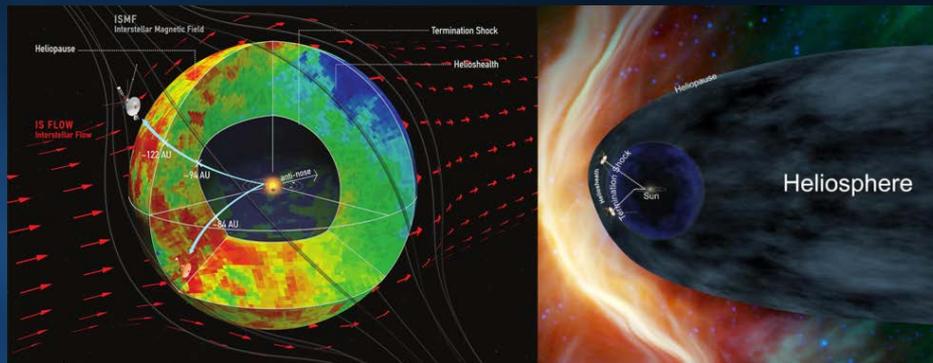


Putting the Sphere into Heliosphere using Voyager, Cassini and IBEX Data

Analysis of data from NASA Heliophysics [Voyager](#), [IBEX](#) and [Cassini](#) missions proposes a new theory on the shape of the heliosphere – the volume of space in which solar wind from our home star is present – in which all major planets in our solar system are embedded. The data suggest that the heliosphere is spherical rather than comet-shaped. Understanding the shape of the heliosphere gives us crucial information about the environment beyond, the space that surrounds us, known as the local interstellar medium. A paper on these findings was recently published in [Nature Astronomy](#) by a team of scientists from the Academy of Athens, Greece, and from the Applied Physics Laboratory in Laurel, MD.



The image on the left shows a compact model of the heliosphere, supported by this latest data, while the image on the right shows an alternate model with an extended tail.
Credits: Dialynas, et al. (left); NASA (right)

Many researchers believe that the part of the heliosphere trailing behind us as we travel through space is shaped more like a comet's tail. This new analysis of Cassini data, spanning a full 11-year solar cycle, supports the assertion that the heliosphere has no tail, and resembles more of a sphere. A rounded heliosphere could be the result of a number of factors. Data from Voyager 1 -- which is currently past the heliopause -- show that the interstellar magnetic field (IMF) beyond the heliosphere is stronger than scientists previously thought. This means that the IMF could interact with the solar wind at the edges of the heliosphere and compact what scientists thought was the heliosphere's tail, creating a spherical shape.

Cassini measures neutral atoms that are accelerated at the edges of the heliosphere back into our solar system in response to solar wind particles mixing with the interstellar medium. Measurements taken from Voyager show that it takes nearly one year for changes in solar activity, which are present in the characteristics of solar wind, to propagate out to the nose of the heliosphere, through which the two Voyager spacecraft are traveling. Neutral particles bouncing back into the inner solar system carry information about the original particles in the solar wind, and as such serve as a natural time-of-flight measurement. The distance to what scientists thought was the tail region is unknown as it hasn't been visited by any active spacecraft. Cassini, however, offers an opportunity to determine this distance by comparing the arrival time of neutral particles from the nose and the back of the heliosphere.

Cassini saw something unexpected. The particles coming from the tail of the heliosphere reflected the changes in solar activity at the sun nearly in sync with the changes seen in particles coming from the nose of the heliosphere. If the back of the heliosphere were stretched out into a comet-shaped tail that was larger in distance from the sun than the nose of the heliosphere, scientists would see a delayed arrival at Cassini of neutral particles traveling back into the solar system. The close correlation of the data coming from each direction, however, implies that the tail is about the same distance from us as the nose.

At nearly 40 years since launch, the Voyager mission continues to return information about the very nature of the particles and magnetic fields it travels through – crucial information to understand the local part of our galaxy that we travel through.