18033 - The smoking gun uncovering the origin of the rotational spread in young Magellanic cloud clusters: NGC1866

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) NGC-1866	WFC3/UVIS	2	29-Jul-2025 10:00:15.0	yes

2 Total Orbits Used

ABSTRACT

Young stellar clusters in Magellanic Clouds (MCs) do not host simple stellar populations, as could be expected. Features, such as the split main sequence (MS) and the extended main sequence turn-off (eMSTO), are easily visible in all clusters younger than 2 Gyrs. Spectroscopic studies suggest that these features arise from different rotation rates among the stars.

However, the occurrence of slow rotators poses a serious challenge to our understanding of stellar evolution. Indeed, pre-MS stars are expected to accelerate, so we do not expect to find slow-rotating stars. What causes some stars to slow down while others retain their spin?

So far, three main mechanisms have been proposed, involving tidal interaction in binary systems, disc interaction in the pre-MS phase, and stellar mergers. Binary fraction among fast and slow rotators is the key to constrains the mechanism, indeed, each mechanism predicts different binary content.

A new method has been developed to analyze a large sample of binaries, effectively distinguishing between slow and fast rotators using the F275W filter. This method has already been applied to three star clusters that are less than 100 million years old. Unfortunately, due to their young age, it is challenging to validate a single mechanism. We propose to observe NGC 1866, a 200-million-year-old star cluster in the Large Magellanic Cloud, using the F275W filter. Given that the mechanism has been active for a longer period, we expect to find more significant differences in binary content. This makes the cluster the smoking gun uncovering the braking mechanism and the origin of the split MS and the eMSTO.

OBSERVING DESCRIPTION

This is a proposal aimed at obtaining high accuracy photometry of the MC cluster NGC1866 in the WFC3/UVIS/F275W band.

Visit

Proposal 18033, Visit 01 Tue Jul 29 14:00:15 GMT 2025

Diagnostic Status: No Diagnostics

Scientific Instruments: WFC3/UVIS

Special Requirements: (none)

Patterns

#	Primary Pattern		Secondary Pattern	Exposures
(1)	Pattern Type=LINE	Coordinate Frame=POS-TARG		(1), (2)
	Purpose=DITHER	Pattern Orientation=270		
	Number Of Points=2	Angle Between Sides=		
	Point Spacing=6	Center Pattern=false		
	Line Spacing=			

Fixed Targets

#	Name	Target Coordinates	Targ. Coord. Corrections	Fluxes	Miscellaneous
(1)	NGC-1866	RA: 05 13 41.9100 (78.4246250d) Dec: -65 27 36.20 (-65.46006d) Equinox: J2000	Epoch of Position: 2000	V=9.73	Reference Frame: ICRS

Comments: This object was generated by the targetselector and retrieved from the SIMBAD database.
Category=STELLAR CLUSTER
Description=[GLOBULAR CLUSTER]

Exposures

#	Label	Target	Config,Mode,Aperture	Spectral Els.	Opt. Params.	Special Reqs.	Groups	Exp. Time (Total)/[Actual Dur.]	Orbit
1		(1) NGC-1866	WFC3/UVIS, ACCUM, UVIS-CENTER	F275W	FLASH=20		Pattern 1, Exps 1-1 in Visit 01 (1)	1282 Secs (2564 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[1]***
2		(1) NGC-1866	WFC3/UVIS, ACCUM, UVIS-CENTER	F275W	FLASH=20		Pattern 1, Exps 2-2 in Visit 01 (1)	1269 Secs (2538 Secs)	
								[==>(Pattern 1)] *[==>(Pattern 2)]*	***[2]***

Orbit Structure