

**Supplementary Online Material:**

**Movie S1.** This 73-frame movie of Saturn's southern hemisphere (from the equator to the pole) is comprised of images captured between February 6 and May 12, 2004 as Cassini approached Saturn. Six navigated, illumination-corrected images were projected onto a rectangular grid of latitude and longitude to make each cylindrical map, with one map for each rotation of the planet that was captured by the cameras.

**Movie S2.** A 76-frame movie in which the cylindrical maps have been projected back onto an oblate 'Saturn' and re-illuminated. The geometry and lighting represent how Saturn appeared to the Cassini spacecraft on March 23, 2004.

Both movies are fixed in longitude (rotation is removed).

This view of Saturn has some similarities to movies made from Cassini's encounter with Jupiter, except that in this case only the dark ovals are visible and not the background jets. The jets are there, but their features are much more muted. It is not yet clear whether all of the ovals visible here are anti-cyclonic—meaning that their winds flow in a counter-clockwise direction—but they are similar in appearance to the anti-cyclonic ovals Cassini saw on Jupiter. A few of the ovals can be seen to change their apparent direction of travel, from westward to eastward, as they change their latitude. This behavior was also observed on Jupiter. Mergers of ovals are seen and white convective-looking storms are seen to erupt occasionally in the same latitude region of the ovals. One bright eruptive storm is associated with the appearance of three dark spots similar in nature to the other long-lived vortices present in the atmosphere, an observation which may indicate a mechanism involved in the creation of vortices on Saturn, and possibly on other giant planets (Fig. 4).

These images were taken with the narrow angle camera using a spectral filter centered at 750 nanometers, and from distances ranging from 70.8 million kilometers (44 million miles) to 25.9 million kilometers (16.1 million miles) from Saturn. The image scale ranges from 425 kilometers (264 miles) to 155 kilometers (96 miles) per pixel.