



Next Generation GONG ngGONG

Next Generation GONG Network driven by Space Weather Forecasting

The National Solar Observatory (NSO) is promoting the definition and design of the **Next Generation Global Oscillations Network Group (ngGONG)**. This network will replace NSO's existing facilities, GONG and SOLIS as both are more than 20 years old and new requirements for synoptic solar observations have arisen since their construction. There is strong interest for a new solar synoptic network within the space weather research and forecasting agencies in the US, but also within the broader international solar community.

NSO proposes to develop **ngGONG** to provide solar data on a continual basis. Once operational, ng GONG will:

- Measure the magnetic polarity of boundary data that propagate the magnetic connectivity from the solar surface into the heliosphere.
- Map the 3-D magnetic topology of solar erupting structures in the chromosphere and corona, increasing advanced warning of space weather events from hours to days.
- Anticipate processes in the solar interior and on the Sun's far-side that impact heliospheric conditions.
- Provide context for high-resolution observations of the Sun as well as for in situ single-point measurements throughout the heliosphere.

The instruments that currently feed Space Weather operational models were not initially designed for that purpose. **ngGONG will be the first ground based network that includes operational Space Weather requirements from its conception.** We anticipate the breadth of knowledge that ngGONG will provide about the magnetic linkages in the solar system to transfer into the developing field of exo space-weather and its impact on the habitability of other worlds.

www.nso.edu/nisp

ngGONG is an international effort that builds on our experience with GONG, and incorporates the US expertise with that of other countries that operate synoptic programs.



The National Solar Observatory is operated by AURA under a cooperative agreement with the National Science Foundation.



Financials

Construction of the ngGONG is estimated at \$100 million.

Operations costs for ngGONG are expected to be \$1 million per site annually, totaling \$6 million per year.

Why do we need ngGONG?

Next Generation GONG will be a ground-based network of Space Weather driven observatories that will provide continuous, robust coverage of solar variability over timescales of decades.

Benefits of a ground-based space weather network

Lifetime – Space missions have limited lifetimes due to the harsh environment at their location, and due to the difficulty in repairing them when they malfunction. In principle, ground-based systems can be operated indefinitely.

Upgrades and Maintenance – Once a space mission is launched it is virtually impossible to access for upgrades or repairs. Ground-based systems can be continually maintained and improved.

Cost – The costs of constructing and operating ground-based systems are typically less than 20% of the costs for space missions.



Artist's impression of ngGONG shelter.

Data Delivery – The rate at which data can be returned from a space mission is highly constrained by the distance to the spacecraft, the power of the spacecraft telemetry system, and the sensitivity of the receiving antennas on the ground. None of these restrictions exist for ground-based systems that can also take advantage of the continual improvements in internet technology.

Space Weather Vulnerability – Space systems are embedded in the very environment that causes space weather and are thus at risk for damage from that source. Ground-based systems are much less vulnerable as they are shielded by the Earth's magnetic field and atmosphere.

