

The Sun's ripple effect

July 30 2013

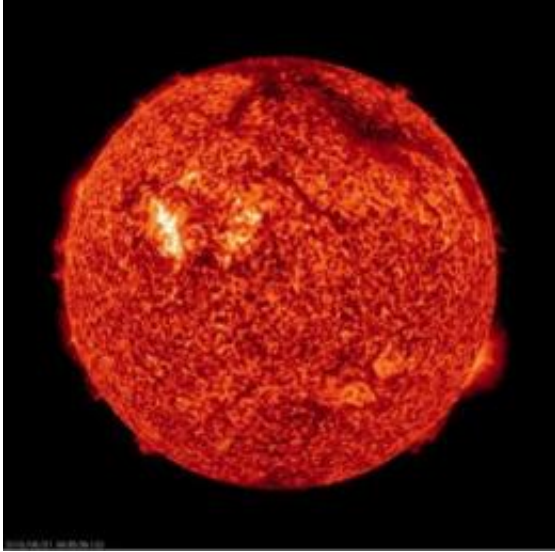


Image of sun courtesy of NASA.

A new study co-authored by Boston University astronomers indicates that a bow shock (a dynamic boundary between the Sun's heliosphere and the interstellar medium) is highly likely. These findings challenge recent predictions that no such bow shock would be encountered.

The researchers base their expectation of finding a [bow shock](#) on a new magneto-hydrodynamic simulation that confirmed a theoretically expected slow bow shock (SBS) ahead of the [heliosphere](#). The new research supports the idea that the sun, like a boat moving through water, forms a crescent-shaped shockwave as it moves through interstellar gas. The study, titled "A slow bow shock ahead of the heliosphere," was

published recently in the journal *Geophysical Research Letters*.

In the current study, Bertalan Zieger, lead author and research scientist at BU's Center for Space Physics, and colleagues predict that a slow bow shock should exist ahead of the heliosphere. This challenges some recent models that argued no bow shock at all would be found. Those studies, which used the Interstellar Boundary Explorer (IBEX) satellite to measure the speed of interstellar particles entering the solar system near the edge of the heliosphere, suggested that the sun was moving too slowly through interstellar space (at 52,000 miles an hour) to create a bow shock.

However, the bow shock that they refer to is what is called a fast bow shock. The new study shows that a slow type is possible: IBEX observations also indicate that the interstellar wind is slower than the fast and the intermediate wave, but faster than the slow wave. Using these observations, the researchers conducted a magneto-hydrodynamic simulation that predicts a slow bow shock should exist in front of the heliosphere.

These projections could soon be confirmed by actual data: Voyager 1 is heading toward the slow bow shock, while Voyager 2 is not, which means that the two spacecraft are expected to encounter different interstellar plasma populations beyond the heliopause. Confirmation of the existence of a bow shock could have important implications for our understanding of the nature of the interstellar magnetic field that the Voyagers will encounter ahead of the heliopause, including whether the slow bow shock filters the influx of high-energy cosmic rays into the heliosphere.

More information: *Geophysical Research Letters*, Vol. 40, 1–6, [doi: 10.1002/grl.50576](https://doi.org/10.1002/grl.50576), 2013

Provided by Boston University

Citation: The Sun's ripple effect (2013, July 30) retrieved 10 April 2024 from
<https://phys.org/news/2013-07-sun-ripple-effect.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.