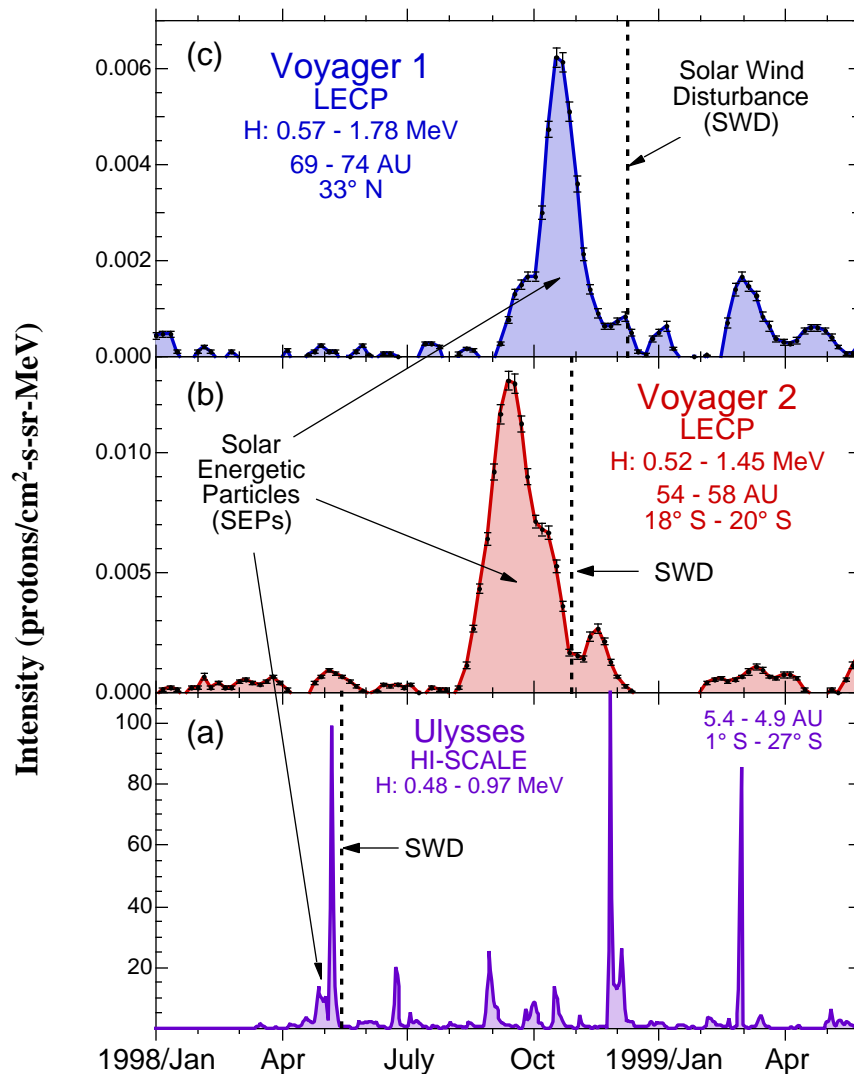


Hydrogen Nuclei from a Burst of Solar Activity Arrive at Voyagers after 6-Month, 200-Billion Mile Trek



- Fast solar energetic particles (SEPs), accelerated on the Sun and in interplanetary space by powerful shock waves during April-May 1998, were observed, in succession, at **Ulysses**, **Voyager 2**, and **Voyager 1**.
- SEP protons (hydrogen nuclei, H) produced by violent solar activity passed **Ulysses** (a), 500 million miles from the Sun in April 1998, well in advance of a major solar wind disturbance (SWD, dashed vertical line) moving radially outward at a speed of about 500 km/s (1.1 million mph).
- The SEPs, which travel at speeds in excess of 30 million mph, must follow the spiral magnetic field carried by the outflowing solar wind; between 5 and 70 au (1 au = 93 million miles), this spiral path winds around the Sun 10 times and has a length of over 2000 au or 200 billion miles.
- Despite such long paths and energy losses suffered during their 200 billion mile journey, the SEPs manage to outrun the SWD, reaching peak intensity at **Voyager 2** (b) in Sept. 1998 (56 au), and at **Voyager 1** (c) in Oct. 1998 (72 au), 1.5 months before passage of the SWD and 6 months after they left the Sun.

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