Supplementary Online Material:

Movie S1
Cassini ISS collected images of Jupiter for months before and after its closest approach to the planet on 30 December 2000. Six images of the planet in each of several spectral filters were taken at evenly spaced intervals over the course of Jupiter's 10-hour rotation period. The entire spectral sequence was then repeated generally every second Jupiter rotation, yielding views of every sector of the planet at least once every 20 hours. The images used for the movies shown here were only those taken 20 hours apart and through a filter centered at 751 nanometers over the course of 70 days. The six images covering each rotation were mosaicked together to form a cylindrical map extending from 75° north to 75° south in latitude and covering 360° in circumference. These maps were then re-projected into a polar movie rotating with the magnetic field; ie, the System III longitude system. The coherent nature of the high latitude flows, despite the very chaotic, mottled and non-banded appearance of the planet's polar regions, is surprising. Jupiter's alternating eastward and westward jet streams flow in concentric rings around the pole, with equatorial motions visible in the corners. The large dark features flowing counterclockwise near the equator are "hot spots" where cloud cover is relatively thin. This is the first extended movie sequence to show the coherence of the circumpolar winds and the features blown around the planet by them. (Credit: NASA/JPL/University of Arizona/Cosmos Studios)

Movie S2
The UV1 (258 nm) images acquired over each 10 hour Jupiter rotation between 1 October 2000 and 15 December 2000 were mosaicked together to form a 360* cylindrical map of Jupiter in the ultraviolet. These maps were re-projected into a polar movie, shown here, rotating with the magnetic field (System III). Prograde (westerly) jets move in a counter-clockwise direction in this view. Contrast was enhanced to reveal faint features. The movie clearly shows the development, evolution and demise of a large dark, oval vortex, indicating complex dynamics in the jovian polar stratosphere never observed before on Jupiter. The view extends south to the equator at the corners of the frame. The black area at the pole is where no presentable data were acquired due to Cassini's viewing angle. For reference, a circle of 60* latitude is superimposed in white, and an oval where Jupiter has a persistent aurora is superimposed in blue. The aurora itself, comparable to Earth's Northern Lights, is not visible here. (Credit: NASA/JPL/University of Arizona)

Movie S3
During the eclipse of the moon, Io, on 1 January 2001, Cassini recorded images in several colors ranging from the near-UV to the near-IR. Two of these colors have been added to the clear-filter temporal sequence of this eclipse to make visual the evidence in determining the source of Io's auroral glows. The color frames were taken at lower resolution than the clear filter frames (120 versus 60 km/pixel) and less frequently than the clear filter images, though they still span the entire two hour duration of the movie. The white dots near the equator are volcanoes, the brightest being Pele, and are often much brighter than the faint atmospheric glows. Emissions in the 595 to 645 nm

wavelength range likely arise from a tenuous atmosphere of atomic oxygen; they would appear red to the eye and are consequently colored red in the movie. Emissions in the near-UV, between 300 and 380 nm, correspond in wavelength to the bright blue visible glows one would expect from molecular sulfur dioxide; they have been colored blue in the movie. The blue glows are restricted to areas deep down in the atmosphere near the surface of Io, whereas the red glows are much more extensive (reaching heights of up to 900 km). The prominent blue and red regions near the equator of Io dance across the moon with the changing orientation of Jupiter's magnetic field, dramatically illustrating the relationship between Io's aurorae and the magnetic-field-aligned electrical currents which excite them. A faint but localized blue emission is visible near the north pole of Io, probably due to a volcanic plume erupting from the volcano Tvashtar at high northern latitude on the side of Io opposite Cassini. (Credit: NASA/JPL/University of Arizona)

Movie S4
This brief movie clip is made from images taken during 40 hour sequence targeted to the jovian ring on 11 December 2000 at phase angle near 0°. The segment shown here is 16 hrs long and shows the motions of the two ring-embedded satellites Adrastea and Metis (the brighter of the two). The satellites each orbit the planet twice during this movie. These images, and others taken throughout the encounter, including an equivalent high phase movie taken on departure from Jupiter, have been used to refine the orbits of these two bodies. (Credit: NASA/JPL/University of Arizona)