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A New Dark Vortex

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A bright, unusually long-lived outburst of cloud activity on Neptune was observed in 2015. This led to speculation about whether the clouds were convective in nature, or bright companions to an unseen dark vortex (similar to the Great Dark Spot studied in detail by Voyager 2). HST OPAL images at blue wavelengths finally answered this question by discovering a new dark vortex at 45 deg S. We call this feature SDS-2015, for "southern dark spot discovered in 2015."

Dark vortices on Neptune are rare; SDS-2015 is only the fifth ever seen. All five were diverse in terms of size and shape, the distribution of bright companion clouds, and horizontal motions (oscillations and drifts). The drift of these vortices is highly sensitive to horizontal and vertical wind shear, making them valuable probes into the structure of Neptune's atmospheric jets. We have traced oscillations in the longitudinal positions of bright companion clouds of SDS-2015, but a second epoch of HST imaging is needed to measure latitudinal motion of the dark vortex itself.

Only HST can image dark vortices on Neptune. Ground-based facilities lack the resolution to detect these low-contrast features at blue optical wavelengths, while infrared observations don't detect the dark spots themselves, only their bright companion features. We propose observations of SDS-2015, in order to measure its size, drift rate, and aerosol structure, and to trace its temporal evolution. The observations will improve our understanding of the life cycle of neptunian vortices, of their influence on the surrounding atmosphere, and of the structure of planetary jets.

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