WEYMOUTH ASTRONOMY

Sky Watcher

Volume 16, Issue 7
10 December 2021

Trips / Events

Ideas for trips and events always welcome!

events@weymouthastronomy.co.uk

Society Meetings

Dec 15—@WAS Members' short talks and Social

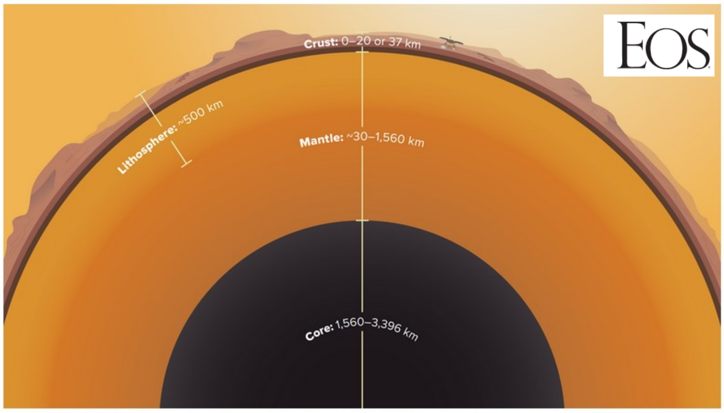
Lots more to come in the new year. Stay tuned!

WAC Upcoming Events:

	Watch website for online options.
10 Dec	**Winter Social**
More to come in 2022!	

Latest News:

Recently research has been reported from the Insite mission regarding the internal structure of Mars based on seismic data from the internal Marsquakes >700 and counting. A fascinating article on the structure has appeared in EOS as well as Sky and Telescope recently. If you haven't read the details yet, the image on the right illustrated what the seismic waves have revealed as the internal layers of Mars. Read more at https://tinyurl.com/mryypx68



A hardworking seismometer has helped scientists reveal the interior structure of Mars in more detail than ever before. Credit: Mary Heinrichs, AGU

Hope you all have a lovely holiday month. Very best wishes for a Happy New Year!

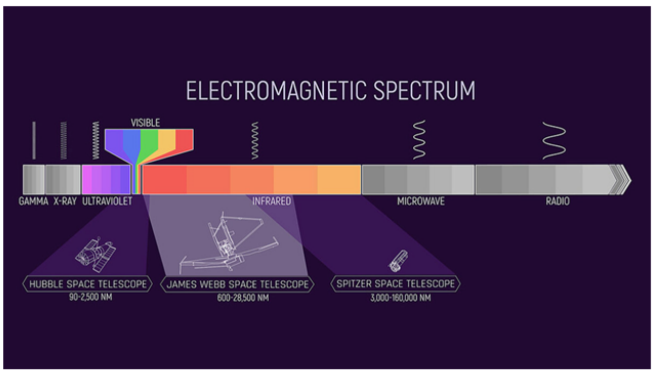
Until next month...Clear Skies! ~SLKarl

The James Webb Telescope: Ready for Launch!

by David Prosper

NASA's James Webb Space Telescope is ready for lift-off! As of this writing (November 15), the much-anticipated next-generation space telescope is being carefully prepared for launch on December 18, 2021, and will begin its mission to investigate some of the deepest mysteries of our universe.

The development of the Webb began earlier than you might expect – the concept that would develop into Webb was proposed even before the launch of the Hubble in the late 1980s! Since then, its design underwent many refinements, and the telescope experienced a series of delays during construction and testing. While frustrating, the team needs to ensure that this extremely complex and advanced scientific instrument is successfully launched and deployed. The Webb team can't take any chances; unlike the Hubble, orbiting at an astronaut-serviceable 340 miles (347 km) above Earth, the Webb will orbit about one million miles away (or 1.6 million km), at Lagrange Point 2. Lagrange Points are special positions where the gravitational influence between two different bodies, like the Sun and Earth, "balance out," allowing objects like space telescopes to be placed into



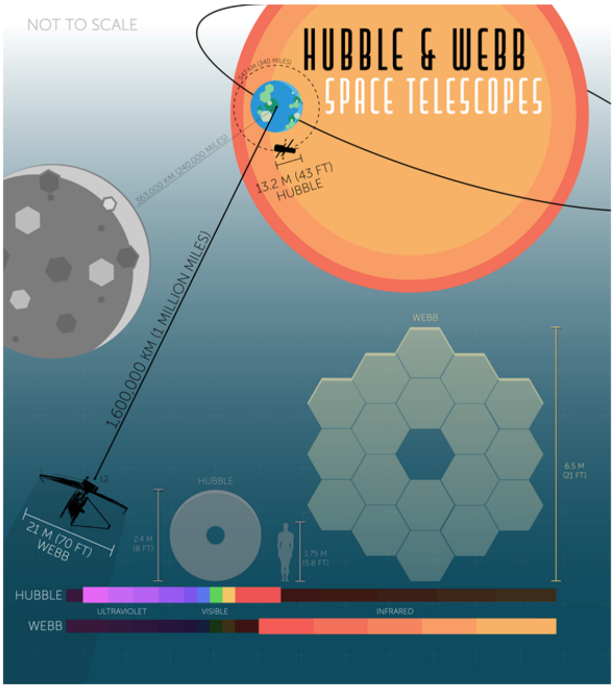
Webb will observe a wide band of the infrared spectrum, including parts observed by the Hubble - which also observes in a bit of ultraviolet light as well as visible - and the recently retired Spitzer Space Telescope. Webb will even observe parts of the infrared spectrum not seen by either of these missions! Credits: NASA and J. Olmstead (STScI)

James Webb (more!)

stable long-term orbits, requiring only minor adjustments - saving Webb a good deal of fuel. Since this position is also several times further than the Moon, Webb's sunshield will safely cover the Moon, Earth, and Sun and block any potential interference from their own infrared radiation. Even the seemingly small amount of heat from the surfaces of the Earth and Moon would interfere with Webb's extraordinarily sensitive infrared observations of our universe if left unblocked. More detailed information about Webb's orbit can be found at bit.ly/webborbitinfo, and a video showing its movement at bit.ly/webborbitvideo.

Once in its final position, its sunshield and mirror fully deployed and instruments checked out, Webb will begin observing! Webb's 21-foot segmented mirror will be trained on targets as fine and varied as planets, moons, and distant objects in our outer Solar System, active centers of galaxies, and some of the most distant stars and galaxies in our universe: objects that may be some of the first luminous objects formed after the Big Bang! Webb will join with other observatories to study black holes - including the one lurking in the center of our galaxy, and will study solar systems around other stars, including planetary atmospheres, to investigate their potential for hosting life.

Wondering how Webb's infrared observations can reveal what visible light cannot? The "Universe in a Different Light" Night Sky Network activity can help - find it at bit.ly/different-light-nsn. Find the latest news from NASA and Webb team as it begins its mission by following #UnfoldTheUniverse on social media, and on the web at nasa.gov/webb.



Webb will follow up on many of Hubble's observations and continue its mission to study the most distant galaxies and stars it can - and as you can see in this comparison, its mirror and orbit are both huge in comparison, in order to continue these studies in an even deeper fashion! Credits: NASA, J. Olmsted (STScI)

Imagers Corner

7 November at 17:32 using an iPhone 11 camera which was hand held.—Chris Bowden

We hope to see more images and sketches from members soon. ~SLK

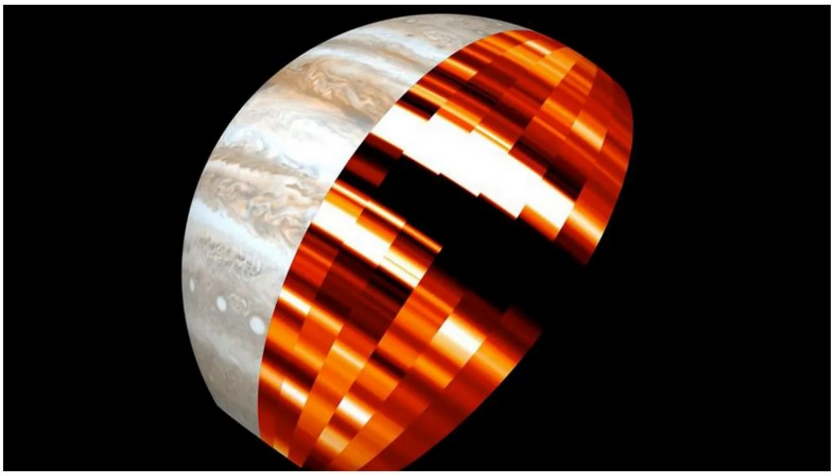
EOS

A Transition Zone Below Jupiter's Clouds
—Morgan Rehnberg, Science Writer

Source: *Journal of Geophysical Research: Planets*

Among Jupiter's most notable attributes is its distinctive banded appearance. Planetary scientists call the light, whitish bands "zones" and the darker, reddish ones "belts." Jupiter's planetary-scale winds circulate in opposite directions on the boundaries of these alternating regions. A key question is whether the belts and zones are confined to the planet's cloud tops, or whether they persist with increasing depth.

An investigation of this phenomenon is one of the primary objectives of NASA's Juno mission, and the spacecraft carries a specially designed microwave radiometer not only to measure emissions from deep within the planet for the first time, but also to examine the nature of the belts and zones. Juno's microwave radiometer operates in six wavelength channels ranging from 1.4 to 50 centimeters, and these enable Juno to probe the Jovian atmosphere at pressures starting near the cloud tops near 0.6 bar to pressures up to 1,000 bars (about 600 kilometers deep).



The microwave radiometer aboard NASA's Juno spacecraft can probe the atmosphere of Jupiter at pressures starting at the top of the atmosphere to depths of about 600 kilometers, shedding light on the characteristics of the planet's belts and zones. Credit: NASA-JPL/SwRI/University of Leicester

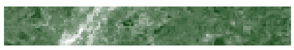
Fletcher et al. used data from the microwave radiometer and found that at the cloud tops, Jupiter's belts are bright with microwave emission, whereas the zones are dark. This configuration persists down to approximately 5 bars. And at pressures deeper than 10 bars, the pattern reverses, with the zones becoming microwave-bright and the belts becoming dark.

The team terms the transition region between 5 and 10 bars the jovicline, a comparison with the thermocline region in Earth's oceans, where seawater transitions sharply from relative warmth to relative coldness. The researchers observe that the jovicline is nearly coincident with a stable atmospheric layer created by condensing water.

According to the authors, there are two mechanisms that could be responsible for the change in brightness, each implying different physical conclusions. One mechanism is related to the ammonia distribution within the belts and zones. Ammonia is opaque to microwaves; thus, a region with relatively less ammonia will shine brighter in Juno's observations. This mechanism could imply a stacked system of opposing circulation cells with sinking in belts at shallow depths and upwelling in belts at deeper levels, or vigorous storms and precipitation, moving ammonia gas from place to place.

Another possibility is that the gradient in emissions corresponds to a gradient in temperature, with higher temperatures resulting in greater microwave radiation. If this scenario is correct, then Jupiter's winds may increase with depth below the clouds until we reach the jovicline, before tapering off into the deeper atmosphere—something that was also suggested by the Galileo probe in 1995.

The likely scenario is that both mechanisms are at work simultaneously, each contributing to part of the observed brightness variation. According to the authors, new atmospheric models based on the Juno discovery could help discriminate the relative importance of each mechanism, and this will eventually lead to broader understanding of how circulation cells, winds, and precipitation work in giant planet atmospheres. (*Journal of Geophysical Research: Planets*, https://doi.org/10.1029/2021JE006858, 2021). https://eos.org/research-spotlights/a-transition-zone-below-jupiters-cloud?mkt_tok=OTg3LUlHVC01NzIAAAGA1te80i1tT1AA6G8TwJmue_6OCHmPenbVHni8SdOFCE8jLupoK3V2eKPRNPzqQOnKUU4eY4Zt4W8gK-litdgk6akvpfFXemyxXRlIK9g



Skymaps.com—Feel free to download the full article directly each month.

The Evening Sky Map

FREE* EACH MONTH FOR YOU TO EXPLORE, LEARN & ENJOY THE NIGHT SKY

Sky Calendar – December 2021

Get Sky Calendar on Twitter
http://twitter.com/skymaps

1 **Moon near Spica** at 4h UT (45° from Sun, morning sky).
3 **Moon near Mars** at 2h UT (18° from Sun, morning sky). Mag. 1.6.
4 **New Moon** at 7:43 UT. Start of lunation 1224.
4 **Moon at perigee** (closest to Earth) at 10:12 UT (distance 356,794 km; angular size 33.5'). 2.5 hours after New Moon.
6 **Moon at southernmost declination** (–26.33°) at 3h UT.
7 **Moon near Venus** at 2h UT (evening sky). Mag. –4.7.
7 **Venus at its brightest** at 16h UT. Mag. –4.7.
8 **Moon near Saturn** at 4h UT (evening sky). Mag. 0.7.
9 **Moon near Jupiter** at 10h UT (evening sky). Mag. –2.2.
11 **First Quarter Moon** at 1:36 UT.
14 **Geminid Meteor Shower** peaks in a broad maximum centred at 7h UT. Produces bright, medium-speed meteors at its peak (up to 80 meteors/hour). Most reliable annual meteor shower. Easy to observe (radiant on sky map). Best after midnight. Some interference from moonlight.
16 **Moon near the Pleiades** at 23h UT (evening sky).
17 **Moon near Aldebaran** at 17h UT (evening sky).
18 **Moon at apogee** (farthest from Earth) at 2h UT (distance 406,320 km; angular size 29.4').
19 **Full Moon** at 4:37 UT.
21 **December solstice** at 15:57 UT. The time when the Sun reaches the point farthest south of the celestial equator marking the start of winter in the Northern Hemisphere and summer in the Southern Hemisphere.
22 **Moon near Beehive cluster M44** at 13h UT (morning sky).
24 **Moon near Regulus** at 9h UT (morning sky).
27 **Last Quarter Moon** at 2:25 UT.
27 **Mars 4.5° N of Antares** at 20h UT (26° from Sun, morning sky). Mags. 1.6 and 1.0. The red planet pairs up with its red "rival".
28 **Moon near Spica** at 13h UT (morning sky).
29 **Mercury 4.2° S of Venus** at 6h UT (17° from Sun, evening sky). Mags. –0.7 and –4.4.

More sky events and links at http://Skymaps.com/skycalendar/

All times in Universal Time (UT). (USA Eastern Standard Time = UT – 5 hours.)

Skymaps.com

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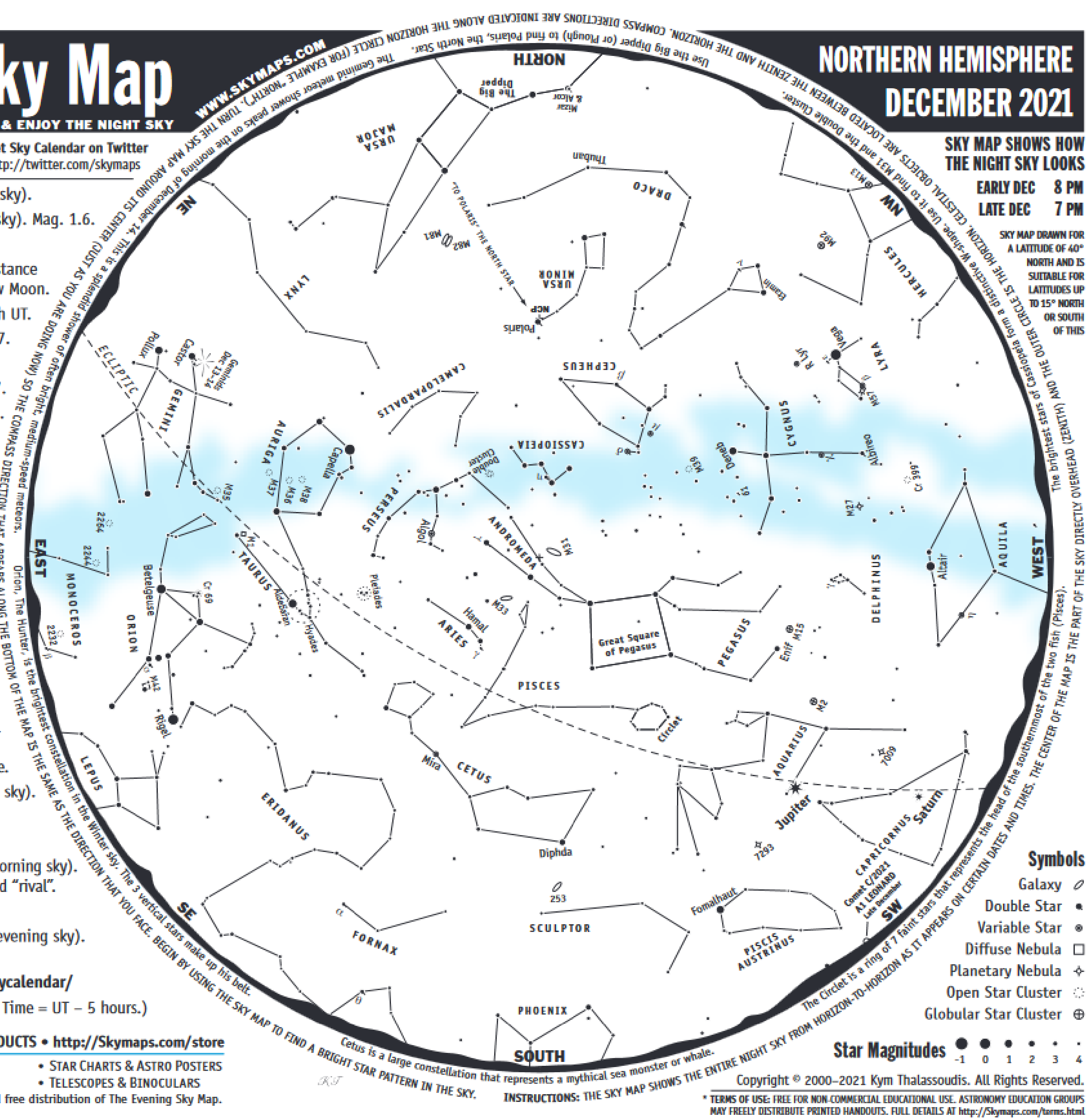
All sales support the production and free distribution of The Evening Sky Map.



NORTHERN HEMISPHERE DECEMBER 2021

SKY MAP SHOWS HOW THE NIGHT SKY LOOKS

EARLY DEC	8 PM
LATE DEC	7 PM

SKY MAP DRAWN FOR A LATITUDE OF 40° NORTH AND IS SUITABLE FOR LATITUDES UP TO 15° NORTH OR SOUTH OF THIS

Symbols

- Galaxy
- Double Star
- Variable Star
- Diffuse Nebula
- Planetary Nebula
- Open Star Cluster
- Globular Star Cluster

Star Magnitudes -1 0 1 2 3 4

INSTRUCTIONS: THE SKY MAP SHOWS THE ENTIRE NIGHT SKY FROM HORIZON-TO-HORIZON AS IT APPEARS ON CERTAIN DATES AND TIMES. THE CENTER OF THE MAP IS THE PART OF THE SKY DIRECTLY OVERHEAD (ZENITH) AND THE OUTER CIRCLE IS THE HORIZON. CELESTIAL OBJECTS ARE LOCATED BETWEEN THE ZENITH AND THE HORIZON. COMPASS DIRECTIONS ARE INDICATED ALONG THE HORIZON CIRCLE (FOR EXAMPLE "NORTH"). TURN THE SKY MAP AROUND ITS CENTER (JUST AS YOU ARE DOING NOW) SO THE COMPASS DIRECTION THAT APPEARS ALONG THE BOTTOM OF THE MAP IS THE SAME AS THE DIRECTION THAT YOU FACE. BEGIN BY USING THE SKY MAP TO FIND A BRIGHT STAR PATTERN IN THE SKY.