

Moon Photography Resources

Times and Positions

Online Calculators

- Large Format Page Sun/Moon Calculator
www.lfphoto.info/sunmooncalc/
- U.S. Naval Observatory web site www.usno.navy.mil

Astronomy Software

Software for Windows

- Fossil Creek Software
weba.viawest.net/users/fcs/ho/
 - Heavenly Opportunity (Windows 9x and later)
- Digital Light & Color www.dl-c.com
 - Ephemeris (free) (Windows 9x and later, Windows CE 3)
- Bruce Sidell www.moonrise.us
 - Moonrise (Windows 9x and later)

Software for Windows and Macintosh

- Willmann-Bell www.willbell.com
 - U.S. Naval Observatory MICA (PC & Mac)

Program Source & Documentation

- *Sky & Telescope*—Downloadable Software
skyandtelescope.com/resources/software
 - sunup.bas
 - moonup.bas
- *Sky & Telescope*—Articles
 - July 1989, pp. 78–80, “Ups and Downs of the Moon”
 - August 1994, pp. 84–85, “Sunrise and Sunset: A Challenge”
 - March 1995, pp. 84–86, “Sunrise/Sunset Challenge: The Winners”
- Articles—Sun and Moon Position
 - Van Flandern, T. C., and Pulkkinen, K. F. (1979). “Low-Precision Formulae for Planetary Positions,” *Astrophysical Journal Supplement Series* 41:391–411
 - Available from USNO reprint service:
www.usno.navy.mil/library/libsource/REPRINTS.HTML

Astronomy Calculation Books

- Montenbruck, Oliver, and Pfleger, Thomas. *Astronomy on the Personal Computer*. 4th ed. Berlin: Springer, 2000
- Meeus, Jean. *Astronomical Algorithms*. 2nd ed. Richmond: Willmann-Bell, 1999
- Duffett-Smith, Peter. *Practical Astronomy with Your Calculator*. 3rd ed. Cambridge: Cambridge University Press, 1988
- Duffett-Smith, Peter. *Easy PC Astronomy*. Cambridge: Cambridge University Press, 1996

Photography Books

- Adams, Ansel. *Natural Light Photography*. Book 4 of the Ansel Adams Basic Photo Series. Boston: New York Graphic Society, 1952.
- Adams, Ansel. *The Negative*. Book 2 of The New Ansel Adams Photography Series. Boston: New York Graphic Society, 1981.
- Petersen, Bryan F. *Understanding Exposure*. New York: AMPHOTO, 1990

Other Book

- Lynch, David K., and William Livingston. *Color and Light in Nature*. 2nd ed. New York: Cambridge University Press, 2001.

Moon Photographs

- Flaherty, Dennis. *Mono Lake: Mirror of Imagination*. Santa Barbara: Companion Press, 1996
- Larson, Frederic. *Mystical San Francisco*. San Francisco: San Francisco Chronicle Press, 2005
- Larson, Frederic (*San Francisco Chronicle*).
“Mystical Photography” blog on www.SFGate.com
Also: www.SFGate.com/buyphotos
- Rigler, James. *San Francisco Moon*. Berkeley: Celestial Arts, 1998

Moonrise, Hernandez, NM

- Adams, Ansel. *Examples: The Making of 40 Photographs*. Boston: Little, Brown, and Company, 1983.
- Callahan, Sean. “Short Takes: Countdown to Moonrise,” *American Photographer*, January 1981
- di Cicco, Dennis. “Dating Ansel Adams’ Moonrise,” *Sky & Telescope*, November 1991
- Maloney, T. J., ed. *U.S. Camera 1943*. New York: Duell, Sloan & Pierce, 1942.

Mapping Software

- National Geographic
www.nationalgeographic.com/topo/

- Delorme
www.delorme.com
- Maptech
www.maptech.com

Compasses & Clinometers

- Resellers
 - REI: www.rei.com
 - Wide-Screen Software: www.wide-screen.com
- Manufacturers
 - Brunton: www.brunton.com
 - Silva: www.silva.se
 - Suunto: www.suunto.com

Magnetic Field Calculation Software

- Interpex
www.interpex.com
 - Geomagix (Windows 9x/NT)
- Resurgent Software
www.resurgentsoftware.com/geomag.html
 - GeoMag (Windows 98/2000/XP)
- NOAA Satellite and Information Services—Geomagnetism
www.ngdc.noaa.gov/seg/potfld/geomag.shtml

Formulas

Rise and Set Azimuths

$$A_r \approx \cos^{-1} \frac{\sin \delta}{\cos \phi}$$

$$A_s = 360^\circ - A_r$$

Angle of Path with Horizon

$$\psi \approx \cos^{-1} \frac{\sin \phi}{\cos \delta}$$

Maximum Altitude

$$h_{\max} = 90^\circ - |\delta - \phi|$$

Where

A_r = Azimuth of rise

A_s = Azimuth of set

h_{\max} = Maximum altitude

δ = Declination

ϕ = Observer's latitude

ψ = Angle of path with horizon

Example 1: Rise and Set Azimuth Range for the Moon in San Francisco— Maximum Declination

Latitude: 37.775° ; Moon declination: $\pm 28.7^\circ$

$$A_r \approx \cos^{-1} \frac{\sin \pm 28.7^\circ}{\cos 37.775^\circ} = 52.6^\circ \text{ to } 127.4^\circ$$

$$A_s = 360^\circ - A_r = 232.6^\circ \text{ to } 307.4^\circ$$

Example 2: Rise and Set Azimuth Range for the Moon in San Francisco— Minimum Declination

Moon declination: $\pm 18.1^\circ$

$$A_r \approx \cos^{-1} \frac{\sin \pm 18.1^\circ}{\cos 37.775^\circ} = 66.9^\circ \text{ to } 113.1^\circ$$

$$A_s = 360^\circ - A_r = 246.9^\circ \text{ to } 293.1^\circ$$