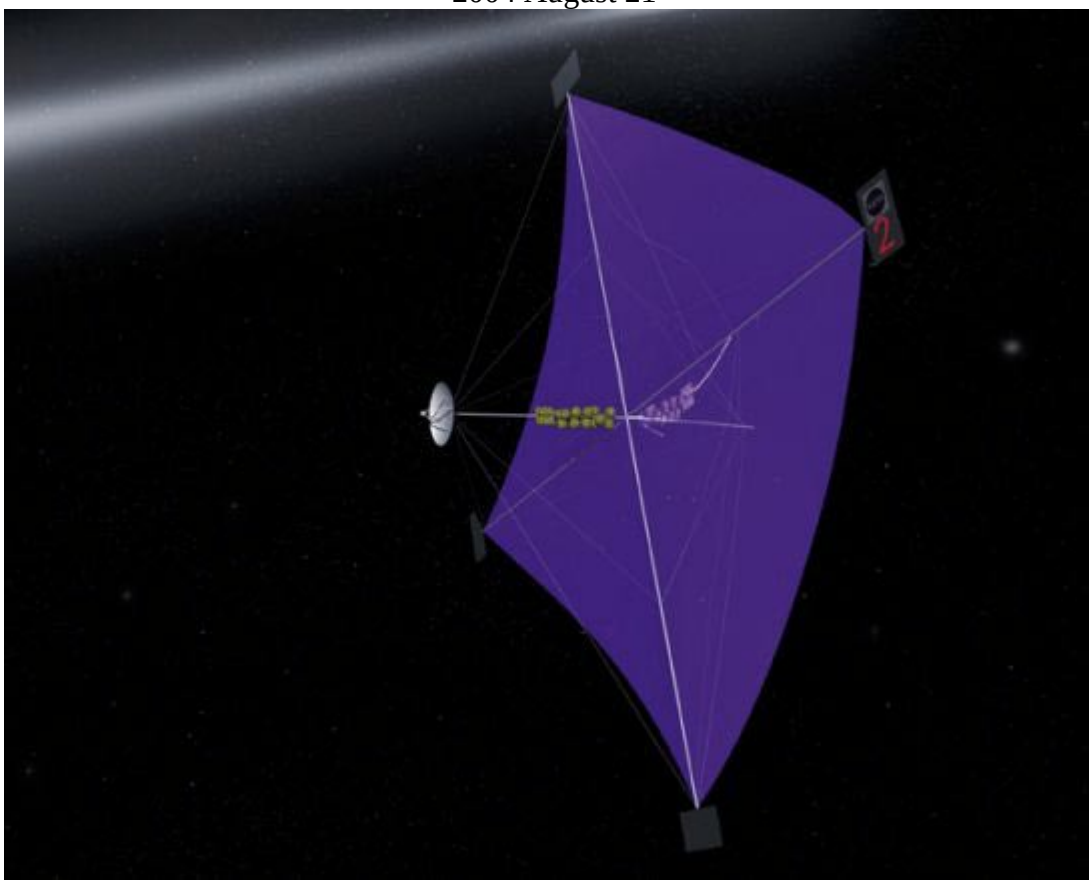
THE POWER OF OUR STAR

CAN WE TRAVEL IN SPACE WITH A SOLAR SAIL?

2004 August 21

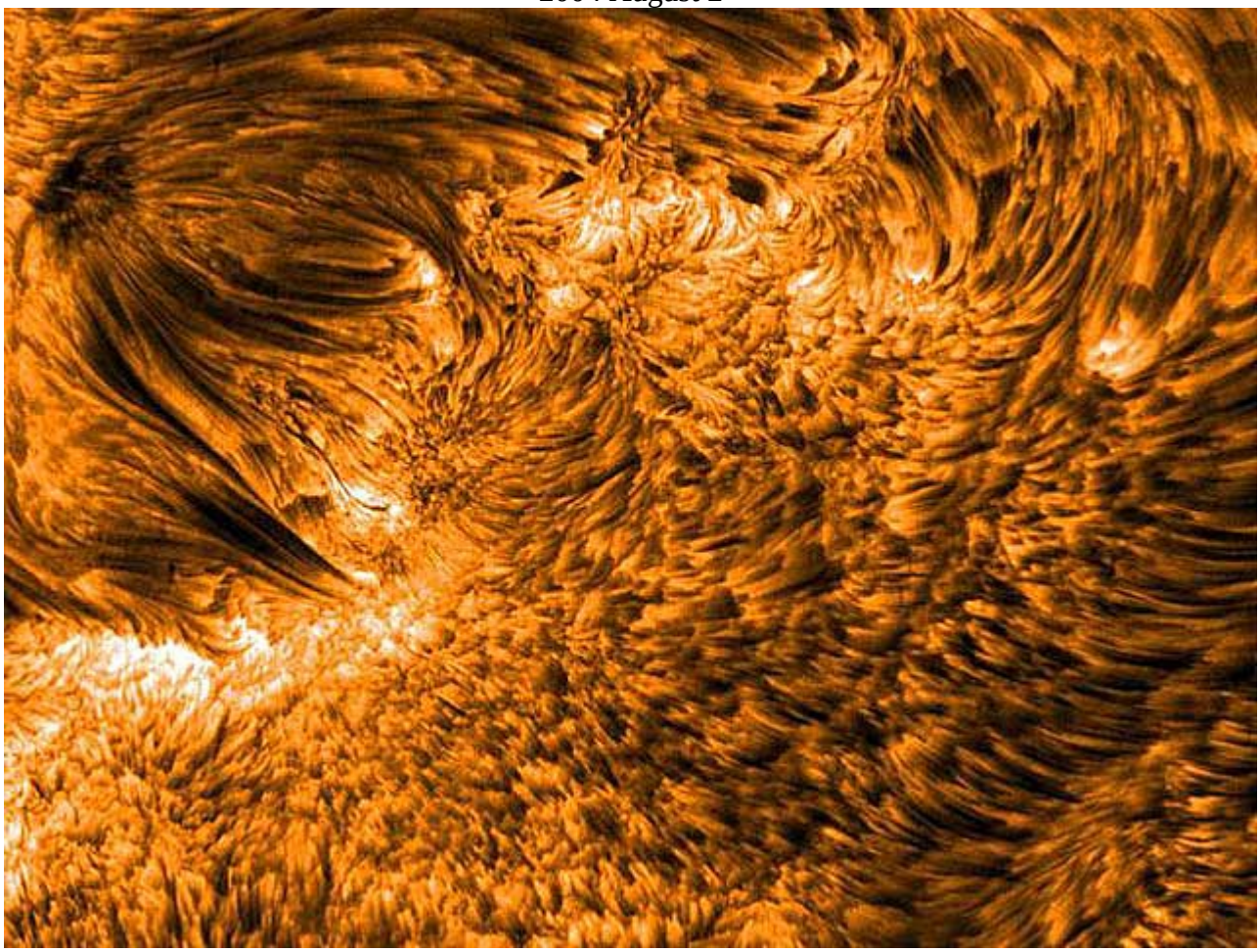


Solar Sail
Illustration Credit: NASA / MSFC

Explanation: Could solar sailing become a future Olympic sport? Nearly 400 years ago astronomer Johannes Kepler observed comet tails blown by a solar breeze and suggested that vessels might likewise navigate through space using appropriately fashioned sails. It is now widely recognized that sunlight does indeed produce a force which moves comet tails and a large, reflective sail could be a practical means of propelling a spacecraft. In fact, the illustration above represents a concept explored by NASA for an interstellar probe pushed along by sunlight reflected from an ultrathin sail. Nearly half a kilometer wide, the delicate solar sail would be unfurled in space. Continuous pressure from sunlight would ultimately accelerate the craft to speeds about five times higher than possible with conventional rockets. While not quite ready for the Olympics, NASA has recently tested solar sail technologies on earth and the Japanese Space Agency ISAS has deployed solar sail material in space. The Planetary Society in collaboration with the Space Research Institute (IKI) in Moscow and partners is preparing to launch Cosmos 1, a solar sail powered spacecraft.

Adapted from the Nasa website, www.msfc.nasa.gov/ by Patricia G. Smith, Instructor at Starbase Oklahoma, www.starbaseok.org.

2004 August 2



Spicules: Jets on the Sun
Credit: SST, Royal Swedish Academy of Sciences, LMSAL

Explanation: Imagine a pipe as wide as a state and as long as half the Earth. Now imagine that this pipe is filled with hot gas moving 50,000 kilometers per hour. Further imagine that this pipe is not made of metal but a transparent magnetic field. You are envisioning just one of thousands of young spicules on the active Sun. Pictured above is perhaps the highest resolution image yet of these enigmatic solar flux tubes. Spicules dot the above frame of solar active region 10380 that crossed the Sun in June, but are particularly evident as a carpet of dark tubes on the right. Time-sequenced images have recently shown that spicules last about five minutes, starting out as tall tubes of rapidly rising gas but eventually fading as the gas peaks and falls back down to the Sun. These images also indicate, for the first time, that the ultimate cause of spicules is sound-like waves that flow over the Sun's surface but leak into the Sun's atmosphere.

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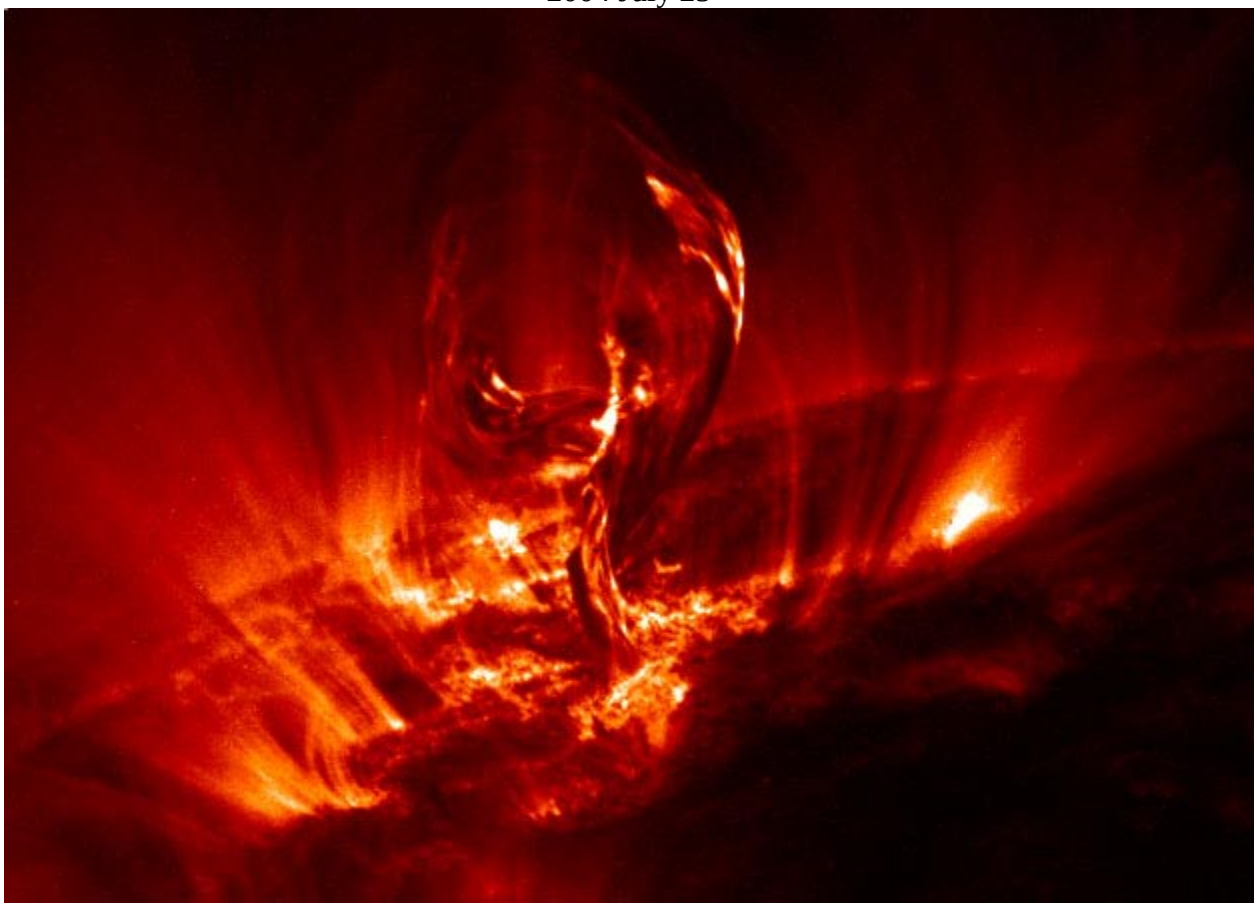

A Solar Filament Lifts Off
Credit: TRACE, NASA

Explanation: Hot gas frequently erupts from the Sun. One such eruption produced the glowing filament pictured above, which was captured in 2000 July by the Earth-orbiting TRACE satellite. The filament, although small compared to the overall size of the Sun, measures over 100,000 kilometers in height, so that the entire Earth could easily fit into its outstretched arms. Gas in the filament is funneled by the complex and changing magnetic field of the Sun. After lifting off from the Sun's surface, most of the filamentary gas will eventually fall back. More powerful solar eruptions emit particles that reach the Earth and can disrupt manmade satellites. The cause and nature of solar eruptions are the topic of much research.

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You too can try your hand at a simulated solar sail, using plastic sacks, aluminum foil for the space craft, and a heat lamp to act as the Sun. To reduce friction on your space craft, you can place it on row of cookie sheets that have been sprayed with vegetable oil.

Attach the sail to floral wire and bend for maximum speed. Experiment with other materials, such as foil, silk, or other very light-weight materials.

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