NASA Satellite Laser Ranging Program

NASA Goddard Space Flight Center

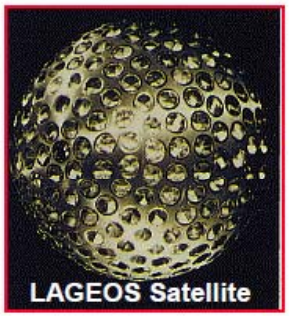
Ron Sebeny
MOBLAS 4 Station Manager

December 9, 2011

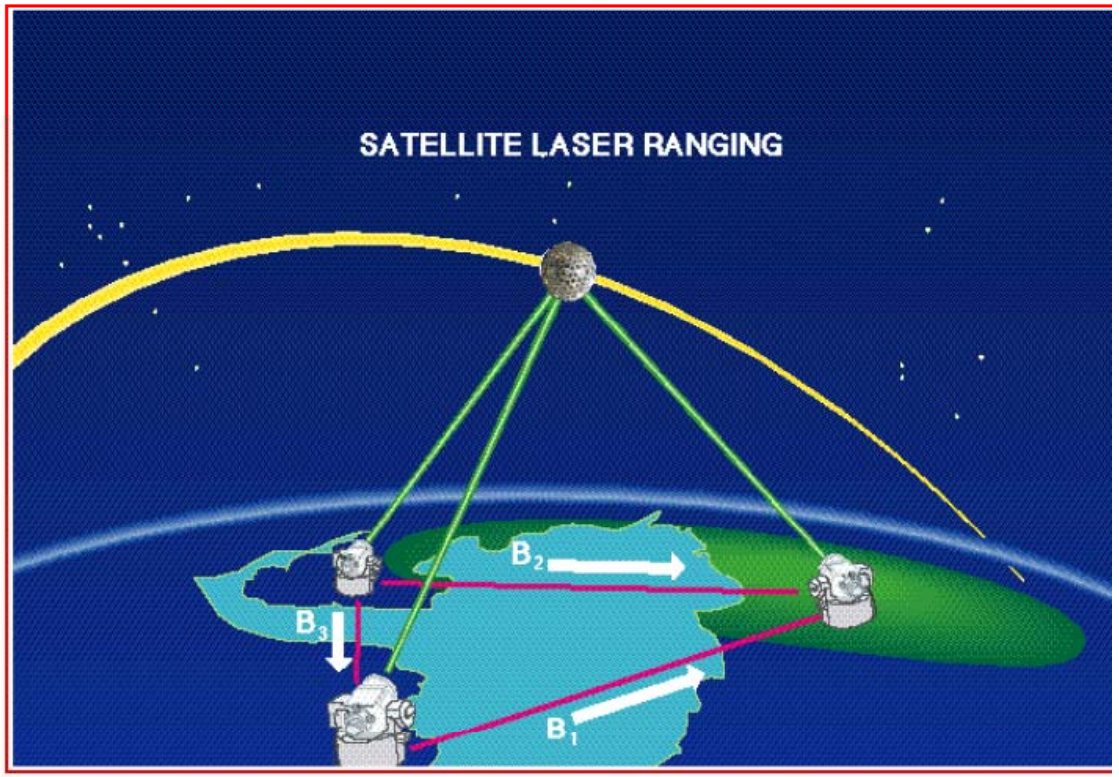
What is Satellite Laser Ranging?

SLR is…The precise measurement of the range between a SLR ground station and a retroreflector- equipped satellite using ultrashort laser pulses.

- Simple range measurement
- Space segment is passive
- Night / Day Operation
- Near real-time global data availability
- Satellite altitudes from 400 km to 20,000 km and to the Moon
- Now to Lunar Orbiter (LRO)
- Satellite Orbit Accuracy
  - ~ 1-2 cm (LAGEOS)


LAGEOS Satellite


ICESat Retroreflector



Map of International Laser Ranging Service (ILRS) Network

Project: Satellite Laser Ranging (SLR)

NASA SLR Network:

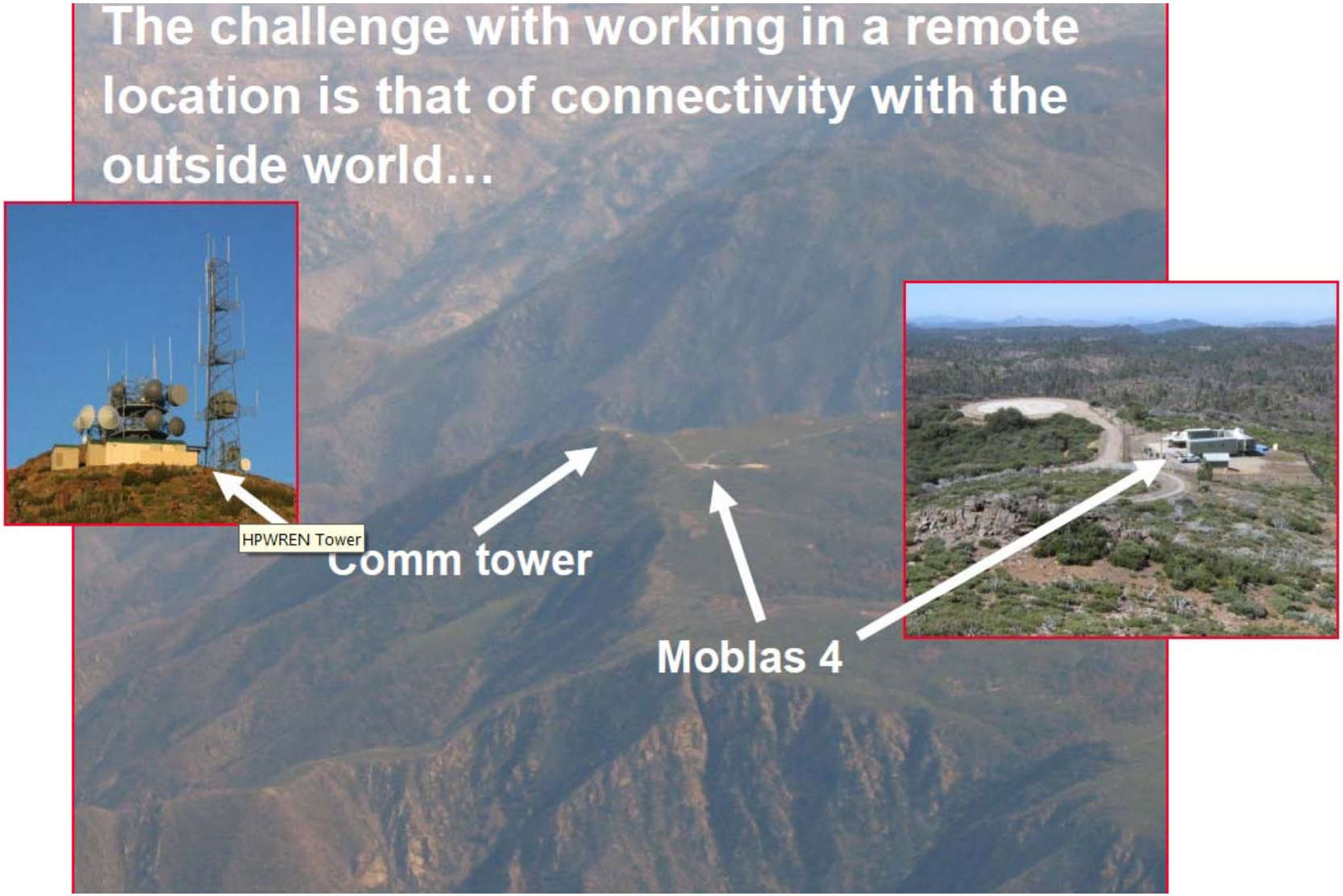
- Eight Ground Stations
- Part of International Laser Ranging Service (ILRS)
- Data operations
  - **Data reception, processing, and analysis**
  - **Orbit determination**
  - **Acquisition generation**
  - **Data Archive**

Laser Ranging Satellite Missions (past/present) :

- **Geodetic:**
  - **Larets, Starlette, Stella, Ajisai, LAGEOS-1, LAGEOS-2, Etalon-1, Etalon-2, BLITS**
- **Earth Sensing/Technology Demonstration:**
  - **CHAMP, GRACE-A, GRACE-B, ICESat, Jason-1, Jason-2, Envisat, ERS-2, ETS-8, Beacon-C, TerraSAR-X, SOHLA-1, GOCE, CryoSat-2**
- **Navigation:**
  - **GLONASS-102, GLONASS-115, GLONASS-120, GPS-35, GPS-36, GIOVE-A, GIOVE-B, Compass-M1**

MOBLAS 4 Monument Peak

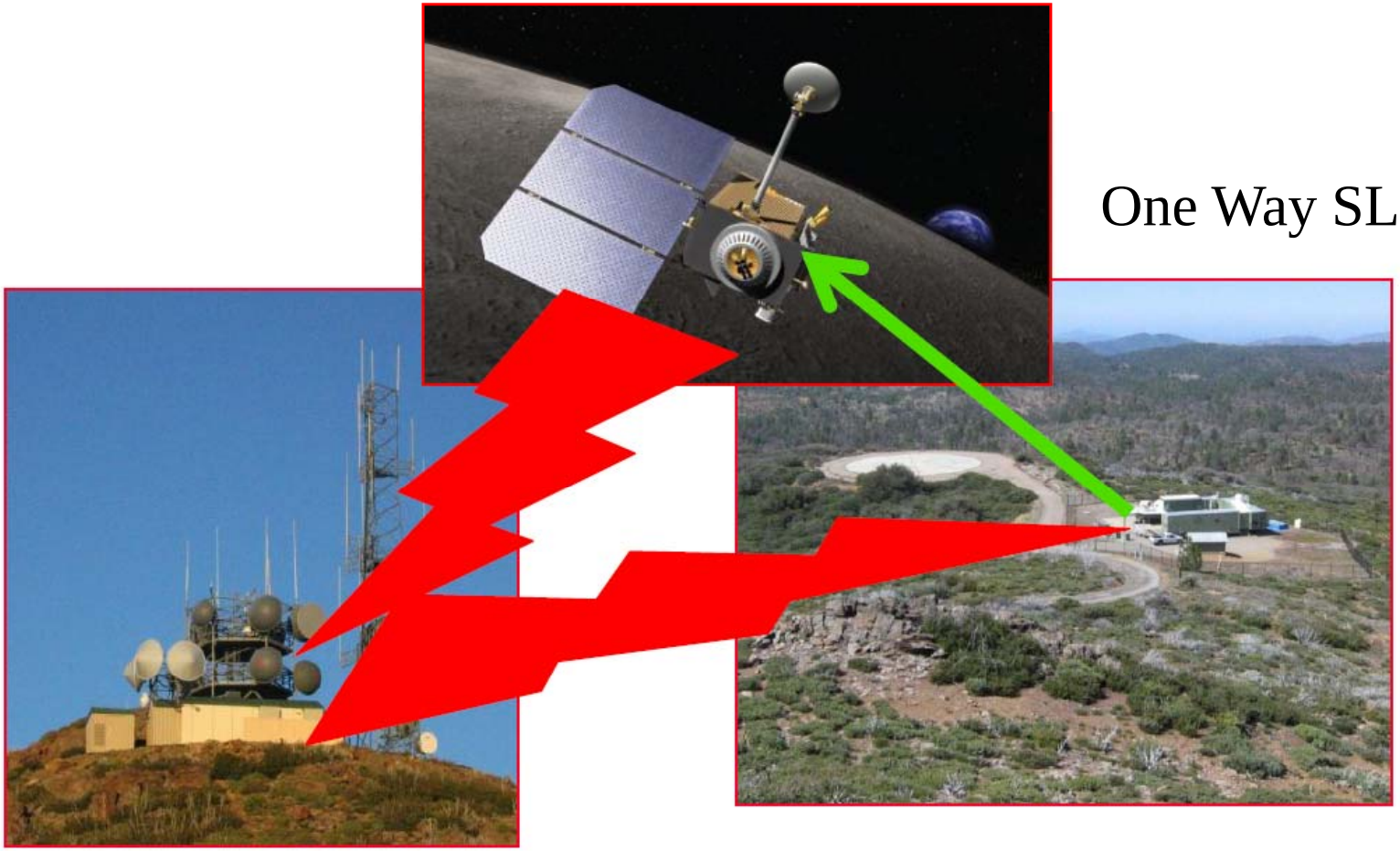
MOBLAS 4 Monument Peak



What is LRO?

- **Lunar Reconnaissance Orbiter**
  - **NASA's Mission to map the moons surface with highest accuracy to date (highly successful thus far)**
- **Laser ranging to LRO will improve the scientific value of the data**
  - **Laser ranging will improve/check the spacecraft altimeter and clock**
- **Instrument is receiver only – not reflector**
- **One way ranging requires satellite feedback via HPWREN to the laser operator**
  - **SLR feedback normally achieved via laser return signal**
- **Feedback via HPWREN must be fast and reliable**

Real-time connectivity requirement



One Way SLR

Reliable Communications from HPWREN is needed to provide feedback on Moblas 4 LRO ranging attempts

Summary

- **MOBLAS 4 has received excellent support from the HPWREN organization/service**
  - **Thank you for recent system upgrades with minimal downtime**
- **MOBLAS 4 will continue to require real-time connectivity for LRO mission in 2012**
  - **HPWREN also required for standard daily connectivity**
- **Future missions like LRO are likely**
- **Monument Peak has some potential for future expansion requiring increased service**
  - **Technology development is in work but no deployment dates/locations have been identified**

Thank you

- **Ron Sebeny**
  - MOBLAS 4 Station Manager
  - Monument Peak, CA
- **NASA SLR Network POC: David McCormick**
  - david.r.mccormick@nasa.gov 301-286-2354

End