On the Satellite Laser Ranging Operations at HartRAO and the Scientific Applications

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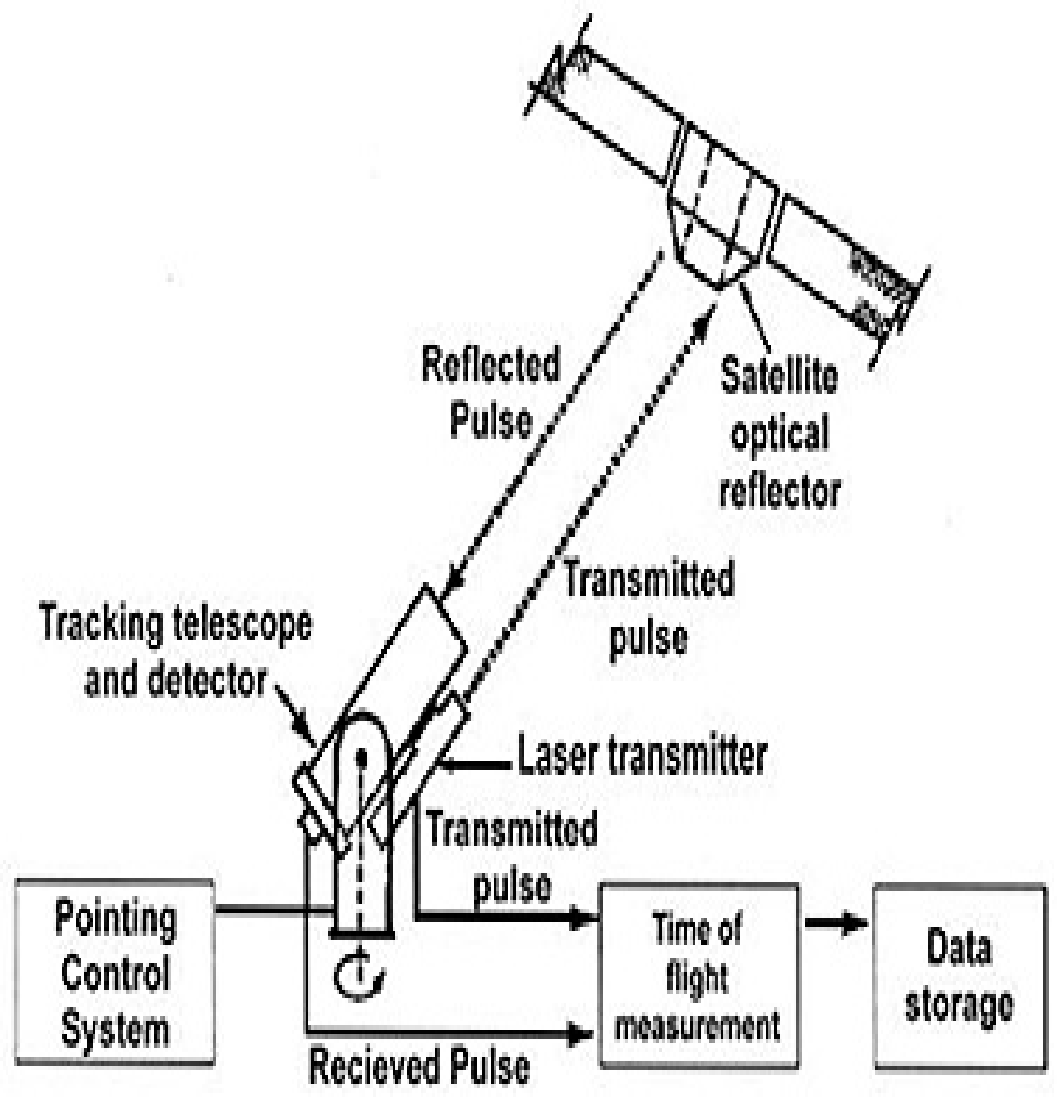
Outline

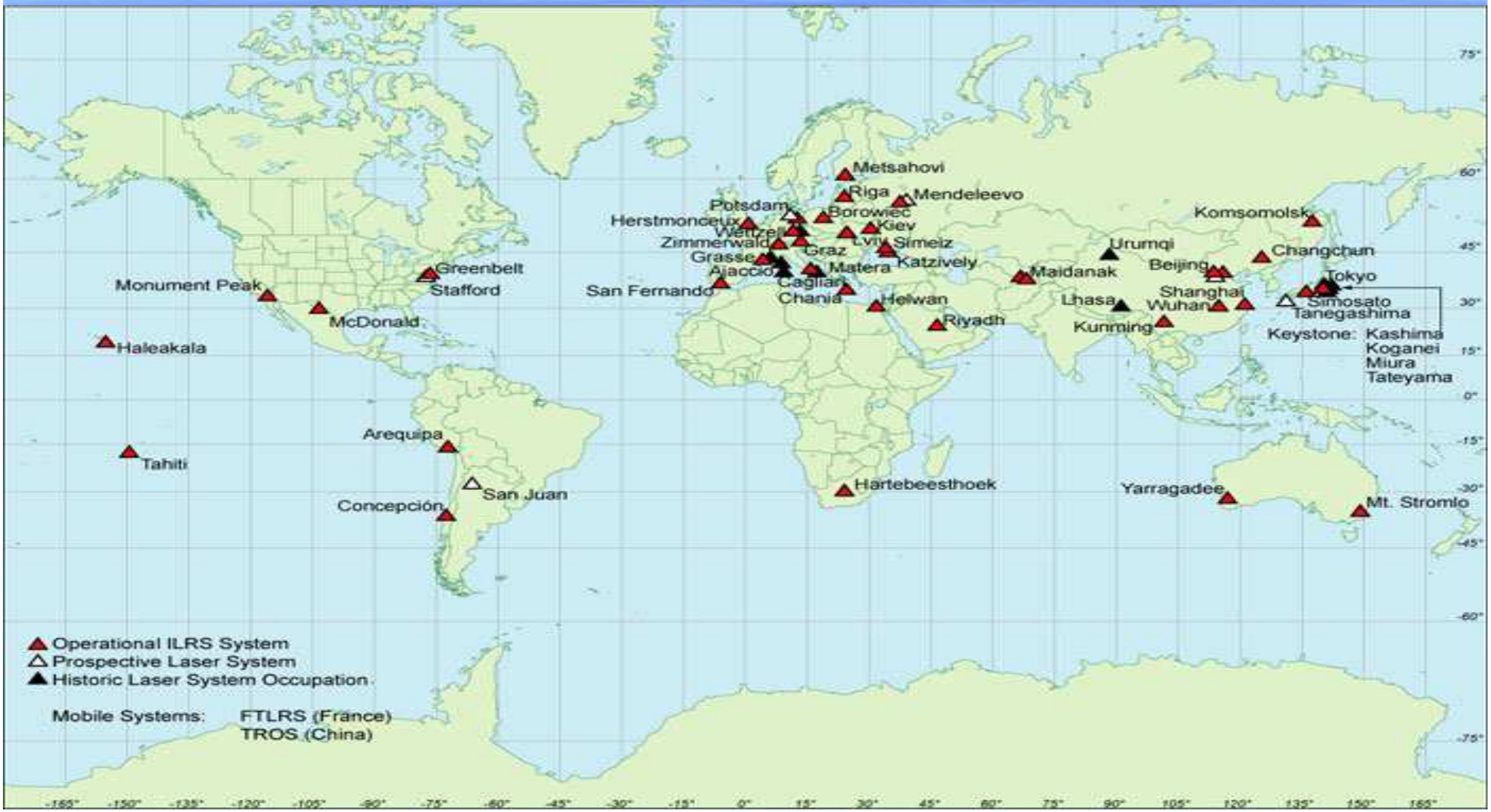
- The concept of SLR
- Overview of SLR data analysis
- SLR products and applications
- Future research focus

Satellite Laser Ranging

- A method of satellite tracking
- A ground station shoots a laser beam to an orbiting satellite
- The satellite's mirrors reflect the laser pulse to the ground station
- Principle: Measure the Time of Flight (TOF) for the round trip of the laser pulse
- TOF signal is analysed -> SLR products



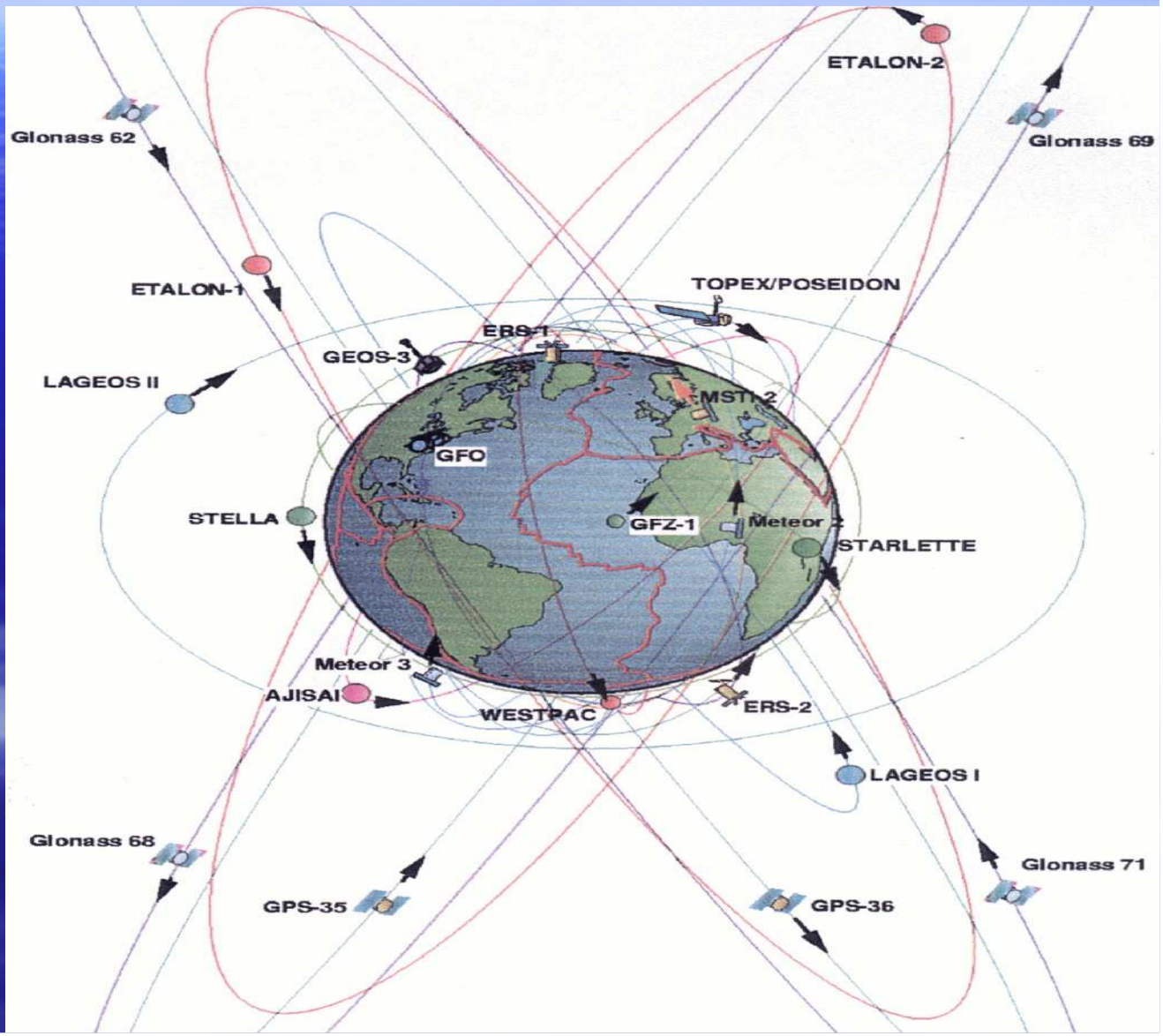
International Laser Ranging Service station network



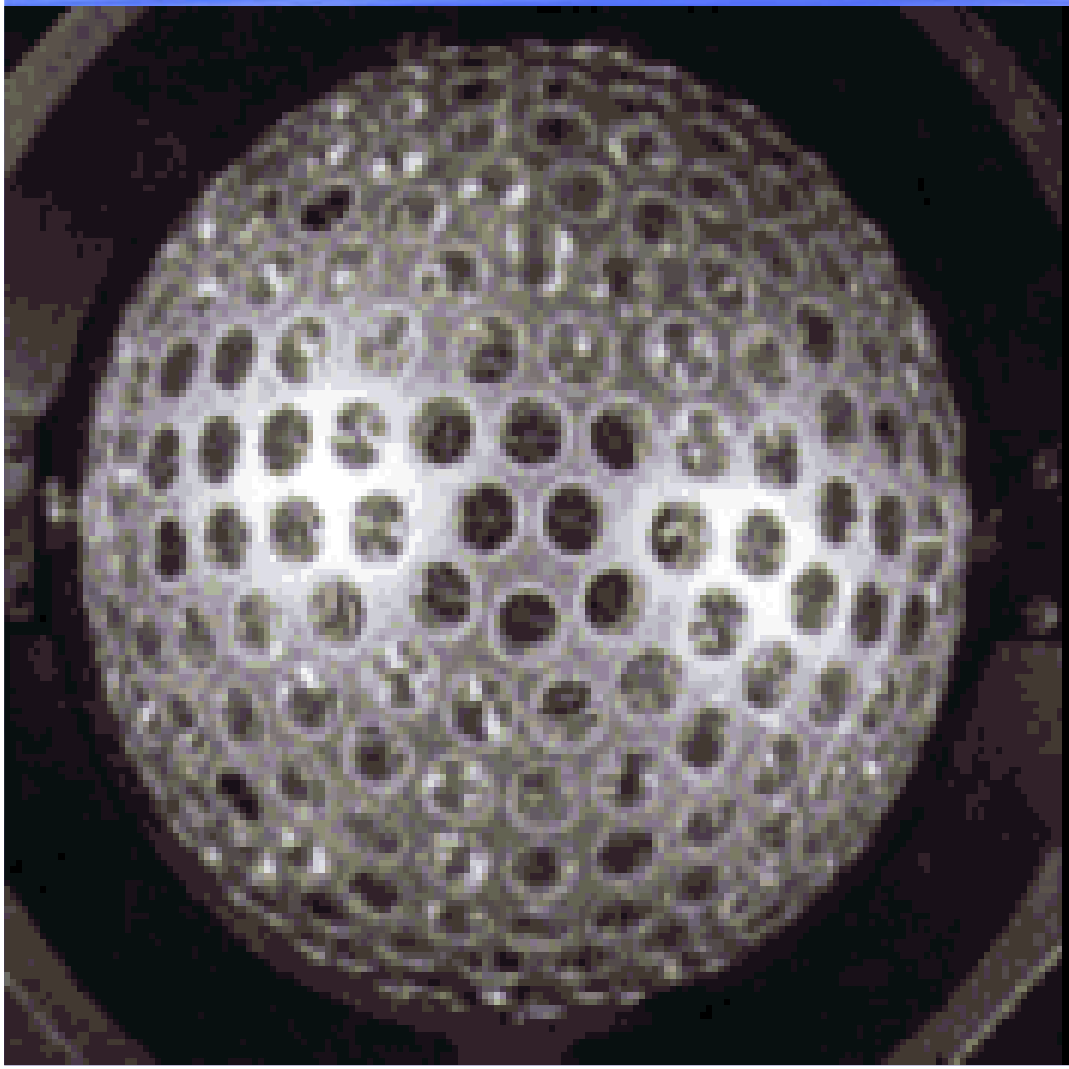
HartRAO's SLR station

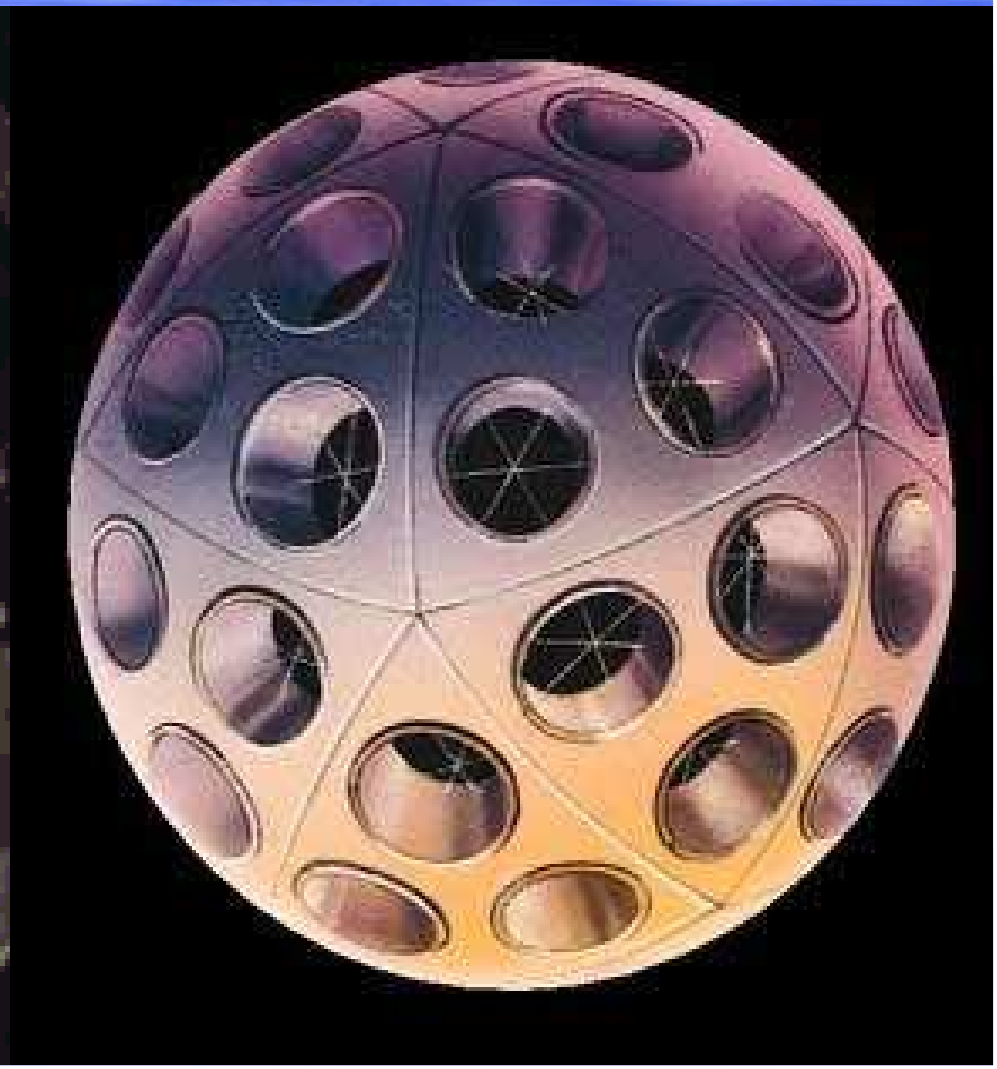
Satellites currently tracked by SLR

- TerraSAR – X
- Grace A/B
- Champ
- Anderra A
- Anderra P
- ICESAT
- GFO
- ENVISAT
- ERS 2
- Jason
- Larets
- Stella
- Starlette
- Beacon
- AJISAI
- LAGEOS 1/2

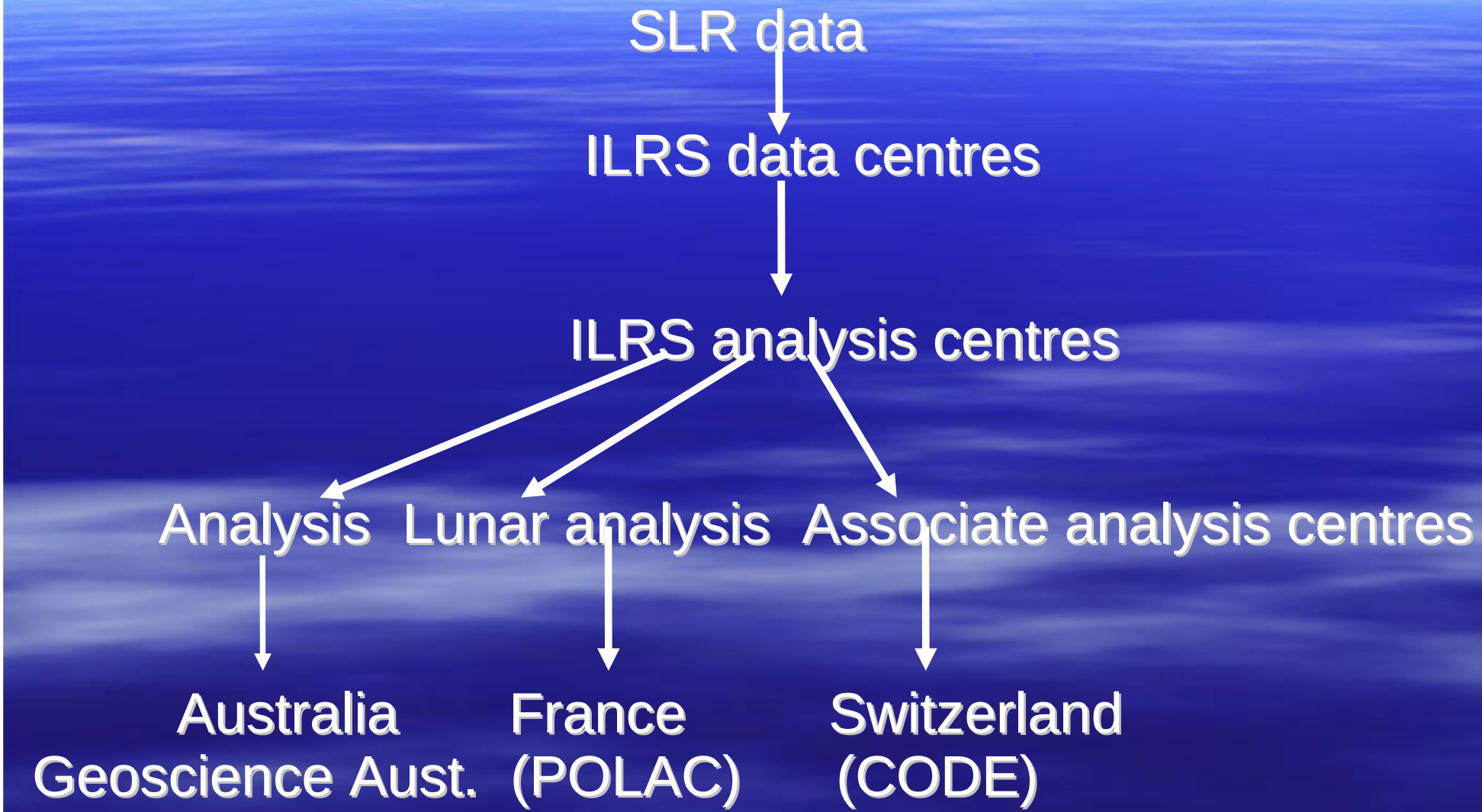


Retro-reflectors on satellites





SLR analysis



SLR products & Applications

- Scientific data products:
- Earth orientation parameters (EOP)
  - Polar Motion (PM)
  - Length of Day (LOD)
  - Earth rotation rates
- Terrestrial Reference Frames (TRF)
- Station coordinates
- Site velocities

SLR products & Applications

- Scientific applications:
  - Geodesy
  - Geology
  - Geophysics
  - Atmospheric sciences

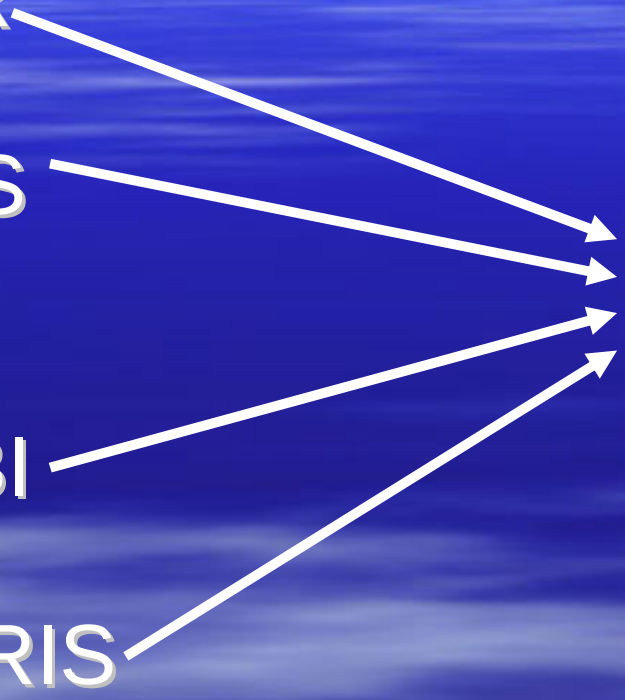
e.g.: - study the variations Earth's rotation

- maintaining & monitoring the TRF
- Earth's gravity field measurements
- sensing the atmosphere – compute atmospheric refractivity

SLR products & Applications

SLR + other geodetic techniques -> combined solution (of EOP & TRF)

- SLR
- GPS
- VLBI
- DORIS



Multi – technique combined solution

Research interests

- Atmospheric research – analysis of the effects of refractivity & gradients (due to atmospheric delay) on HartRAO's SLR station
- Gravity field measurements – studying the variability of Earth's gravity field
- Possible PhD project: The investigation of tuned gravity fields to optimise geodetic station displacements due to Earth and pole tide


Thank You!