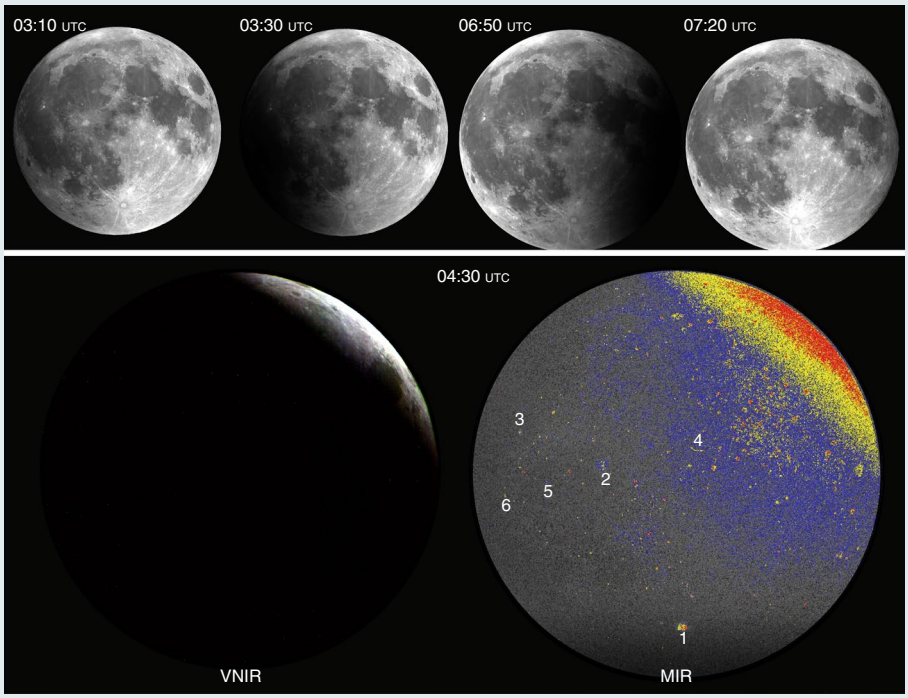
SOLAR SYSTEM

The ‘super blood wolf Moon’ from space

A total lunar eclipse known as the super blood wolf Moon took place on 20–21 January. China’s geostationary satellite Gaofen-4 (GF-4) monitored the eclipse in multiple bands. GF-4, part of the China High-resolution Earth Observation System, can produce images in visible and near-infrared (VNIR) and mid-infrared (MIR) wavelengths (up to 4.10 μm). During the lunar eclipse, which lasted from 02:36 UTC until 07:48 UTC with middle of totality at 05:13 UTC, the entire lunar disk was imaged in a single exposure with spatial resolutions of 530 m per pixel and 4.4 km per pixel for VNIR and MIR, respectively (pictured).

The Earth’s penumbral shadow is so faint that naked-eye observations won’t perceive brightness changes of the Moon until the penumbra has reached roughly 70% across the lunar disk. Unaffected by Earth’s atmosphere, GF-4’s image taken at 03:10 UTC already shows that the brightness of the Moon’s left-hand limb is 40% of its original brightness. Similarly, an image taken at 07:20 UTC, near the end of the eclipse, shows that the brightness of the Moon’s right-hand limb is one half of its original brightness.

GF-4 MIR images illustrate the quick cooling of the lunar surface during the eclipse and the strong temperature contrast between the shadowed and the still-illuminated parts of the disk (pictured, lower-right panel). The lunar regolith cools faster than the boulders on the surface. As a result, warm features on the MIR map suggest elevated rock concentrations (numbered on lower-right panel: 1, Tycho; 2, Copernicus; 3, Aristarchus; 4, Rima Hyginus; 5, Kepler; and 6, Reiner). Tycho is very clearly visible in the eclipse image, indicating large thermal inertia due to higher rock abundance. This effect is also used by the Diviner Radiometer instrument on the Lunar Reconnaissance Orbiter (LRO) to derive rock abundances on the lunar surface. Unlike the LRO, which would need multiple orbits to build up such a map, this rich new dataset from GF-4 allows direct mapping of the whole near-side of the Moon in multiple wavelengths with a single exposure. ❐



Yunzhao Wu[1,2,3]
[1]Key Laboratory of Planetary Sciences, Purple Mountain Observatory, Chinese Academy of Sciences, Nanjing, China. [2]CAS Center for Excellence in Comparative Planetology, Hefei, China. [3]Planetary Spectroscopy Laboratory, Institute for Planetary Research, DLR, Berlin, Germany.
e-mail: wu@pmo.ac.cn

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