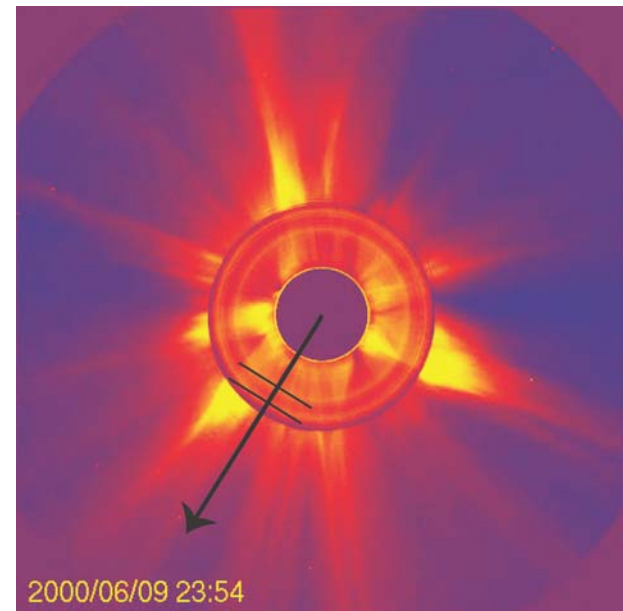
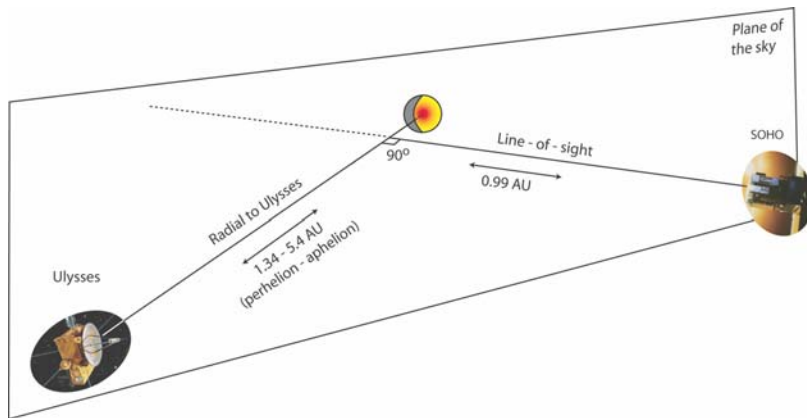


# Ulysses' Orbit in 2006-2008

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“Quadratures” and a description of where Ulysses will be in 2006-2008, with respect to the Earth, SOHO, STEREO, Solar-B, & etc.

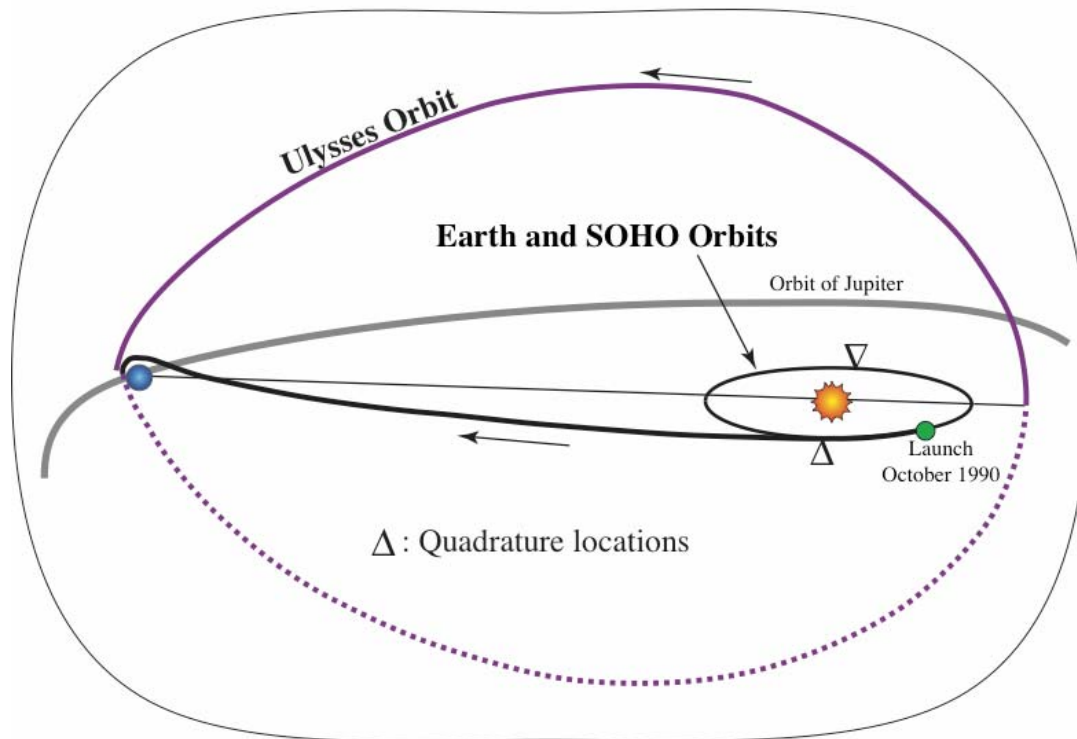


•SOHO-Sun-Ulysses quadratures occur ~twice/year and *normally* have ~10 days duration.

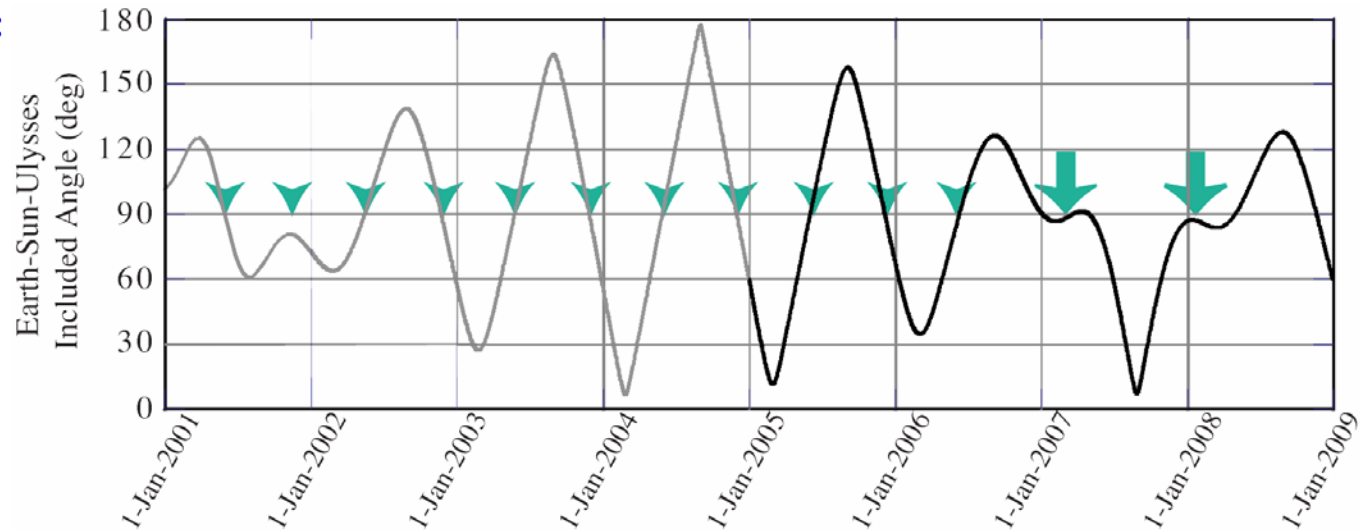
Ulysses usually moves much more slowly around the Sun than SOHO.

SOHO/Earth move ~1°/day around the Sun so Ulysses is within 5° of the limb for ~10 days. 10 days is short enough that *luck is required* for activity to occur along the radial direction to Ulysses.

Ulysses covers latitudes 80°S to 80°N.



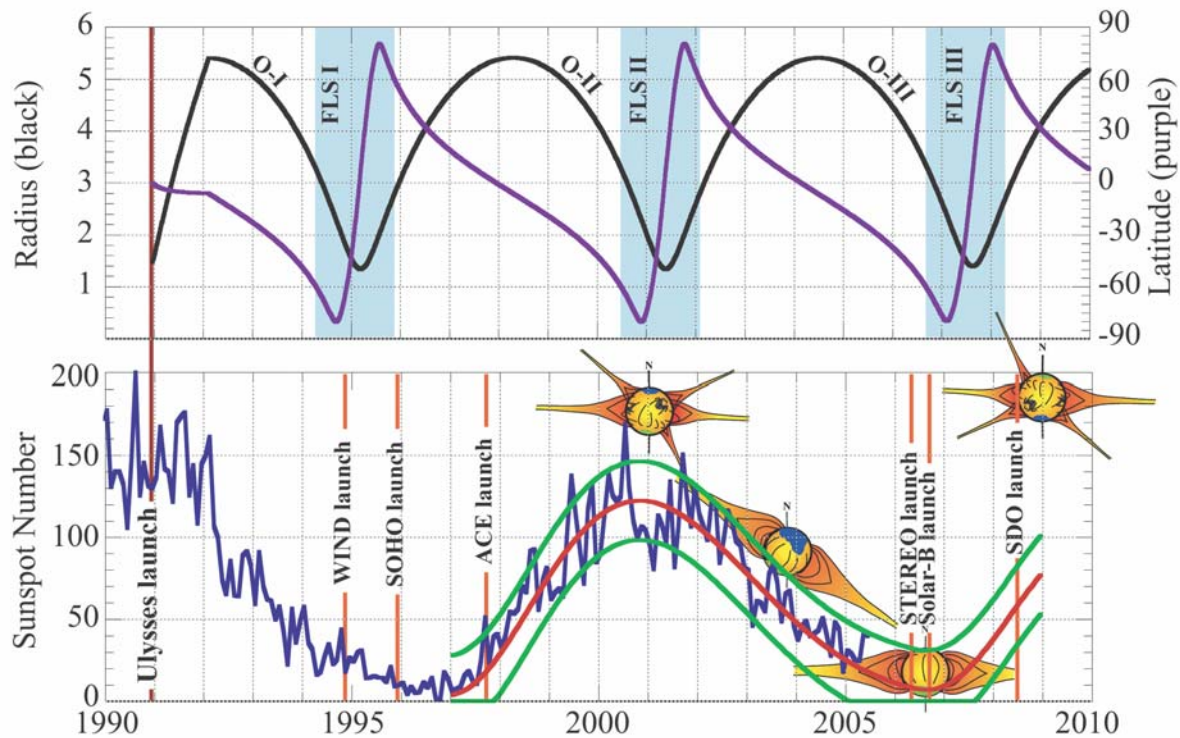
**The Earth-Sun-Ulysses included angle and quadrature dates (▼) from 1 January 2001 to 1 January 2009:**



- The configuration in Fall 2001 was never quite a real quadrature. This is because Ulysses was at high heliographic latitude.
- The quadratures in *winter 2007* and *winter 2008* are associated with times when the SOHO-Sun-Ulysses included angle remains *near 90° for five months* instead of the more common ~10 days. This is, again, because Ulysses is at high heliographic latitude.

The next few panels will show: (1) Ulysses orbital parameters. (2) The location of Ulysses in fixed SOHO/Earth - Sun coordinates.

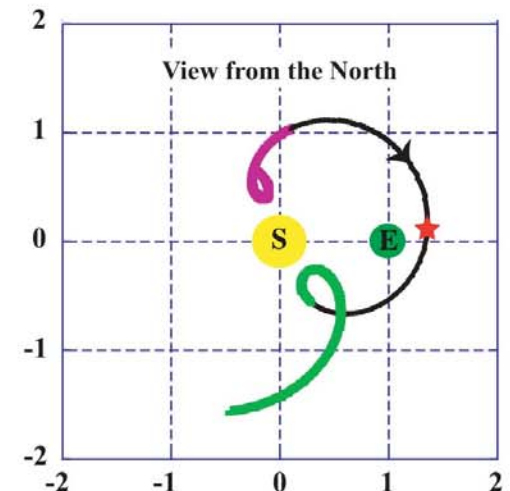
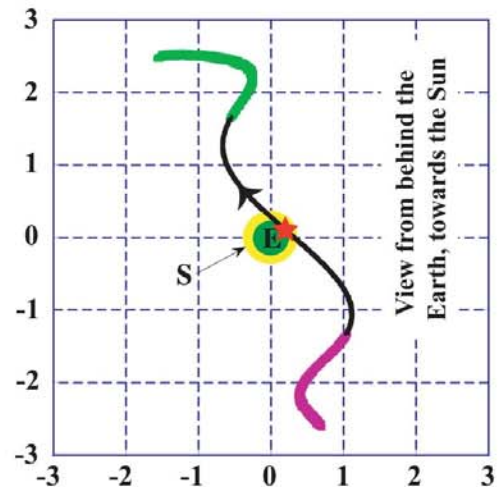
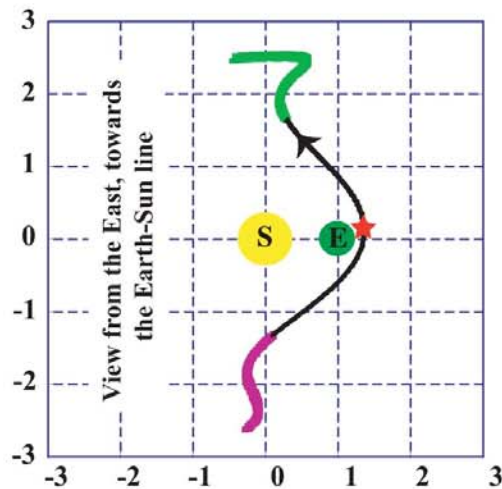
## Ulysses' orbital parameters, the sunspot cycle, and launch dates of other missions:



## Ulysses in fixed SOHO/Earth - Sun coordinates

Ulysses is moving from the south to the north and the plots cover the interval 19 December 2006 to 28 May 2008.

- The fuchsia portion of the orbit covers 19 December 2006 - 28 May 2007. Over these *five months*, Ulysses is within  $\pm 5^\circ$  of the limb.
- The green portion of the orbit covers 2 December 2007 - 28 May 2008. Over these *five months*, Ulysses is within  $\pm 10^\circ$  of the limb.



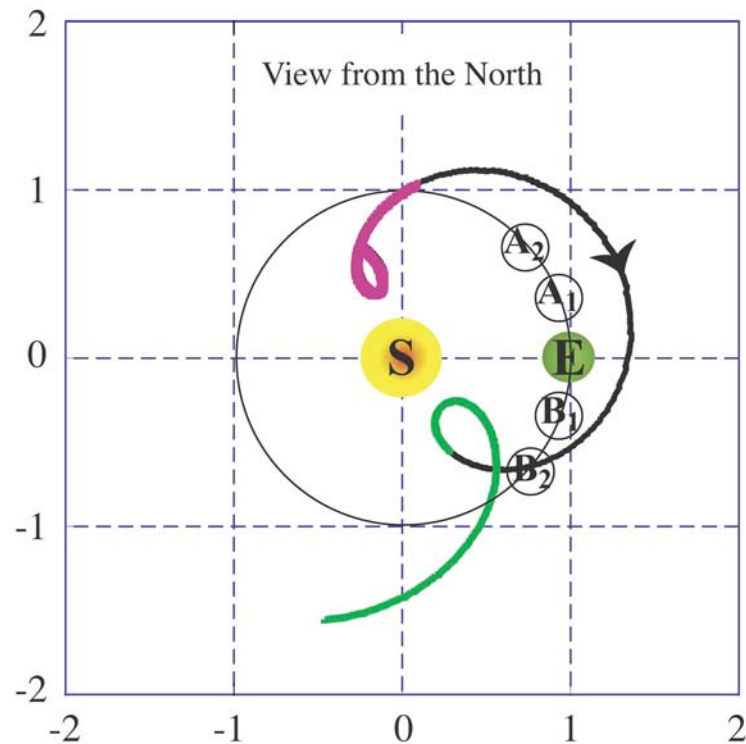
These extraordinarily long quadratures will minimize the requirement of good luck for activity to occur along the radial direction to Ulysses.

## STEREO A/B will be launched in April 2006

This plot shows the locations of STEREO A/B *one year* and *two years* after launch.

The STEREO spacecraft will bracket the location of SOHO.

Their positions will be favorable to constructing a 3D picture of the limb phenomena occurring during the quadratures.



**In summer 2007, as Ulysses passes the ecliptic plane from south to north, there will be a near-radial alignment of Ulysses with the Earth and all the S/C near the Earth (SOHO, ACE, WIND, IMP-8, Cluster, etc.).**

This radial alignment will be used to study energetic particle propagation and transport between 1.0 AU and 1.34 AU (Ulysses' perihelion).

It is an advantage that the radial alignment is passed by motion in latitude because it allows observation of transport in latitude.

