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# Xenon Isotopes as Indicators of the Origin of Volatiles in the Ice Giants

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## Abstract

Observations by the Rosetta spacecraft of the xenon isotopes in the coma of comet 67P/Churyumov-Gerasimenko (67P/C-G) show a deficit in the heavy isotopes that is interpreted to suggest an origin for xenon in 67P/C-G which is a nucleosynthetic mix that is different from that which produced solar xenon. However, the xenon isotopes measured in Jupiter's atmosphere by the Galileo probe mass spectrometer showed values close to solar within the uncertainties of the measurements. This suggests that two reservoirs of materials contributed to the formation of bodies in the outer solar system. These results have important implications for the ice giants, which formed at higher heliocentric distances than Jupiter and Saturn potentially in the same region as 67P/C-G. A measurement of the xenon isotopes in the ice giants that is deficient in the heavy isotopes would confirm such an origin of their building blocks.

**Keywords:** Uranus, Neptune, Xenon, Comets, Origins

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