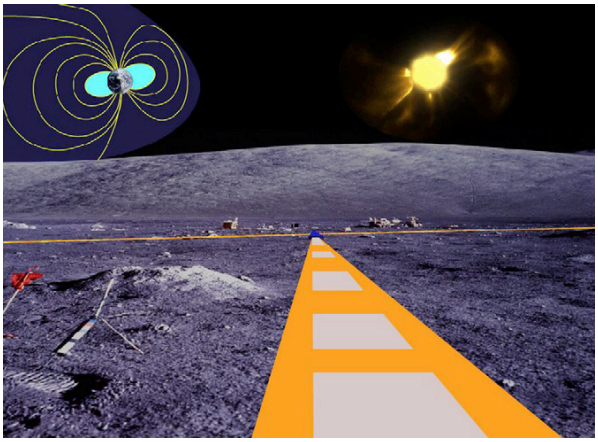
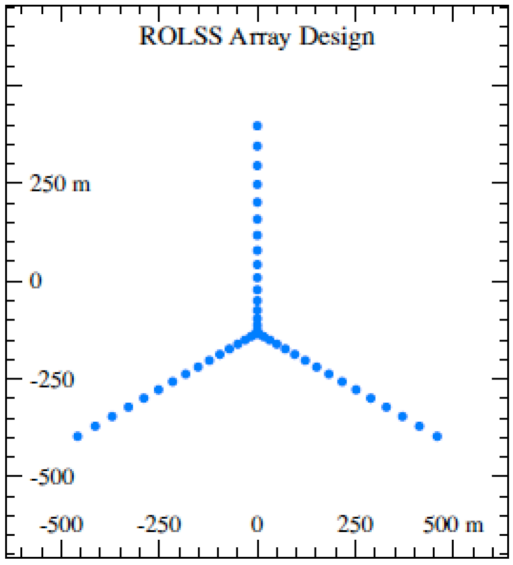
LOW FREQUENCY RADIO ASTRONOMY FROM THE LUNAR SURFACE. R. J. MacDowall[1] , T. J. W. Lazio[2], and J. O. Burns[2], [1]NASA Goddard SFC (Robert.Macdowall@nasa.gov), [2]Jet Populsion Laboratory/California Institure of Technology (Joseph.Lazio@jpl.nasa.gov), [3]University of Colorado (Jack.Burns@cu.edu)

Our view of the Universe at wavelengths longer than about 30 m (frequencies < 10 MHz) is impeded significantly by the Earth's ionosphere. These wavelengths correspond to frequencies comparable to or below the plasma frequency of the ionosphere, so that any celestial radiation is reflected. The actual plasma frequency varies as a function of solar illumination, solar cycle, and even geomagnetic latitude, and there have been a series of attempts to exploit favorable conditions to observe from the ground at these wavelengths. In general, however, ground-based observations are not possible [1].



Artist's illustration of the ROLSS array on the lunar surface.

A variety of observatory concepts have been proposed, which we will summarize, with emphasis on the Radio Observatory on the Lunar Surface for Solar studies (ROLSS). The ROLSS array consists of 3 arms arranged in a Y configuration, subject to local topographic constraints. Each arm is approximately 500 m long, providing approximately 2 deg angular resolution at 30-m wavelength (10 MHz). The arms themselves consist of a polyimide film on which electrically-short dipole antennas are deposited, and they hold the transmission system for sending the electrical signals back to the central electronics package (CEP), located at the intersection of the arms. The CEP performs the requisite filtering and digitization of the signals, then downlinks them to the ground for final imaging and scientific analysis. The array would operate over the wavelength range 30–300 m (1–10 MHz), with a selectable, variable frequency sub-band being able to be placed anywhere within the operational wavelength range.



Science antenna distribution along the antenna arms.

An alternate being considered to the radio observatory being located on the lunar surface is a large array of nanosatellites (CubeSats) with dipole electric field antennas to collect the data. Even if this option were to fly, it would still be beneficial to place the array in an relatively stable, elliptical orbit around the moon, so that terrestrial radio interference would be blocked when the array was behind the moon.

In summary, the moon has a key role to play in the advancement of low frequency radio astronomy. A radio observatory like ROLSS would be the logical precursor to a larger radio telescope on the far side of the Moon for the study of astrophysics and cosmology.

References: [1] Lazio, T. J. W. et al. (2011), *Adv. Space Res., 48,* 1942-1957.