CASSINI–HUYGENS

Saturn's big storm

In contrast to the dramatic meteorology of Jupiter, Saturn's golden-yellow hues provide an air of calmness, with slow seasonal changes from wintry blues to summertime yellows as the temperatures, chemistry and hazes evolve over Saturn's 29.5-year orbit. But, once every Saturnian year, a gigantic storm of billowing white cloud activity erupts from those serene cloud decks.

There were five recorded annual storms prior to Cassini's mission, all of which had erupted after the northern summer solstice (which just passed on 24 May 2017). It was incredibly fortuitous that a similar gargantuan storm occurred a decade earlier than expected, erupting from Saturn's northern mid-latitudes during early spring in December 2010. The plumes, thought to be powered by moist convection, lofted fresh volatiles upwards to condense to form bright white clouds. The fresh clouds and chemicals were redistributed by the prevailing winds, with the storm 'head' moving swiftly westward, and a turbulent tail of patchy clouds and newly formed anticyclones moving eastward. Eventually, the head of the storm encountered material from the tail, merging to form a new, white turbulent band on Saturn.

Cassini's multi-spectral capabilities provided a wealth of insights into the nature of the storm. Powerful lightning strikes, a signature of convective activity, were detected as both optical flashes and via their radio emissions. Fresh ices of water and ammonia were detected via the spectral signatures in reflected sunlight. Enormous stratospheric temperature perturbations, and the formation of a glowing, hot vortex known as 'the beacon', were discovered via their heat signatures and persisted for three years after the churning storm had abated. And radar observations after the storm had passed showed that the storm had completely cleared the atmosphere of ammonia gas, maybe by rain or snow. Combined, these Cassini data have allowed researchers to understand the convective phenomena and timescales for one of the most spectacular meteorological phenomena in our Solar System.

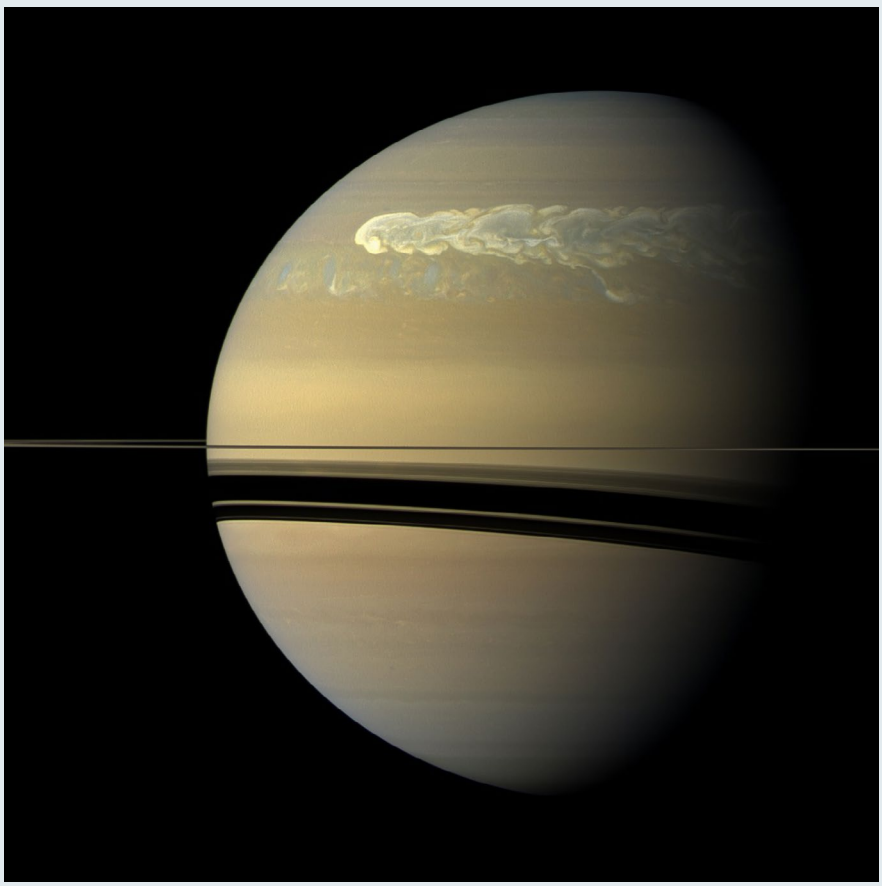

Image credit: NASA/JPL-Caltech/Space Science Institute

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Published online: 5 September 2017
DOI: 10.1038/s41550-017-0246-6