TOP 5 ELEMENTS IN THE ATMOSPHERE OF URANUS

Credit: NASA

Uranus is an ice giant, meaning that its chemical makeup differs from Jupiter and Saturn, with strong enrichment in elements like carbon, nitrogen, sulfur, and oxygen, mixed with an atmosphere of hydrogen and helium. These elements were likely mixed into Uranus as it was forming billions of years ago, while being bombarded by the ice-rich building blocks in the outer solar system. All of these key elements are found as molecules in a reduced form (i.e., combined with hydrogen) to form methane, ammonia, hydrogen sulfide, and water. To make matters even more complex, the atmosphere of Uranus is so cold that these gases condense to form clouds. The topmost clouds, seen in rare uranian storms and atmospheric outbursts, comprise methane ice crystals. Beneath the methane ice clouds, we find a main cloud deck of hydrogen sulfide ice. We can see the impacts of the hydrogen sulfide in our astronomical data, but if you had the misfortune to fly through the uranian clouds, you’d be quickly overwhelmed by a pungent “rotten egg” smell. Deeper into the interior, we’d expect to find water clouds — but these are so deep down that no spacecraft or ground-based telescope have ever been capable of detecting them. The water might be in the form of an exotic hot and black ice, which might be the most common form of water in our solar system. Its properties remain very mysterious, and future missions to the ice giants are needed to explore this exotic mixture of chemical elements.

Two views of Uranus in the infrared as observed by the Keck telescopes in 2012 showing clouds of methane ices above a main cloud deck of hydrogen-sulfide ice. Uranus exhibits a banded structure, just like the other giant planets of our solar system. Credit: NASA/ESA/L. A. Sromovsky/P. M. Fry/H. B. Hammel/I. de Pater/K. A. Rages.

The year 2019 marks the 150th anniversary of Dmitri Mendeleev’s development of the Periodic System and has been proclaimed the “International Year of the Periodic Table of Chemical Elements” (IYPT2019).

www.iypt2019.org

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