National Aeronautics and
Space Administration

Earth ⊕

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EARTH, our planet, is the only planet in the solar system known to harbor life. All of the things we need to survive are provided under a thin layer of atmosphere that separates us from the uninhabitable void of space. Earth is made up of complex, interactive systems that are often unpredictable. Air, water, land, and humans themselves combine forces to create a constantly changing world that we are striving to understand.

NASA, in partnership with other U.S. and international agencies, has been studying Earth as an integrated system. Viewing Earth from the unique perspective of space provides the opportunity to see Earth as a whole. Scientists around the world have discovered many things about our planet by working together and sharing their findings.

Some facts are well known. For instance, Earth is the third planet from the Sun, and the fifth largest in the solar system. Earth's diameter is just a few hundred kilometers larger than that of Venus. Our planet rotates on its axis at a surface speed of approximately 0.5.km/sec at mid-latitudes, while orbiting the Sun at a speed about 30 km/sec. We experience these motions as the daily routine of sunrise and sunset and the slower change of the seasons. The four seasons are a result of Earth's axis of rotation being tilted more that 23 degrees.

The changing nature of the planet's systems are the mysteries that scientists study today. For instance, the North American continent continues to move west over the Pacific Ocean basin, roughly at a rate equal to the growth of our fingernails. We are made aware of this movement when it is interrupted by earthquakes. Scientists notice a distinctive pattern to those earthquakes, leading them to conclude that Earth is dynamic, with its spherical surface separated into moving caps or plates. Earthquakes result when plates grind past one another, ride up over one another, collide to make mountains, or split and separate. These movements are known as plate tectonics. Developed within the last thirty years, this explanation has unified the results of centuries of study of our planet, long believe to be static.

Oceans at least 4 km deep covers nearly 70% of Earth's surface. Water exists in the liquid phase only within a narrow temperature span (0 degrees to 100 degrees C). This temperature span is especially narrow when contrasted with the full range of temperatures found within the solar system. The presence and distribution of water vapor in the atmosphere is responsible for much of the Earth's weather.

On the surface, we are enveloped by an ocean of air that consists of 78% nitrogen, 21% oxygen, and 1% other constituents. Earth's atmosphere shields us from nearly all harmful radiation coming from the Sun, and protects us from meteors as well—most of which burn up before they can strike the surface. Satellites have revealed that the upper atmosphere, which was thought to be calm and uneventful, actually swells by day and contracts by night due to solar activity. The upper atmosphere contributes to Earth's weather and climate and protects us from the Sun's harmful ultraviolet radiation.

Besides affecting Earth's weather, solar activity gives rise to a dramatic visual phenomenon in our atmosphere. When charged particles from the solar wind become trapped in Earth's magnetic field, they collide with air molecules above our planet's magnetic poles. These air molecules then begin to glow and are known as the auroras, or the Northern and Southern lights.

Our planet's rapid spin and molten nickel-iron core give rise to a magnetic field, which the solar wind distorts into a teardrop shape. The solar wind is a stream of charged particles continuously ejected from the Sun. The magnetic field does not fade off into space, but has definite boundaries.

As you observe Earth's finite boundaries, depicted on the front of this lithograph, consider the many unanswered questions and discoveries yet to be made on our own home planet.

Significant Dates

1957— Sputnik 1 U.S.S.R. became the first artificial satellite of the Earth.
1959— Luna 1 U.S.S.R. was the first successful mission to the Moon and the first spacecraft to leave Earth's gravity.
1960— NASA launched TIROS I, the first weather satellite.
1961— Vostok 1 U.S.S.R. carried the first human, Yuri Gagarin, into space. Alan Shepard became the first U.S. astronaut in space.
1962— John Glenn, Jr. was the first American to orbit Earth.
1964— Nimbus I began a series of missions to study Earth's atmosphere, geology, and oceans.
1968— The first humans orbited the Moon (U.S.).
1969— Apollo 11 (U.S.) became the first manned lunar landing.
1972— NASA began the Landsat satellite series to observe Earth's land surfaces.
1973— Skylab, the first space station (U.S.), was launched.
1976— LAGEOS I tracked movements of Earth's surface to increase understanding of earthquakes and other geological activity.
1978— The TOMS instrument, launched on Nimbus VII, recorded continuous data on Earth ozone layer.
1984— Earth Radiation Budget Satellite began studies of Earth's reaction to the Sun's energy.
1991— The UARS comprehensive data on chemistry and physics of the atmosphere provides evidence that human-made chemicals are responsible for the Antarctic ozone hole.
1992— The OPEX/Poseidon satellite details links between Earth's oceans and climate.
1998— NASA will launch first satellite of Earth Observing System (EOS) series, continuing through the first decade of the 21st century.

Fast Facts

Equatorial Diameter	12,756 km
Mean Distance from Sun	1.52 X 108 km
Mass	5.976 X 1023 kg
Density	5.52 g/cm^3
Mean Orbital Velocity	29.79 km/s
Tilt of Equator to Orbit	23.45°
Rotational Period	23.93 hours
Eccentricity of Orbit	0.017
Number of Satellites	1
Orbit Period	365.26 days

About the Image

This Apollo 10 view of Earth was taken during a journey to the Moon in May 1969. While clouds obscure the Yucatan Peninsula, nearly all of Mexico north of the Isthmus of Tehuantepec is clearly visible. The Gulf of California, Baja, and the San Joaquin Valley of California are identifiable as well. In the upper right corner, the northern polar cap appears with pressure fronts emanating to the south.

References

1) Views of the Solar System—Earth http://bang.lanl.gov/solarsys/earth.htm
2) Planetary Photo Journal: http://photojournal.jpl.nasa.gov/
3) Stardate, The University of Texas of Austin, McDonald Observatory, 2609 University Ave., #3.118, Austin, TX 78712

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