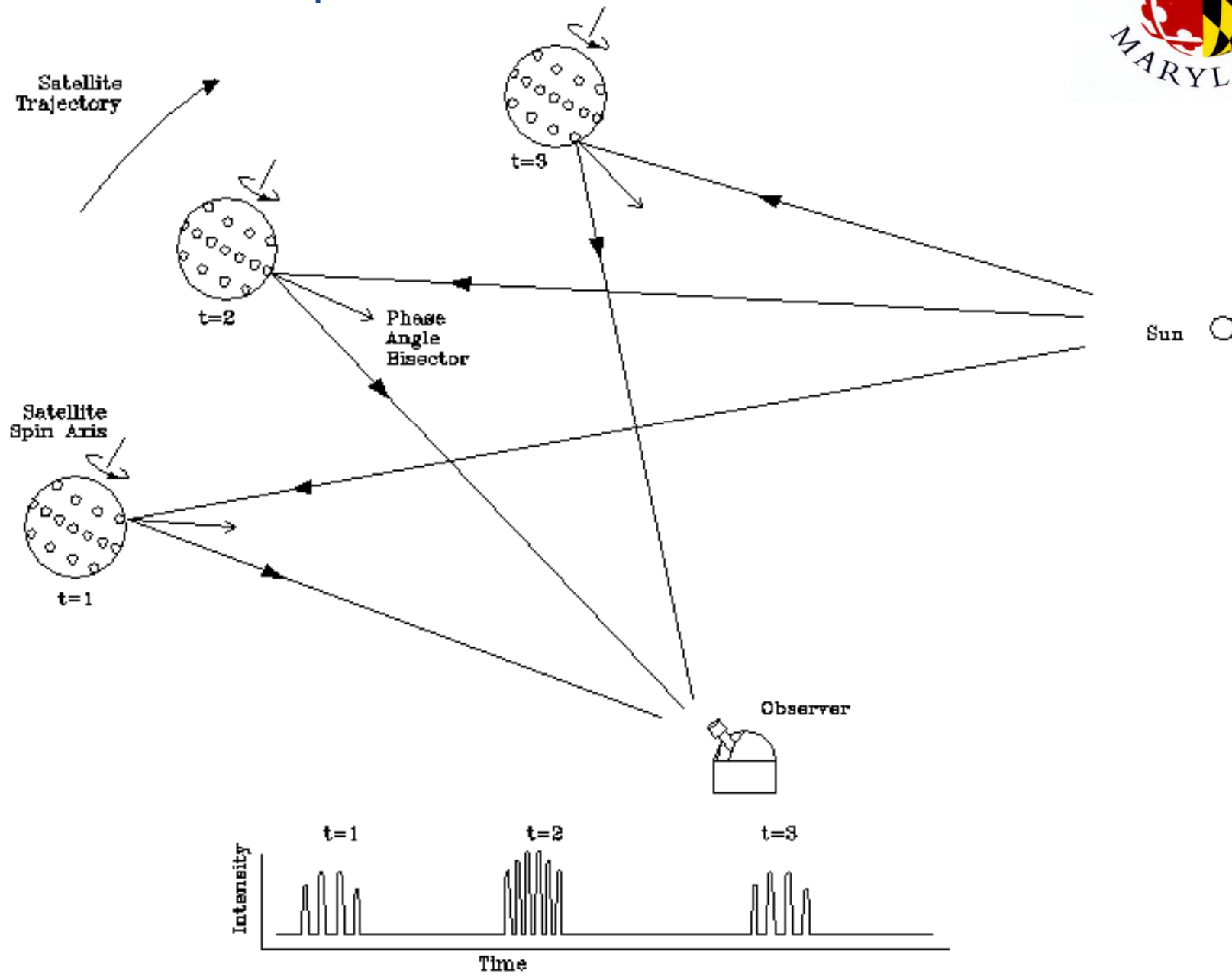
- Sun Glint Method
  - Background or History of Early University of Maryland Work
    - Description of Sun Glint Method
    - Simulation and Data
    - Comparison of Measurements with Early Model
    - Prediction of Acceleration Residuals
- Pocket Method
  - Description of Pocket Concept
    - Pocket Effect – Theory
    - Pocket Effect - Observations
  - Data – Anomalous Flash Investigation at INFN/LNF
- Conclusions and Future Development

# Solar Reflection from LAGEOS Sun Glint Method



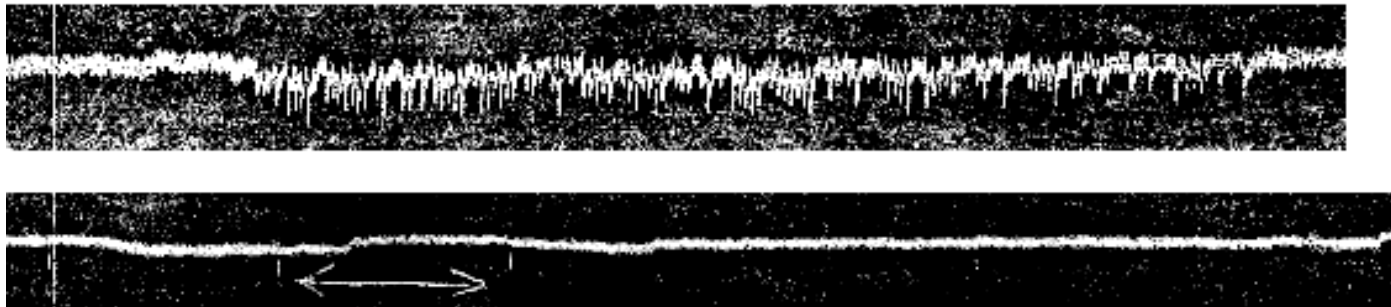
# Remote Sensing Of The LAGEOS-I Spin-Axis

## Observation of Multiple Bursts:

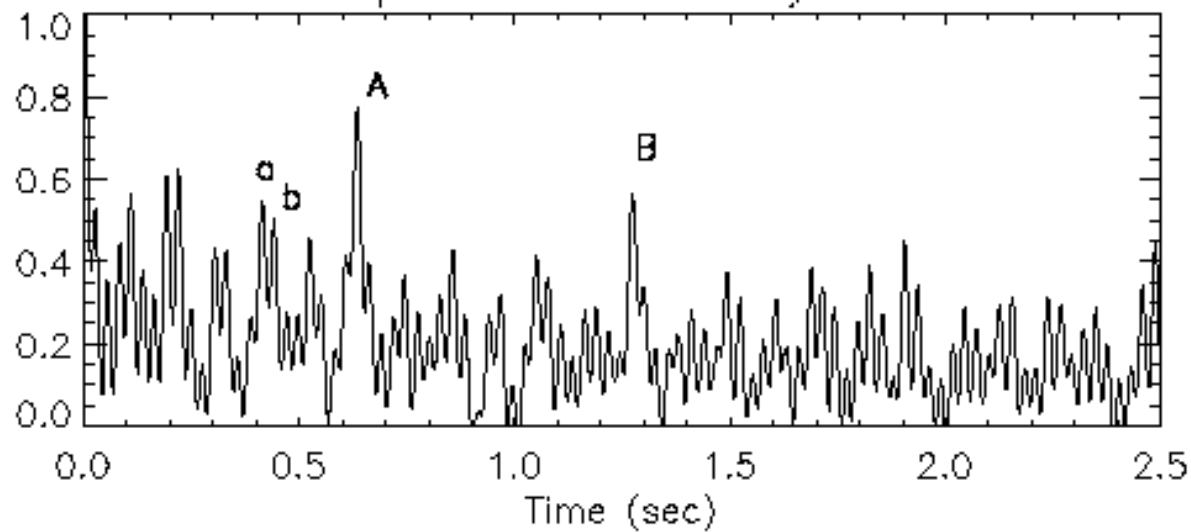




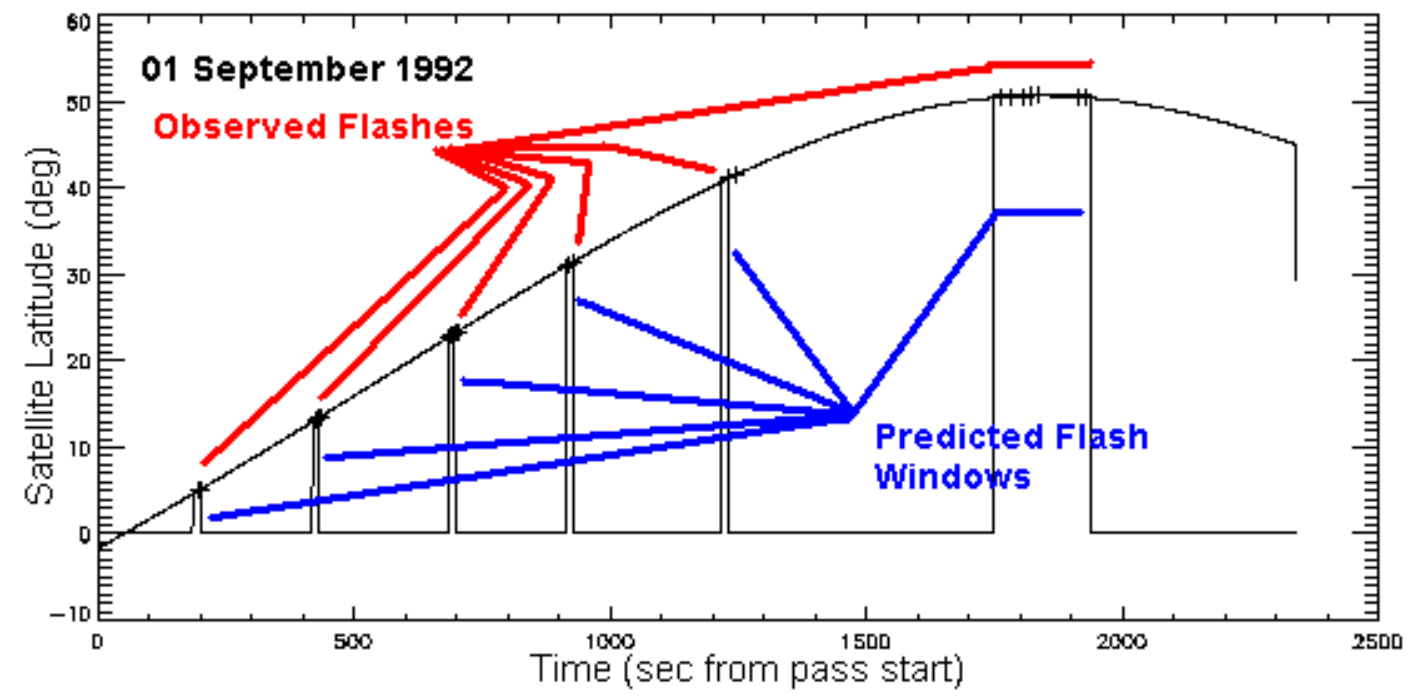
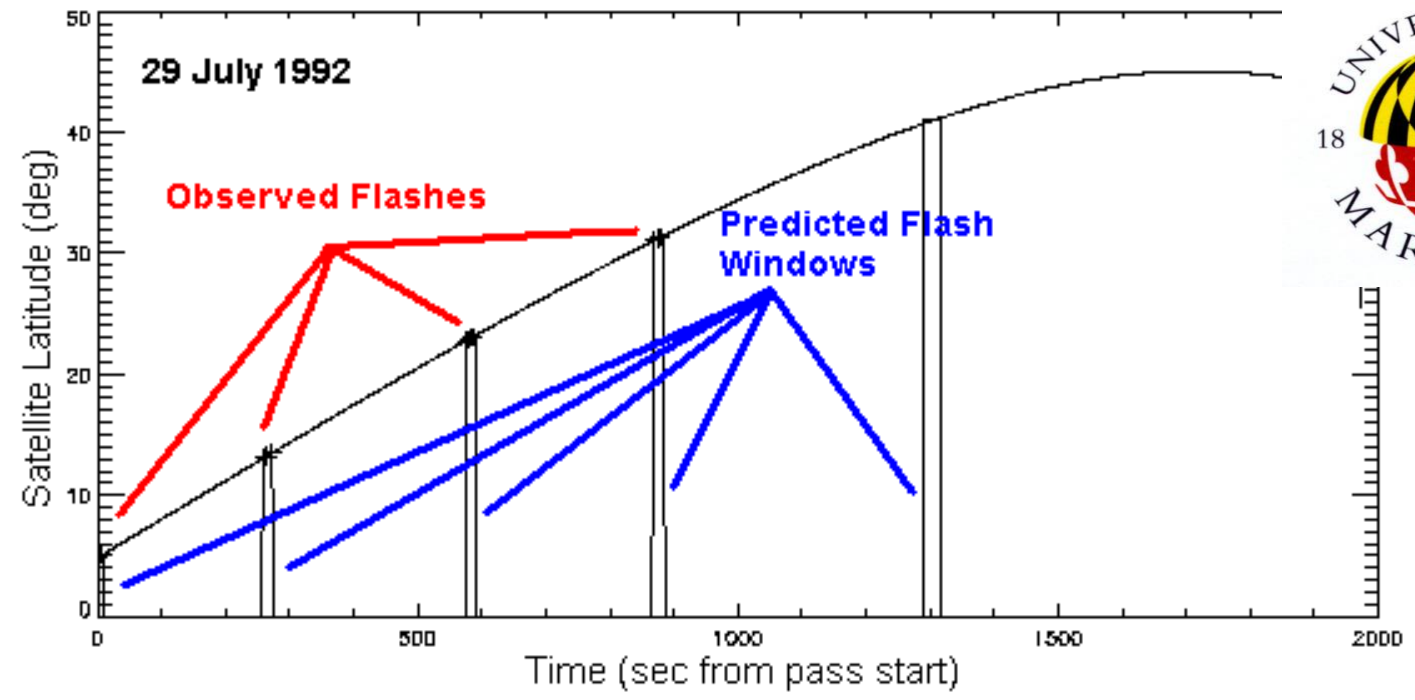
# Remote Sensing Of The LAGEOS-I Spin-Axis Data Examples: July, 1976 St. Margaret's



Fourier Spectrum of 24 July 1976 Data





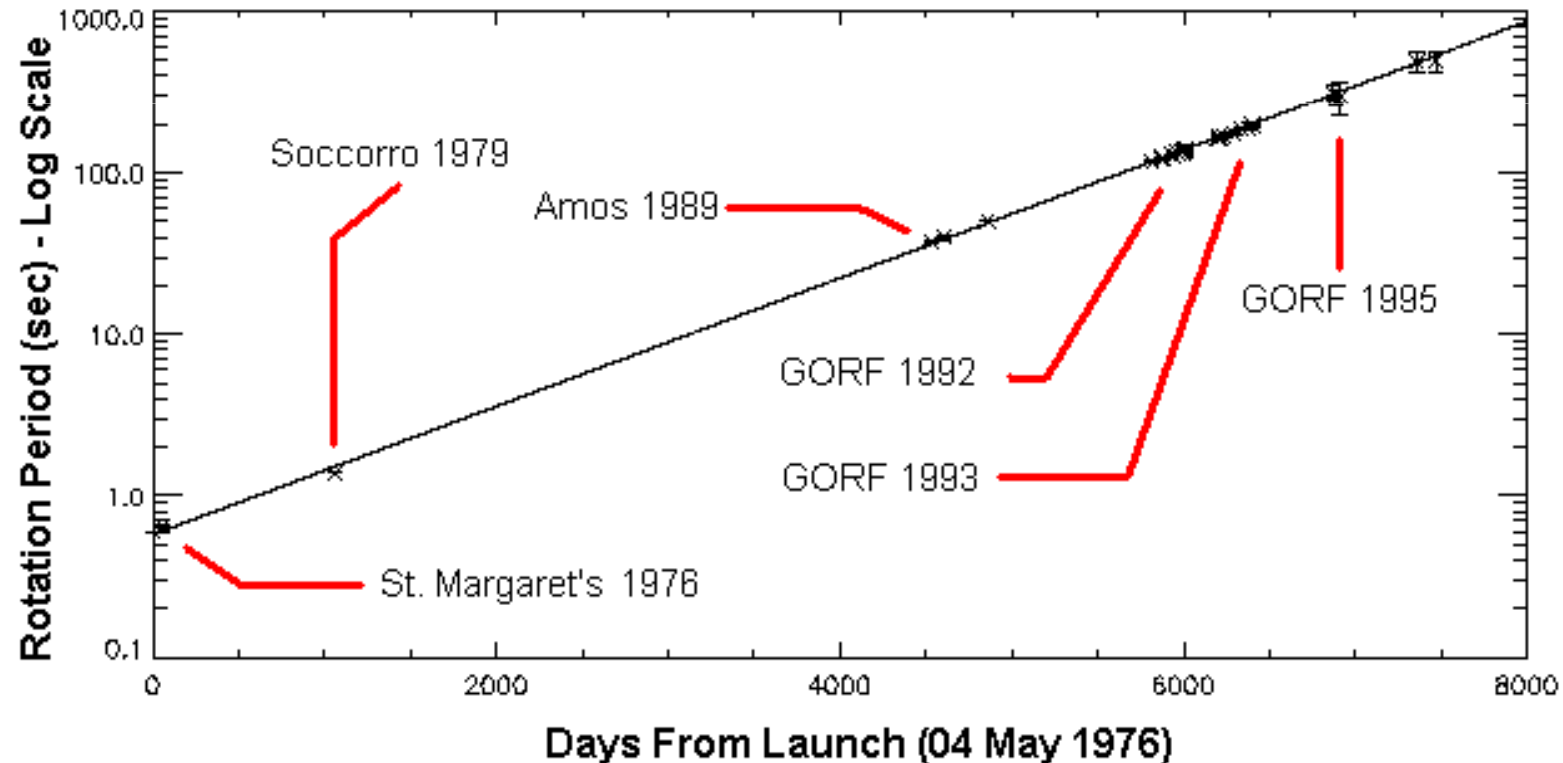




## Remote Sensing Of The LAGEOS-I Spin-Axis Results:



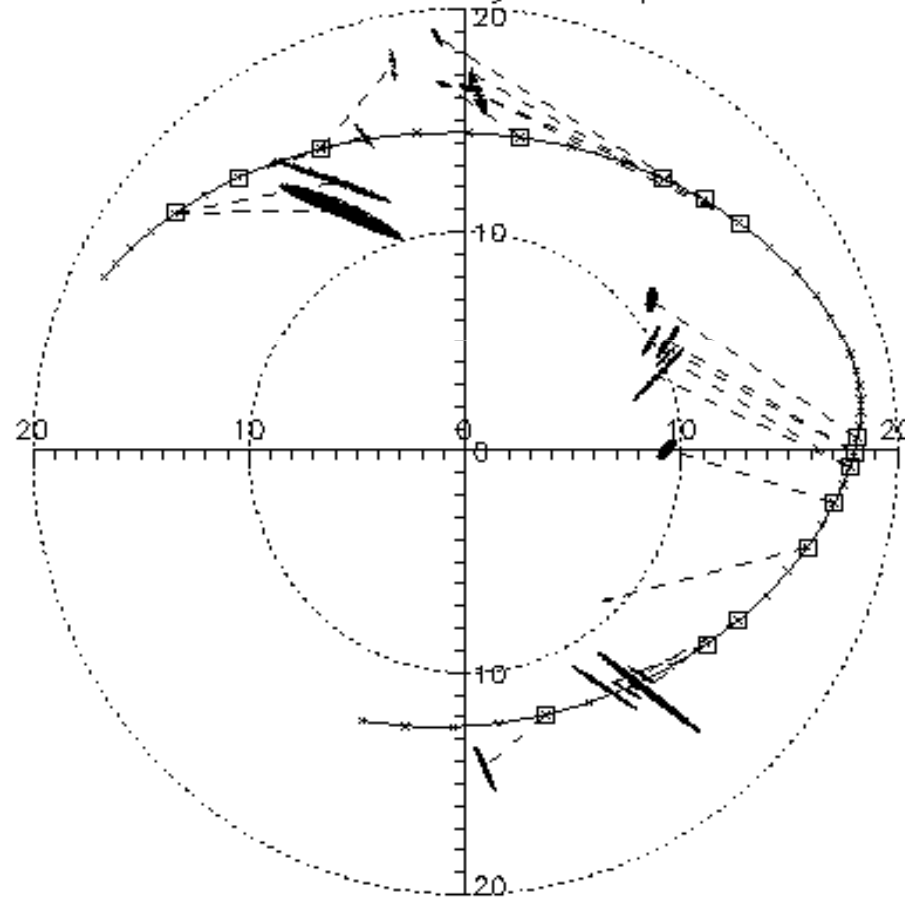
- Spin Rate
  - Determined for 33 Dates - Errors < 5%
  - Determine Spin Half-Life (Exponential Decay) of 2.11 Years



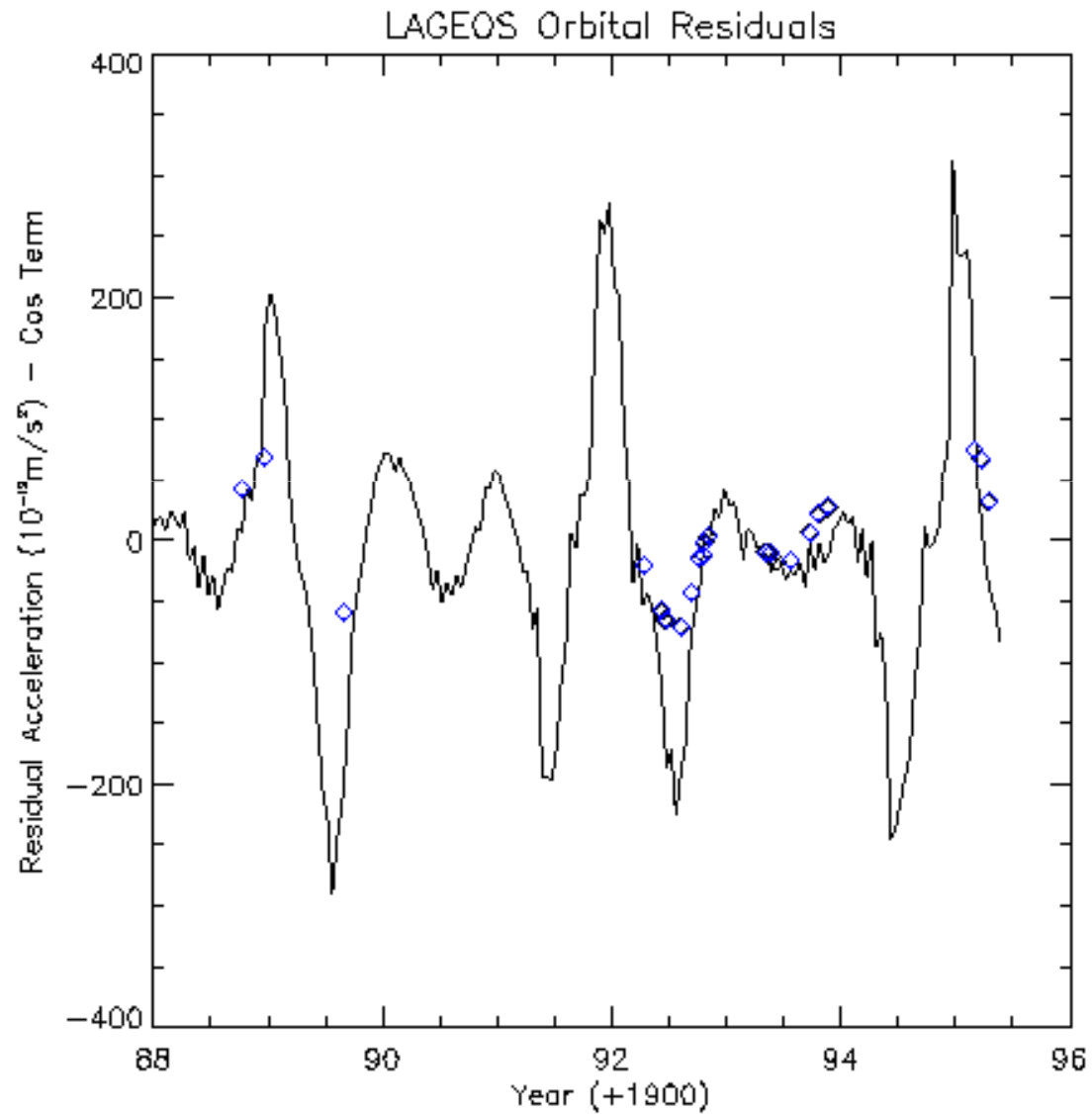
# Comparison of Spin Axis Orientation Vokrouhlicky's Model Polar Representation



Evolution of the Lageos-1 Spin Axis



# David Rubincam's Orbital Residuals University of Maryland Data Mapped



# Solar Reflections from LAGEOS

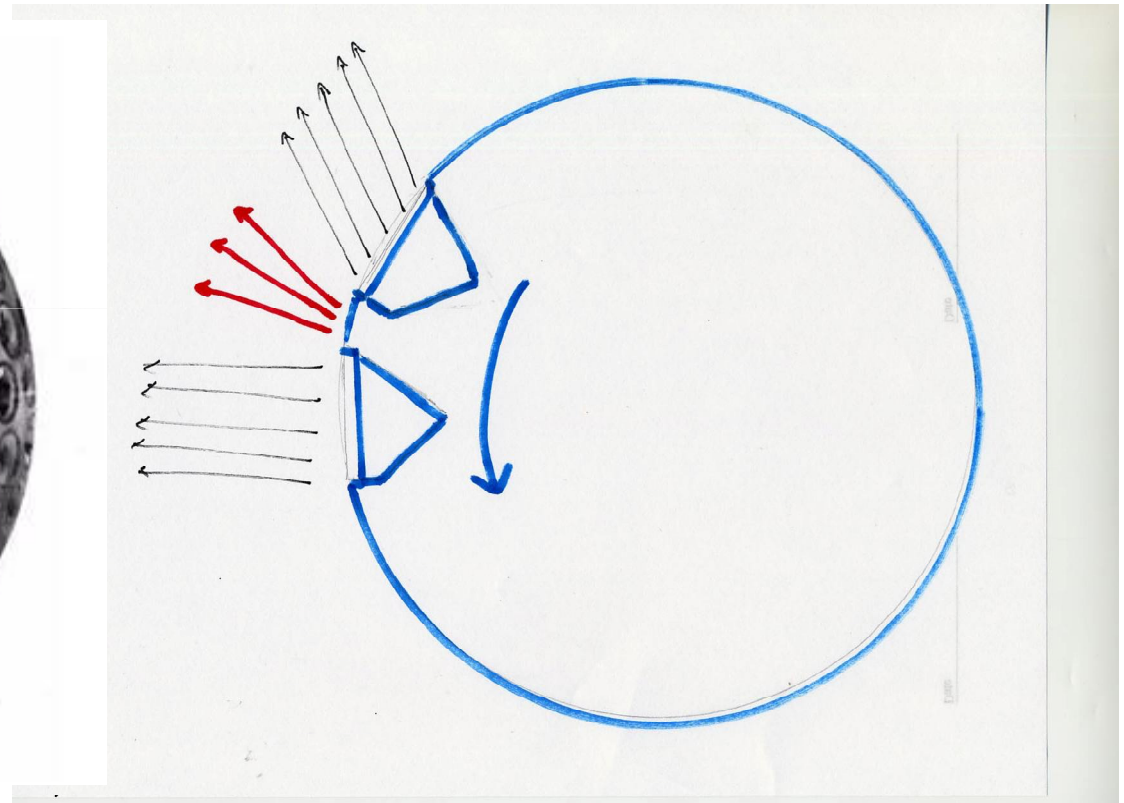
## Specular Reflections



- Fresnel Reflections
  - From Front Face of CCR
  - Forms Narrow Pencil Beams
  - Approximately  $0.5^\circ$  in Width
- Surface Reflections
  - Assume Mirror-Like
  - Broad Angle
  - Approximately  $5^\circ$

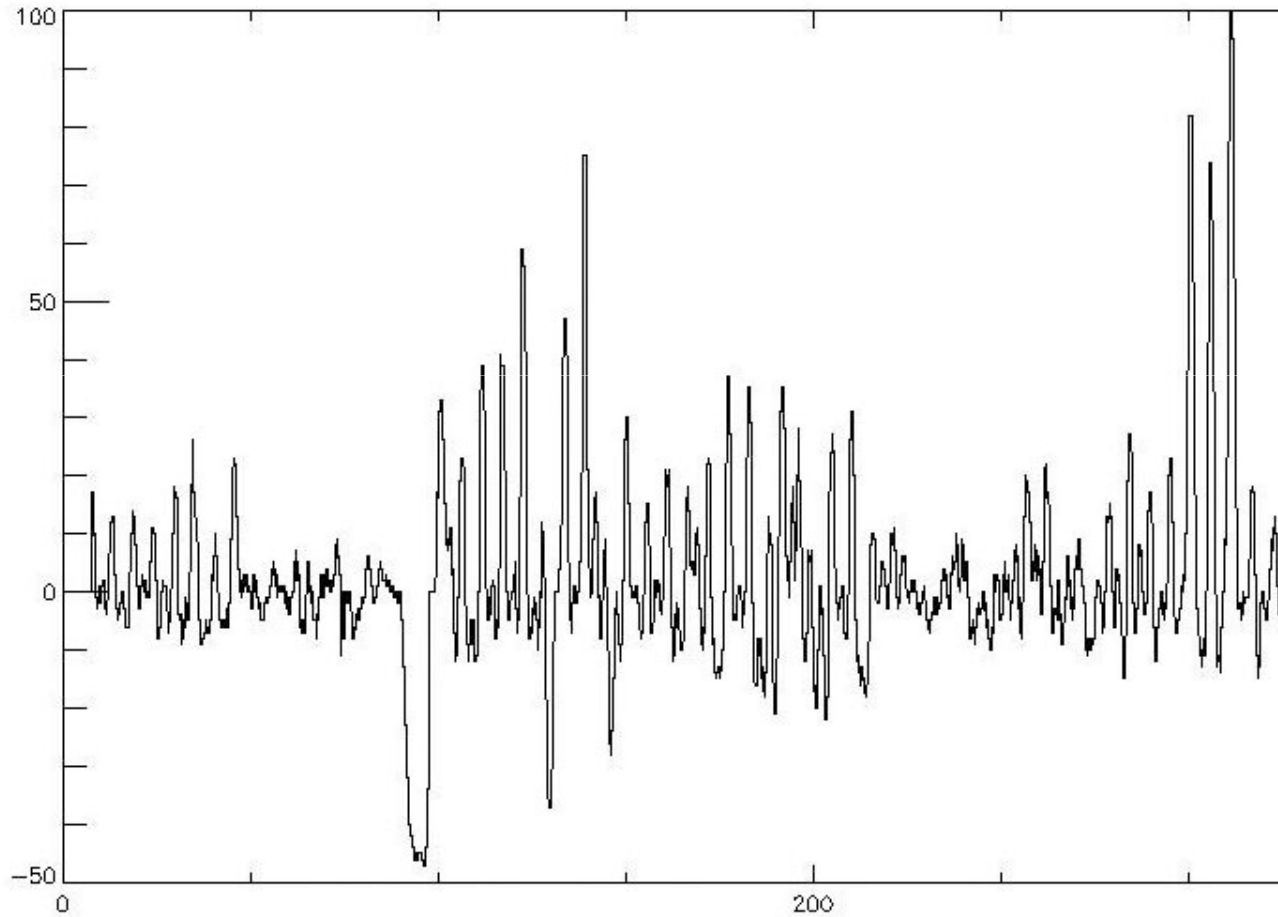


# Pocket Effect

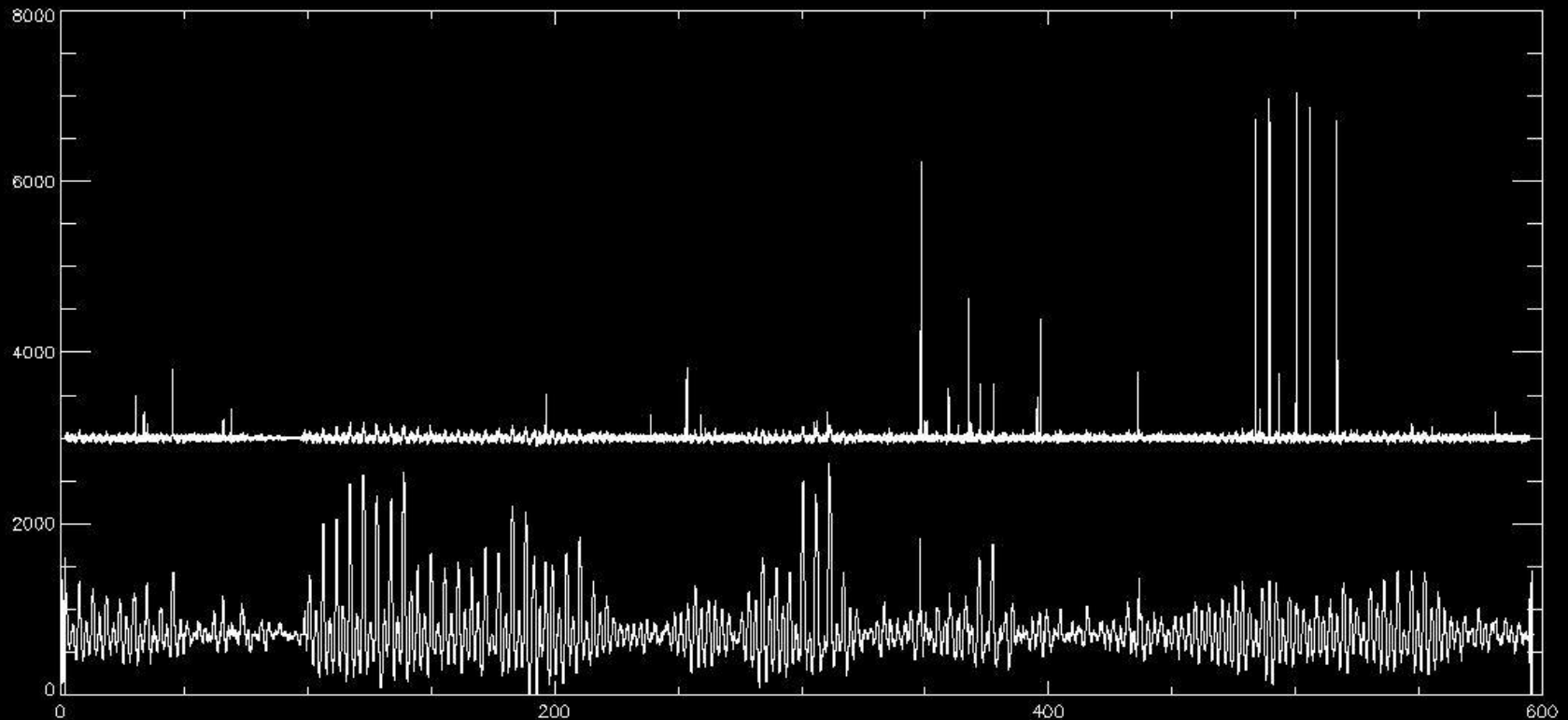




# NRL Stafford Station

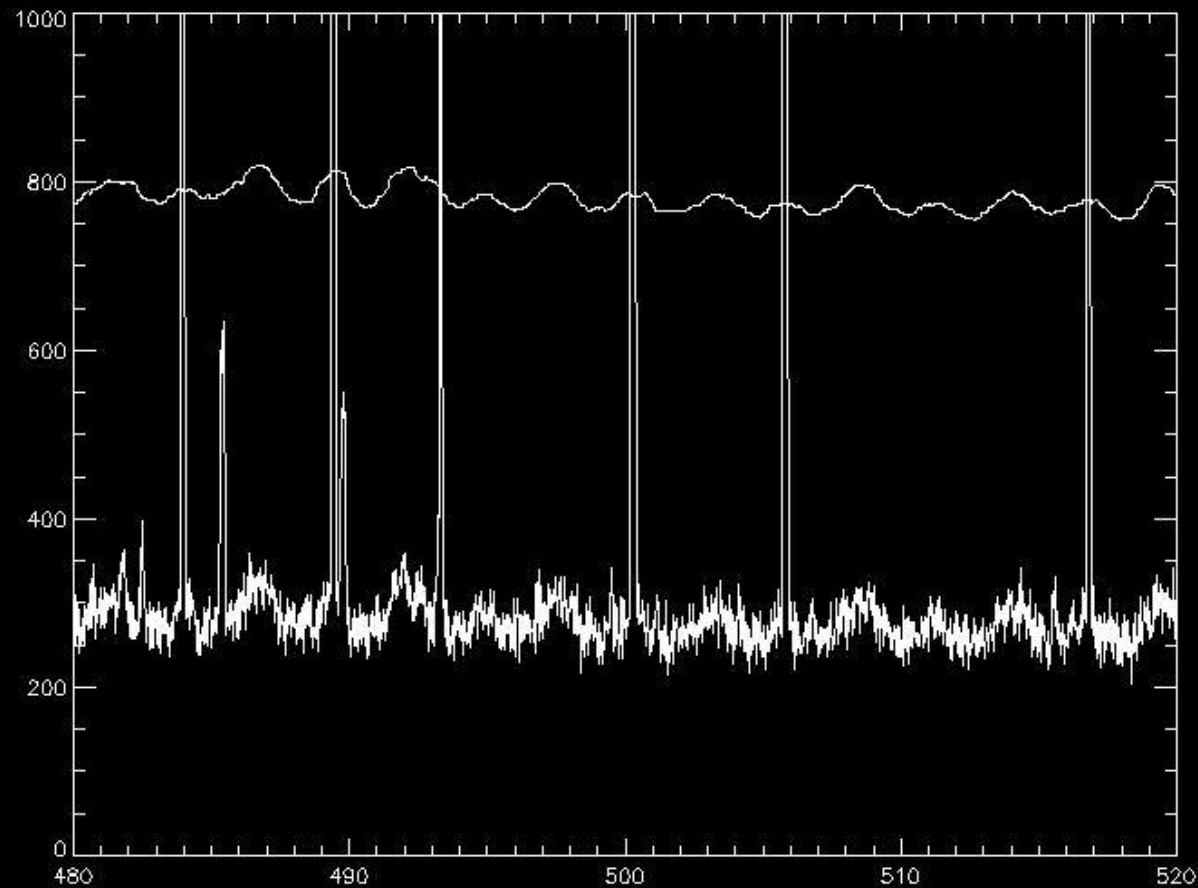


# HIGH SPEED PHOTOMETER AMOS – 3.7 Meter Telescope





# HIGH SPEED PHOTOMETER AMOS – 3.7 Meter Telescope









# Conclusions

- Pocket Effect
  - Provides Monitoring of Spin Axis Orientation
  - Determine Apparent Rotation During a Pass
  - Eventually Obtain Spin Rate & Orientation to  $\sim 0.2^\circ$
- For Evaluation of Thermal Forces on LAGEOS
  - Need Spin Axis Orientation
  - Need Theory of Slowly Rotation LAGEOS
  - Now also Need Spin Rate
- Implementation to be Developed at NRL