One star, eight planets, and a myriad of moons, comets, and asteroids. This is the Earth’s local neighborhood known as the Solar System. Despite studying this system for centuries, astronomers still yearn to know much more. NASA’s Chandra X-ray Observatory is providing new insight and uncovering new mysteries about objects of all sizes and across all distances throughout our Solar System.

Chandra’s specialty is probing the super-hot regions around exploding stars, galaxies, or black holes. But Chandra has also shown that the relatively peaceful realms of space, such as our Solar System, sometimes shine in X-ray light. Planets, satellites and comets typically have temperatures well below 1,000 degrees, but they still can produce X-rays in a number of ways, most of which involve the Sun directly or indirectly. Although the X-ray power is relatively weak, it provides information difficult to come by with other telescopes.

Learn more at: http://chandra.harvard.edu

NASA’s Marshall Space Flight Center, Huntsville, Ala., manages the Chandra program for the agency’s Science Mission Directorate. The Smithsonian Astrophysical Observatory controls science and flight operations from the Chandra X-ray Center in Cambridge, Mass.

Illustration: Inside: NASA/SoHO; Back: CXC/M. Weiss

Chandra X-ray Images

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The Sun's hot atmosphere, or corona, is made up of hot gases called plasma. This plasma is ionized, meaning that some of its atoms have lost electrons. These high-energy particles from the Sun can affect the Earth's environment and climate. The solar wind, a stream of charged particles, mainly protons and electrons, streams away from the Sun at supersonic speeds. The Earth's magnetic field deflects the solar wind, causing it to spiral along the field lines. When the solar wind collides with the Earth's atmosphere, it ionizes molecules and forms auroras. The energy of these collisions can also excite atoms to higher energy levels, causing them to emit light in the form of X-rays. These X-rays are detected by spacecraft like Chandra, which can image the Earth's aurora and provide insights into the dynamics of the solar wind. The solar wind is not only a local phenomenon; it also affects other planets and even distant objects like Titan, Saturn's largest moon. The X-rays from Titan, for example, show that the moon has a tenuous atmosphere, and the observations can help us understand the conditions on other worlds. In summary, studying the solar wind not only helps us understand the Earth's environment but also provides insights into the broader solar system and beyond.