Occultations by **Pluto & Charon** observed by the PHOT team, 2011 June 23 & 27

1. Introduction

The technique of stellar occultation is well-known for its ability to probe planetary atmospheres at high vertical resolution. We attempted four occultations from the Pacific over four days. The June 23 star is occulted by both Charon and Pluto, and the June 27 star is occulted by both Pluto and Hydra. The Charon and both the Pluto occultations were predicted to be observable from the Pacific at equatorial or small northern latitudes.

- 1. Observe Pluto with multiple chords to monitor Pluto's changing
- atmosphere. We observed occultations spanning 1000 km. 2. Occultations by Pluto and Charon of the same star to measure
- relative astrometry of Pluto and Charon (for refining the orbits of all Pluto's moons). We observed seven Charon and six Pluto events. 3 Probe the center of Pluto's atmosphere to probe pressures near
- Pluto's surface. We observed one event within 300 km of shadow
- Pluto's surface. We observed one event winn soo km of shadow center, at SNR 8 per scale height.
 Observe at high cadence, high SNR to measure the temperature at high resolution. Two site observed the upper atmosphere, with SNR 50, 25 points per scale height, and with SNR=40, 7 points per scale height, and with SNR=40, 7 points per scale height. scale height.
- Observe in multiple wavelengths to characterize hazes. Two sites 5. with visible/IR, one with reported detection of upper atmosphere. Observe Pluto twice in a Pluto rotation (6.4 days) to look for 6.
- changes on short time scales. All telescopes in the June 27 Pluto track were clouded out.
- Observe an occultation by Hydra. No Hydra event detected. 7.

Table I: Event Summary

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Target	Event/UT	Event/UT	V	· 1	J	K	Ī
2011-06-23 star	Charon, 11:!4	Pluto 11:24	14.7	14.0	11.0	9.7	
2011-06-27 star	Pluto, 14:18	Hydra, 14:42	13.4	13.2	12.3	11.9	
Pluto	-		14.4	13.6	12.0	13.0	

Fig 1. Predictions used for deployment, 2 weeks before flying



2. Observations & Reduction

Table 2: Site Summary			
Site and Aperture (m)	Observers	Instrumentation	Comments
Byrne Obs., Sedgwick Reserve, CA [0.83]	FBB, BJF	LucaR	High humidity, no data
LCOGT Santa Barbara, CA [0.40]	WR	LucaR	Fog, no data
KEASA, Kauai, HI [0.36]	THH, JCM, BB	Watec 120N	Clear. Charon. Pluto graze?
Kekaha, Kauai, HI [0.36]	TW	Raptor OEM Merlin EM247	Intermittent clouds. Charon egress Pluto graze?
Hyatt Regency Lahaina, Maui HI [0.36]	HJB, EM	Raptor OEM Merlin EM247	Clouds, no data.
Faulkes Tel. North, Maui, HI [2.0]	FBB, TAL, BJF	Andor iXon 888	Charon and Pluto
University of Hawaii, Mauna Kea, HI [2.2]	DT, MM, GTE	OPTIC	Telescope problems, no data.
San Pedro Martir 0.84-cm, Baja Calif., MX [0.84]	RGF	PHOT-Doc	Clear, Pluto and Charon
San Pedro Martir 2.1-m, Baja Calif., MX [2.1]	RH	CID (IR)	Clear, Pluto and Charon
Hale A'a, Bill Beervort's 24-inch [0.61]	EFY, WMF	PHOT-Henri	Clear, heavy condensation (vog). Pluto and Charon
Hale A'a Chris Erickson's 16-inch [0.41]	EFY, CKE	PHOT-Dorothea	Clear, heavy condensation (vog). Pluto and Charon
Hale A'a, 24-inch Dobsonian [0.61]	CL, EFY, TV, TS	NovaSensor Anacapa (IR)	Clear, heavy condensation (vog), difficult telescope pointing
SR-1, Kwajalein, Marshall Islands [0.61]	RW, JO, GH	B3	Intermittent thin clouds.
SR-5, Kwajalein, Marshall Islands [0.61]	JRR, JD, WL, JB	B3	Intermittent thin clouds.
Majuro Atoll, Marshall Islands [0.36]	CBO, HJR	PHOT-Walker	Pluto
Cebu, Phillipines Christopher Go's 14-inch [0.36]	LAY, MJB, CG	PHOT-Eadweard	Cloudy, no data.
Nauru [0.36]	PT, LHW	PHOT-Ansel	Telescope problems, no data.
Faulkes Tel. South, Siding Spring, Aus [2.0 m]	FBB, BJF	Andor iXon 888	Cloudy, no data



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Fig 2. Sites that attempted the 2011 June 23 occultation

KEASA & Kahaka, Kauai Lahaina & FTN, Maure UH2.2m 20 Hale A'a (x3) San Pedro Mart bu City Kwajelain & Roi Namu and so the second



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3. Discussion

