



NSF's National Solar Observatory

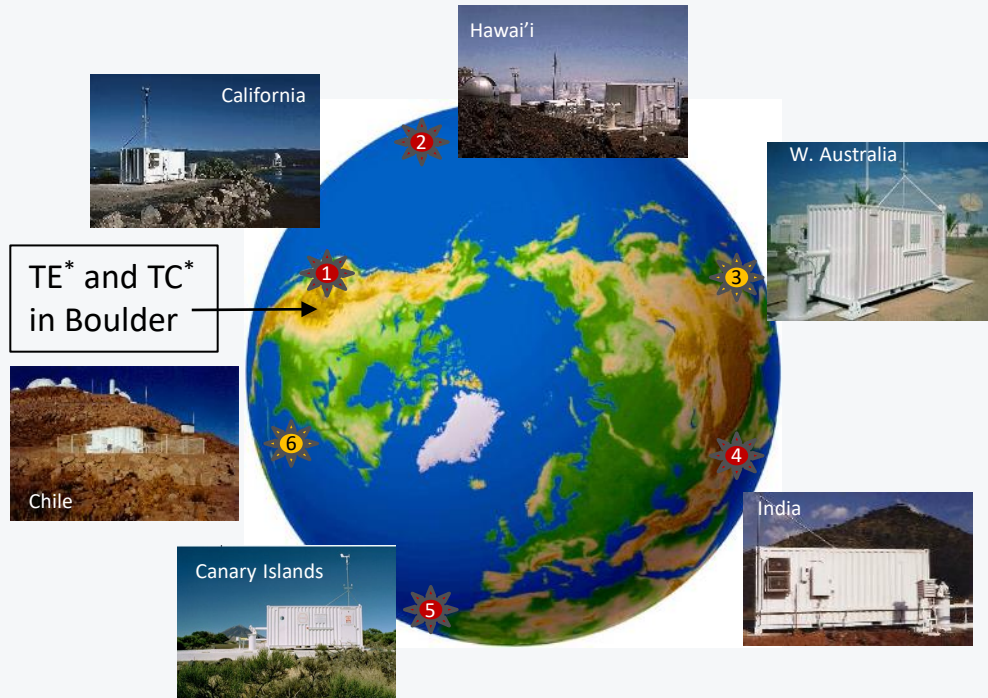
The Next-generation Ground based solar Observing Network (ngGONG)

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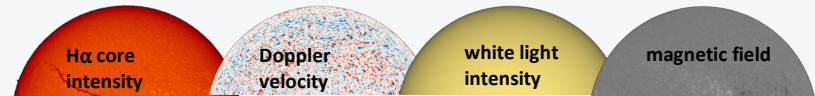
Global Oscillations Network Group (GONG)

- Global Oscillations Network Group (GONG) 1995-2021 and beyond



Data for Research and SW Forecast

- Helioseismology: Plasma flows inside the Sun (dynamo, cycle prediction, far-side imaging etc)
- Magnetic fields: LOS photosphere, 3D structure and evolution, flare & CME initiation, irradiance, modeling of solar wind, geomagnetic disturbances etc



GONG is rapidly aging; does not meet new science requirements.

*TE and TC are two engineering sites in Boulder, CO





Proposal for ngGONG

- NSO-HAO consortium proposed developing a new facility: next generation Ground-based solar Observing Network (ngGONG).
- NSF's Mid-scale Research Infrastructure I
- Objectives: to enable fundamental research in solar and space physics, solar-stellar astrophysics, and modeling of geospace and space weather.
- Once operational, ngGONG will:
 - Provide key infrastructure for measurements of the processes that drive the solar atmosphere and space weather throughout the heliosphere;
 - Provide quantitative context for high-resolution solar and in-situ measurements and models;
 - Bridge solar and stellar research in the area of stellar activity and its consequences for habitability on planets around other stars; and
 - Enable discoveries by building a multi-decade record of solar variability to be exploited by future generations of scientists.



ngGONG telescopes and Instruments

- Science requirements: full disk vector magnetic field measurements (photosphere and chromosphere), Doppler (single height helioseismology), broad/narrow-band imaging, coronal and sun-as-a-star observations.
- a 50-cm Full-disk Telescope for Visible/IR that feeds an IR Vector Spectropolarimeter and a Helioseismic Doppler Imager, a high-cadence Full-Disk Imaging Polarimeter, a White-Light Coronagraph, an Emission-line Coronagraph, and a Sun-as-a-star instrument.
- 5-15 meter tower, LOAO





ngGONG sites

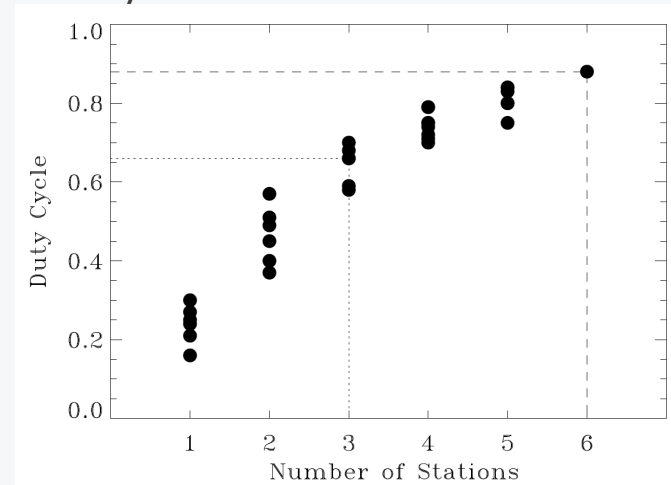
- ngGONG is envisioned as 3-6 site network (defined by cost and helioseismology requirements)

- Single height helioseismology (6 sites)
- Spectropolarimeter, imagers (3 sites)
- Coronagraphs (2 sites)

- Current GONG sites as starting point

- Instruments:

- high-sensitivity spectropolarimeter (Fe I 1.56 μ), other lines: Ca II 8542A, He I 10830A
- visible-infrared tunable filter for narrowband imaging polarimetry;
- helioseismic Doppler imager (single height – multi-height as a future upgrade);
- sun-as-star instrument (high-resolution spectra, polarimetry as an upgrade).
- coronagraphs (white light and emission-line)





ngGONG and SPRING

- ngGONG is not in competition with SPRING
- NSF's Mid-scale Research Infrastructure I funding envelop (\$20M-100M)
- Will require domestic (NOAA, DoD) and international partnership
- Emphasizes science, not operational space weather forecast
- If funded, the design work can start in early 2022.
- Construction will require submitting a separate proposal.