18032 - The Mysterious Death of a Lonely Dwarf: Who Quenched Cetus?

Cycle: 33, Proposal Category: GO

(Availability Mode: SUPPORTED)

INVESTIGATORS

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VISITS

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
01	(1) CETUS-DSPH	ACS/WFC WFC3/UVIS	2	03-Dec-2025 14:00:31.0	yes
02	(1) CETUS-DSPH	ACS/WFC WFC3/UVIS	2	03-Dec-2025 14:00:32.0	yes
03	(1) CETUS-DSPH	ACS/WFC WFC3/UVIS	2	03-Dec-2025 14:00:33.0	yes

Visit	*Targets used in Visit*	*Configurations used in Visit*	*Orbits Used*	*Last Orbit Planner Run*	*OP Current with Visit?*
04	(1) CETUS-DSPH	ACS/WFC WFC3/UVIS	2	03-Dec-2025 14:00:34.0	yes

8 Total Orbits Used

ABSTRACT

Cetus dSph (Cetus) is a classical isolated dwarf galaxy in the LG, separated from the Milky Way (MW) and M31 by ~750 kpc and ~680 kpc, respectively. Despite this apparent isolation, Cetus is a quenched dwarf galaxy with no HI reservoir or recent star formation. This is contrary to the distance-morphology relation where quenched galaxies are typically closer to a massive host and star-forming galaxies are more isolated. Traditionally, the quenched nature of Cetus has been explained by labeling it a backsplash galaxy, i.e. a galaxy, typically a dwarf, that has previously interacted with a massive galaxy but is now significantly outside of its virial radius due to a highly elliptical orbit. Significantly, this explanation is not compatible with recent kinematic studies, which suggest that Cetus may be on first infall with no previous interaction with the MW or M31. If on first infall, Cetus would defy our current understanding of how galaxies quench; there are no analogs of quenched, Cetus-mass galaxies in simulations that have not encountered a more massive companion. However, existing kinematic data for Cetus has significant measurement uncertainty, making its first infall orbit classification highly uncertain. We propose a new epoch of imaging for the Cetus dSph with HST to measure the proper motions (PM) of Cetus to sufficient accuracy to definitively constrain its past orbit and interaction history. Given the clear theoretical challenge of a first infall orbit to galaxy quenching models, it is critical to constrain the orbit of Cetus to advance or verify our understanding of how galaxies quench.

OBSERVING DESCRIPTION

We will observe Cetus using ACS/WFC, with coordinated parallel observations using WFC3/UVIS. PM measurement requires at least two epochs of data separated by a significant period of time. Cetus has deep ACS/WFC and parallel WFC3/UVIS imaging data in both F814W and F475W in the HST archive from 2006 (GO-10505), this gives a time baseline of 20 years compared to Cycle 33. To measure PMs, it is sufficient to observe only in one filter. We will image Cetus for 8 orbits divided into half orbit exposures in F814W.

Proposal 18032 - Visit 01 - The Mysterious Death of a Lonely Dwarf: Who Quenched Cetus?

Visit

Proposal 18032, Visit 01, pi Wed Dec 03 19:00:35 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 266.015D TO 266.015 D; GROUP 01,02,03,04 WITHIN 30D

Comments: A 2 orbit visit for Cetus dSph in F814W.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CETUS-DSPH	RA: 00 26 9.7000 (6.5404167d) Dec: -11 04 35.00 (-11.07639d) Equinox: J2000		V=13.2	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0,0	Prime + Parallel Group 1-2 in Visit 01	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
2		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 1-2 in Visit 01	1100 Secs (1188 Secs) *[==>1188.0 Secs]*	***[1]***
3		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.2228,0.1158	Prime + Parallel Group 3-4 in Visit 01	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
4		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 3-4 in Visit 01	1100 Secs (1128 Secs) *[==>1128.0 Secs]*	***[1]***
5		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.0998,0.2303	Prime + Parallel Group 5-6 in Visit 01	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
6		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Visit 01	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***
7		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.3225,0.3460	Prime + Parallel Group 7-8 in Visit 01	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
8		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 7-8 in Visit 01	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***

Orbit Structure

Proposal 18032 - Visit 02 - The Mysterious Death of a Lonely Dwarf: Who Quenched Cetus?

Visit

Proposal 18032, Visit 02, pi Wed Dec 03 19:00:35 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 266.015D TO 266.015 D; GROUP 02,01,03,04 WITHIN 30D

Comments: A 2 orbit visit for Cetus dSph in F814W.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CETUS-DSPH	RA: 00 26 9.7000 (6.5404167d) Dec: -11 04 35.00 (-11.07639d) Equinox: J2000		V=13.2	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.4075,0.0306	Prime + Parallel Group 1-2 in Visit 02	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
2		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 1-2 in Visit 02	1100 Secs (1188 Secs) *[==>1188.0 Secs]*	***[1]***
3		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.6304,0.1464	Prime + Parallel Group 3-4 in Visit 02	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
4		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 3-4 in Visit 02	1100 Secs (1128 Secs) *[==>1128.0 Secs]*	***[1]***
5		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.5073,0.2609	Prime + Parallel Group 5-6 in Visit 02	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
6		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Visit 02	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***
7		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.7302,0.3767	Prime + Parallel Group 7-8 in Visit 02	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
8		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 7-8 in Visit 02	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***

Orbit Structure

Proposal 18032 - Visit 03 - The Mysterious Death of a Lonely Dwarf: Who Quenched Cetus?

Visit

Proposal 18032, Visit 03, pi Wed Dec 03 19:00:35 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 266.015D TO 266.015 D; GROUP 03,01,02,04 WITHIN 30D

Comments: A 2 orbit visit for Cetus dSph in F814W.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CETUS-DSPH	RA: 00 26 9.7000 (6.5404167d) Dec: -11 04 35.00 (-11.07639d) Equinox: J2000		V=13.2	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.0018,0.4085	Prime + Parallel Group 1-2 in Visit 03	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
2		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 1-2 in Visit 03	1100 Secs (1188 Secs) *[==>1188.0 Secs]*	***[1]***
3		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.2246,0.5243	Prime + Parallel Group 3-4 in Visit 03	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
4		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 3-4 in Visit 03	1100 Secs (1128 Secs) *[==>1128.0 Secs]*	***[1]***
5		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.1017,0.6388	Prime + Parallel Group 5-6 in Visit 03	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
6		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Visit 03	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***
7		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.3244,0.7545	Prime + Parallel Group 7-8 in Visit 03	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
8		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 7-8 in Visit 03	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***

Orbit Structure

Proposal 18032 - Visit 04 - The Mysterious Death of a Lonely Dwarf: Who Quenched Cetus?

Visit

Proposal 18032, Visit 04, pi Wed Dec 03 19:00:35 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS, ACS/WFC

Special Requirements: ORIENT 266.015D TO 266.015 D; GROUP 04,01,02,03 WITHIN 30D

Comments: A 2 orbit visit for Cetus dSph in F814W.

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	CETUS-DSPH	RA: 00 26 9.7000 (6.5404167d) Dec: -11 04 35.00 (-11.07639d) Equinox: J2000		V=13.2	Reference Frame: NED

Comments: This object was generated by the targetselector and retrieved from the NED database.
Category=GALAXY
Description=[DWARF SPHEROIDAL]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.4093,0.4392	Prime + Parallel Group 1-2 in Visit 04	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
2		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 1-2 in Visit 04	1100 Secs (1188 Secs) *[==>1188.0 Secs]*	***[1]***
3		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.6322,0.5550	Prime + Parallel Group 3-4 in Visit 04	1100 Secs (1108 Secs) *[==>1108.0 Secs]*	***[1]***
4		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 3-4 in Visit 04	1100 Secs (1128 Secs) *[==>1128.0 Secs]*	***[1]***
5		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.5091,0.6695	Prime + Parallel Group 5-6 in Visit 04	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
6		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 5-6 in Visit 04	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***
7		(1) CETUS-DSPH	ACS/WFC, ACCUM, WFCENTER	F814W		POS TARG 0.7320,0.7852	Prime + Parallel Group 7-8 in Visit 04	1100 Secs (1129 Secs) *[==>1129.0 Secs]*	***[2]***
8		(1) CETUS-DSPH	WFC3/UVIS, ACCUM, UVIS	F814W			Prime + Parallel Group 7-8 in Visit 04	1100 Secs (1179 Secs) *[==>1179.0 Secs]*	***[2]***

Orbit Structure