Weather Analysis

Robert O'Connell and Anthony Cook

We noted in 'Revisiting The 1963 Aristarchus Events'[1] TLP skeptics have suggested a temperature inversion layer, which "*often markedly accentuates* [atmospheric prismatic] *dispersion*", may have been a contributing factor in producing the reddish TLP of 'The 1963 Aristarchus Events."[2] Fitton (1975) notes an atmospheric inversion layer over an observing location can produce odd and enhanced manifestations of color fringing at high contrasty areas on the Moon, which, could *trick* telescopic observers into believing they are witnessing a real lunar-based color phenomenon.[3] For anyone who has ever carefully studied cataloged TLP reports, it quickly becomes apparent that many, if not most, color TLP observations are in fact most likely due to the misinterpretation of atmospheric prismatic dispersion (APD) (particularly if one takes the time to determine the Moon's altitude range during the observation). In this web-based supplement, we present Flagstaff weather data for the two nights of 'The 1963 Aristarchus Events'[4] which suggest there was no inversion layer present over the city on either night. This supplement available for download at www.the1963aristarchusevents.com

Introduction

TLP skeptics have argued the simplest and most plausible non-lunar explanation for color TLP reports is observer misinterpretation of APD and have raised this possibility specifically with regard to 'The 1963 Aristarchus Events'.[5] APD is a well known optical phenomenon produced by the differential density of Earth's atmosphere which, acting like a prism, can produce bluish and reddish color fringing at high contrasty areas along the Moon's terminator. This effect can be particularly noticeable when the Moon is viewed at relatively low altitudes through large telescopes like the Lowell Observatory 24-inch achromatic Clark refractor.

In our paper we address the APD hypothesis with regard to these reports, noting why its color-fringing effects appear to inadequately account for the color, obscurations and flowing lights reported. We further noted there is no evidence an inversion layer was present over Flagstaff on either night which was based on the following weather analyses provided by retired meteorologist Tandy Carter.

Tandy Carter Weather Analyses

In 2009, we supplied retired U.S. Naval meteorologist Tandy Carter of Gainesville, Florida the Flagstaff weather data for the two nights in question seeking to determine if there was any evidence of in inversion layer over Flagstaff on October 30th or November 28th (UT). Here are Mr. Carter's analyses:

"*After analyzing the provided data I have come to the following conclusions*:"

Night 1: "*During the time of the* (reddish TLP) *observations on October 30, 1963 UT* (Oct. 29th Flagstaff) *the sky had a few high Cirrus Clouds (Thin Clouds). The surface temperature was 54 degrees (F) with the relative humidity of 47%. Winds were from the south southeast at 7 knots. Surface visibility was better than fifteen miles. There was no indication of any haze in the area. Although I cannot say for sure since there were no upper air soundings available, indications are that there was no temperature inversion in the area."*

Night 2: "*During the time of the* (reddish TLP) *observations on November 28, 1963 UT* (Nov. 27 Flagstaff) *the sky was almost clear, for a short time during the observation period a few Cirrus Clouds appeared but dissipated rapidly. The temperature at start was at 49 degrees (F) and had dropped to 31 degrees (F) by the time observations were finished. Relative Humidity was 36%. The wind was from the north and the wind speed varied from calm to 6 knots. As before surface visibility was greater than fifteen miles and with no haze reported. Again there was no indication of a temperature inversion.***"**

Tandy Carter, June 26, 2009

Mr. Carter is a retired U.S. Navy Lieutenant Commander, graduate, U.S. Naval Post Graduate School Monterey CA, May 1960. He served as Chief Meteorological Officer NAS Sand Point Seattle, WA; Forecaster U.S. Naval Fleet Weather Center Joint Typhoon Warning Center Guam and Forecaster U.S. Naval Fleet Weather Facility Alameda, CA.

Conclusion

It appears from the weather data that a temperature inversion layer was *not* present over Flagstaff on either night which might have produced unusual manifestations of APD leading to false TLP reports from Mars Hill. Additionally it seems unlikely the combined experience of the observers at the 24-inch Clark refractor would have allowed for misinterpretation of APD's all too familiar and *ubiquitous* effects for the few discrete TLP seen in October and November. In this regard, it is interesting to note Fitton's comment regarding the ubiquitous nature of APD: *"It is worth noting that, if*

one bright point source at the lunar surface is producing a spectrum (APD), all point sources over the entire lunar surface must be producing spectra."[6] Greenacre repeatedly checked for colors similar to the TLP at other locations during the October TLP episode and failed to detect any noting "*If the atmosphere had been responsible for these colors, we feel there would have been other points, particularly bright points, that would have had these colors. But this was not the case, as no evidence of any color could be found on this upland area or the vast area surrounding it.*"[7] Barr, noting a similar situation on November 28th, promptly called other observers to the Clark dome to confirm his suspected TLP observation.

Greenacre remained firmly convinced for the remainder of his life that he had witnessed some type of real lunar phenomena and it is reported that he was "*sort of in awe*" following the November 28th TLP event. (Personal communication, James E. Greenacre, Jr., 2011). In this connection it is interesting to note that following his own TLP observation on night 2, Hall wrote in a letter dated 1963 Dec. 5, "*We do not know the nature of this phenomena . . . Contention made here is that this coloration is not produced in the optics of the telescope or by the earth's atmosphere.*"[8]

Weather Data

Carter's analysis above is based on Flagstaff surface weather observations of the U.S. Department of Commerce Weather Bureau, Flagstaff Pulliam Airport weather station located 7 kilometers to the southwest and 72 meters below Lowell Observatory.[9] (See Figure 1). The weather-log pages from the U.S. Department of Commerce Weather Bureau below are for October 29 and November 27, 1963 in Flagstaff which corresponds to October 30th and November 28th Universal Dates respectively - the dates of the two TLP observations. Flagstaff is in the Mountain Standard Time Zone (MST) which has always been 7 hours earlier than Universal Time as Daylight Saving Time has never been in effect in this city. Below are weather data for each night and times closest to the TLP observations in MST are highlighted in red.

Figure 1. Proximity of Lowell Observatory to Flagstaff Pulliam Airport weather station. Image: Google Maps 2010.

Acknowledgements

The authors thank Mr. Tandy Carter for his weather analyses and Ms. Janet Wall, Archivist, NOAA National Climatic Data Center, for her assistance in accessing relevant weather data documents (presented below). We also thank James C. Greenacre's eldest son, James E. Greenacre, Jr., for his personal anecdote.

Addresses: **RO**: P.O. Box 1963, Keystone Heights, FL 32656. [admin "at" the1963aristarchusevents.com] **AC**: Institute of Mathematical and Physical Sciences University of Wales Aberystwyth, Penglais, Aberystwyth, Ceredigion, SY23 3BZ, WALES, UNITED KINGDOM. [atc "at" aber.ac.uk]. Website: www.the1963aristarchusevents.com

References and notes

1 O'Connell, R. & Cook, A., 'Revisiting The 1963 Aristarchus Events', *J. Brit. Astron. Assoc.*, **123**(4) pp.197-208, (2013 August)

2 Sheehan W. P. & Dobbins T. A., 'Epic Moon: a history of lunar exploration in the age of the telescope', (*Richmond: William−Bell, Inc., 2001*), p. 318. (Also personal communications with T. A. Dobbins, 2011).

3 Fitton, L. E. 1975, 'Transient Lunar Phenomena - A New Approach', *Journal of the British Astronomical Association*, **85**(6), pp. 511-527 (1975). Note: The relevance of Fitton's temperature inversion layer/anticyclone hypothesis in producing APD has been challenged. For example, see: Griffin, R. F., 'Atmospheric Refraction and Spurious Colour', letter to the editor, *Journal of the British Astronomical Association*, **86**(2), p. 165, (1976)

4 Greenacre J. C., 'The 1963 Aristarchus Events', *The New York Academy of Sciences Annals*, **123**(2), pp. 811-816, (1965 July). Greenacre presented this paper at the conference entitled *Geological Problems in Lunar Research* held by The New York Academy of Sciences on 1964 May 16-19.

5 Sheehan 2001, *op cit.* ref. 2, p. 317: "*The most likely explanation is simply that Greenacre's reddish glows (and the blue and violet counterparts reported by others) arise not on the Moon but in the Earth's atmosphere.*"

6 Fitton 1975, op. cit. ref. 3, p. 523.

7 Greenacre 1965, *op. cit.* ref 4, p. 813.

8 John S. Hall letter to Phil Bury, (1963 Dec 5), In J. S. Hall papers, Lowell Observatory Archives. Mr. Bury was 'Secretary of the Commission of Observations' with the *Societe d'Astronomie Populaire*, Toulouse, France.

9 National Oceanographic and Atmospheric Administration. 'Surface Weather Observations for Flagstaff, Arizona for October 29 and November 27, 1963'. NOAA National Environmental Satellite, Data and Information Service, 2009. National Climatic Data Center.

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KEY TO AVIATION WEATHER OBSERVATIONS

LOCATION IDENTIFIER TYPE AND TIME OF REPORT*	SKY AND CEILING	VISIBILITY WEATHER AND OBSTRUCTION TO VISION	SEA-LEVEL PRESSURE	TEMPERATURE AND DEW POINT	WIND	ALTIMETER SETTING	REMARKS AND CODED DATA
MCI SA Ø758	15 SCT M25 OVC	1R-F	132	/58/56	/18Ø7	/993/	RØ1VR2ØV4Ø

SKY AND CEILING

Sky cover contractions are for each layer in ascending order. Figures preceding contractions are base heights in hundreds of feet above station elevation. Sky cover contractions used are:

CLR = Clear: Less than Ø.1 sky cover.
SCT = Scattered: Ø.1 to Ø.5 sky cover.
BKN = Broken: Ø.6 to Ø.9 sky cover.
OVC = Overcast: More than Ø.9 sky cover.

— = Thin (When prefixed to SCT, BKN, OVC).
—X = Partly obscured: Ø.9 or less of sky hidden by precipitation or obstruction to vision (bases at surface).
X = Obscured: 1.Ø sky hidden by precipitation or obstruction to vision (bases at surface).

A letter preceding the height of a base identifies a ceiling layer and indicates how ceiling height was determined. Thus:

E = Estimated
M = Measured
W = Vertical visibility into obscured sky

V = Immediately following the height of a base indicates a variable ceiling.

VISIBILITY

Reported in statute miles and fractions
(V = Variable)

WEATHER AND OBSTRUCTION TO VISION SYMBOLS

A	Hail	IC	Ice crystals	S	Snow
BD	Blowing dust	IF	Ice fog	SG	Snow grains
BN	Blowing sand	IP	Ice pellets	SP	Snow pellets
BS	Blowing snow	IPW	Ice pellet showers	SW	Snow showers
D	Dust	K	Smoke	T	Thunderstorms
F	Fog	L	Drizzle	T+	Severe thunderstorm
GF	Ground fog	R	Rain	ZL	Freezing drizzle
H	Haze	RW	Rain showers	ZR	Freezing rain

Precipitation intensities are indicated thus: - Light; (no sign) Moderate; + Heavy

WIND Direction in tens of degrees from true north, speed in knots, ØØØØ indicates calm. G indicates gusty. Q indicates Squalls. Peak wind speed in the past 1Ø minutes follows G or Q when gusts or squalls are reported. The contraction WSHFT, followed by GMT time group in remarks, indicates windshift and its time of occurrence. (Knots x 1.15 = statute mi/hr).

EXAMPLES: 3627 = wind from 36Ø Degrees at 27 knots;
3627G4Ø = wind from 36Ø Degrees at 27 knots, peak speed in gusts 4Ø knots

ALTIMETER SETTING

The first figure of the actual altimeter setting is always omitted from the report.

RUNWAY VISUAL RANGE (RVR)

RVR is reported from some stations. For planning purposes, the value range during 1Ø minutes prior to observations and based on runway light setting 5 are reported in hundreds of feet. Runway identification precedes RVR report.

PILOT REPORTS (PIREPs)

When available, PIREPs in fixed-format may be appended to weather observations. PIREPs are designated by UA or UUA for urgent PIREPs.

DECODED REPORT

Kansas City International: Record observation completed at Ø758 UTC 15ØØ feet scattered clouds, measured ceiling 25ØØ feet overcast, visibility 1 mile, light rain, fog, sea-level pressure 1Ø13.2 millibars, temperature 58°F, dewpoint 56°F, wind from 18Ø°, at 7 knots, altimeter setting 29.93 inches. Runway Ø1, visual range 2ØØØ feet lowest 4ØØØ feet highest in the past 1Ø minutes.

* TYPE OF REPORT

SA = a scheduled record observation
SP = an unscheduled special observation indicating a significant change in one or more elements
RS = a scheduled record observation that also qualifies as a special observation

The designator for all three types of observations (SA, SP, RS) is followed by a 24-hour-clock-time-group in Coordinated Universal Time (UTC or Z).

U.S. DEPARTMENT OF COMMERCE—**NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION**—NATIONAL WEATHER SERVICE

U.S. GPO 1988-214 639

TIME CONVERSION TABLE: LST to UTC (COORDINATED UNIVERSAL TIME)

STANDARD TIME ZONE	To Convert LST TO UTC ADD	ie: 1200 (NOON) LST EQUALS
Atlantic Standard Time	4 hours	1600 (4:00pm) UTC
Eastern Standard Time	5 hours	1700 (5:00pm) UTC
Central Standard Time	6 hours	1800 (6:00pm) UTC
Mountain Standard Time	7 hours	1900 (7:00pm) UTC
Pacific Standard Time	8 hours	2000 (8:00pm) UTC
Yukon Standard Time	9 hours	2100 (9:00pm) UTC
Alaska/Hawaii Standard Time	10 hours	2200 (10:00pm)UTC
Bering Standard Time	11 hours	2300 (11:00pm)UTC

To convert UTC to LST, SUBTRACT the same hours from UTC.

WBAN FORM 10A (REV. 11-1-60) — U.S. DEPARTMENT OF COMMERCE - WEATHER BUREAU

SURFACE WEATHER OBSERVATIONS

STATION: Flagstaff, Arizona

DATE: OCT 29 1963

Type (1)	Time (LST) (2)	Sky and ceiling (Hundreds of Feet) (3)	Visibility (Statute Miles) Surface (4)	Visibility (Statute Miles) Tower (4a)	Weather and obstructions to vision (5)	Sea level press. (Mbs.) (6)	Temp. (°F) (7)	Dew pt. (°F) (8)	Wind Direction (9)	Wind Speed (Kts) (10)	Wind Character and shifts (11)	Altimeter setting (Ins.) (12)	Remarks and supplemental coded data (13) (14a) (14b)	Observers initials (15)
R	0058	E120 ⊕	15+			194	46	39		C		030		
R	0158	E120 ⊕	15+			188	45	39	←	3		029	710 102X	
R	0258	E120 ⊕	15+			181	48	39	→ ↗	5		027		
R	0358	E120 ⓓ/⊕	15+			176	46	39		C		025		
R	0458	120 ⓓ U ⓓ	15+			181	40	37		C		025	710 1078 40 25487 46540	
R	0558	E120 ⓓ/⊕	15+			190	41	36		C		025		
R	0658	90 ⓓ E120 ⓓ	15+			206	39	36	↗	3		026		
R	0758	90 ⓓ 120 ⓓ/ⓓ	15+			200	47	38	↗	3		027	305 1074	
R	0858	120 ⓓ	15+			200	54	39	↑ ↗	11		029		
R	0958	120 ⓓ	15+			195	57	37	↑	8		029		
R	1058	60 ⓓ 120 ⓓ	15+			195	58	36	↑	15		029	105 1170 39 25453 1	
R	1158	60 ⓓ 120 ⓓ	15+			186	60	35	↗	14		027		
R	1258	0	15+			178	61	34	↑ ↖	15		025		
R	1359	0	15+			165	62	36	↑ ↗	17		022	719 1100	
R	1459	60 ⓓ	15+			165	60	36	↑ ↗	12		022		
R	1557	60 ⓓ	15+			162	61	35	↑	11		021		
R	1655	0	15+			168	59	35	↑ ↗	9		020	805 1106 63 25097	
R	1758	0	15+			177	54	33	↑	8		020	FEW C 1 S	
R	1858	1 - ⓓ	15+			188	52	32	↑ ↗	7		022		
R	1956	1 - ⓓ	15+			180	49	32	↑ ↗	4		022	105 1006	
R	2057	1 - ⓓ	15+			179	44	33	↑ ↗	3		023		
R	2155	U ⓓ	15+			184	41	33		C		024		
R	2258	1 - ⓓ	15+			177	40	31		C		022	000 1008 63 25361	
R	2355	1 - ⓓ	15+			174	38	34		C		021		

A synoptic observation, in WMO code format FM11A, is entered on line following related aviation observation.

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SURFACE WEATHER OBSERVATIONS

STATION Flagstaff, Arizona DATE OCT 29 1963

TIME (L.S.T.)	STATION PRESSURE (INS.)	DRY BULB (°F.)	WET BULB (°F.)	REL. HUMIDITY (%)	TOTAL SKY COVER	CLOUDS AND OBSCURING PHENOMENA: LOWEST LAYER AMT.	LOWEST LAYER TYPE & DIR.	LOWEST LAYER HEIGHT	SECOND LAYER AMT.	SECOND LAYER TYPE & DIR.	SECOND LAYER HEIGHT	SUMMATION TOTAL	THIRD LAYER AMT.	THIRD LAYER TYPE & DIR.	THIRD LAYER HEIGHT	SUMMATION TOTAL	FOURTH LAYER AMT.	FOURTH LAYER TYPE & DIR.	FOURTH LAYER HEIGHT	TOTAL OPAQUE SKY COVER	PRESSURE TENDENCY	NET 3-HR. CHANGE	SUNSHINE (MINUTES)	PRECIPITATION (INCHES)
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
00 58	23390	45.7	42.0	76	10	10	AS	E120	U				U				U			10				
01 58	23380	45.2	41.9	79	10	10	AS	E120	U				U				U			10	7	030		
02 58	23365	47.8	42.8	70	10	10	Ac	E120	U				U				U			10				
03 58	23350	46.3	42.1	74	10	6	Ac	E120	4	Cs	/	10	U				U			10				
04 58	23350	40.4	38.8	89	9	4	Ac	120	3	Cs	U	7	0			7	0			7	7	030		
05 58	23350	40.6	38.2	83	10	8	Ac	E120	2	Cs	/	10	U				U			10				
06 58	23360	38.8	37.2	88	9	3	Ac	90	6	Ac	E120	9	0			9	0			9				
07 58	23365	46.8	42.1	71	4	1	Ac	90	3	Ac	120	4	0	Ci	/	4	0			4	3	015		
08 58	23380	54.0	45.5	56	1	1	AC	120	0			1	0			1	0			1				
09 58	23380	56.8	46.2	48	1	0	Cu	60	1	Ac	120	1	0			1	0			1				
10 58	23380	57.8	46.0	44	2	1	Cu	60	1	Ac	120	2	0			2	0			2	1	015		
11 58	23365	59.6	46.3	39	2	1	Cu	60	1	Ac	120	2	0			2	0			2				
12 58	23350	60.7	46.5	37	0	0	Cu	60	0			0	0			0	0			0				
13 59	23325	61.8	47.8	38	0	0	Cu	60	0			0	0			0	0			0	7	055		
14 59	23325	60.0	47.0	41	1	1	Cu	60	0			1	0			1	0			1				
15 57	23320	61.0	47.0	38	1	1	Cu	60	0			1	0			1	0			1				
16 55	23310	59.0	46.0	40	0	0	Cu	60	0	Cu	/	0	0			0	0			0	8	015		
17 58	23310	54.0	43.0	44	0	0	Ci	/	0			0	0			0	0			0				
18 58	23325	52.0	42.0	47	4	4	Cu	/	0			4	0			4	0			2				
19 56	23325	49.0	40.5	52	7	7	Ci	/	0			7	0			7	0			3	1	015		
20 57	23330	46.2	38.5	63	8	8	Ci	/	0			8	0			8	0			4				
21 55	23340	44.2	37.0	71	9	9	CS	U	0			9	0			9	0			7				
22 58	23325	40.4	36.0	69	9	9	CS	/	0			9	0			9	0			4	0	000		
23 55	23320	38.4	36.0	82	9	9	CS	/	0			9	0			9	0			4				

SYNOPTIC OBSERVATIONS

TIME (G.C.T.)	TIME (L.S.T.)	NO.	PRECIP. (INS.)	SNOW FALL (INS.)	SNOW DEPTH (INS.)	MAX. TEMP. (°F.)	MIN. TEMP. (°F.)	HGT. 850 MB. SURFACE	STATE OF GRND.	SEA STATE & DIR.	SWELL HGT. & DIR.	SWELL PERIOD	SURF H_s H_s M_s P_s D_s	WATER TEMP.	SOIL TEMP.		
41	48	45	44	45	46	47	48	49	50	51	52	53	54	56	56	57	58
	MID. TO 0455	X	U	U	X	50.	40										
	0455	1	U	U	0	50	40	548	0								
	1050	2	0	0	0	60	39	545	0								
	1650	3	0	0	0	63	58	509	0								
	2250	4	0	0	0	59	39	536	0								
	MID.	X	0	U	U	60	38										

STATION PRESSURE COMPUTATIONS

	TIME (L.S.T.) 59	0455	1050	1655	2255
ATT. THERM. 60			72.0		
OBSRVD. BAR. 61		30250	30209	30200	30220
TOTAL CORR. 62			-121		
STA. PRESS. 63		23350	23388	23320	23325
BAROGRAPH 64		23350	23390	23310	23325
BAR. CORR. 65		0	0	0	0

SUMMARY OF DAY (MIDNIGHT TO MIDNIGHT)

24-HR. MAX. TEMP. (°F.)	24-HR. MIN. TEMP. (°F.)	24-HR. PRECIP. WATER EQUIV. (INS.)	24-HR. SNOWFALL UNMLTD. (INS.)	SNOW DEPTH (INS.)	PEAK GUST SPEED (KNOTS)	PEAK GUST DIRECTION	PEAK GUST TIME L.S.T.	THICKNESS OF ICE ON WATER (INS.)	FROZEN GRND. LAYER (INS.) TOP	FROZEN GRND. LAYER (INS.) BASE	RIVER GAGE	24-HR. MAX. R. H.	24-HR. MIN. R. H.	WATER EQUIV. (INS.)	
66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
63	38	0	0	0											

PRECIP. & THDRSTM. 82	BEGAN 83	ENDED 84	DUR. 85 Hrs. Mins.	OBSTR. TO VIS. 86	BEGAN 87	ENDED 88	DUR. 89 Hrs. Mins.

90 REMARKS, NOTES AND MISCELLANEOUS PHENOMENA

Total sunshine _____ Sunrise 0645 Sunset 1736

Fastest observed 1-minute wind speed 20 m.p.h., or

Fastest mile _____ m.p.h.; associated direction SSW and time: 1359

Excessive precipitation:

Δt (MINUTES)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (INCHES)												

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WBAN FORM 10A (REV. 11-1-60)

U.S. DEPARTMENT OF COMMERCE - WEATHER BUREAU

SURFACE WEATHER OBSERVATIONS

STATION: Flagstaff, Arizona

DATE: NOV 27 1963

Type (1)	Time (LST) (2)	Sky and ceiling (Hundreds of Feet) (3)	Visibility (Statute Miles) Surface (4)	Visibility Tower (4a)	Weather and obstructions to vision (5)	Sea level press. (Mbs.) (6)	Temp. (°F) (7)	Dew pt. (°F) (8)	Wind Direction (9)	Wind Speed (Kts) (10)	Wind Character and shifts (11)	Altimeter setting (Ins.) (12)	Remarks and supplemental coded data (13) (14a) (14b)	Observers initials (15)
R	0058	0	15+			237	24	16	↑	3		025		
R	0158	0	15+			233	24	15		C		025	103	
R	0258	0	15+			233	21	15		C		024		
R	0358	0	15+			235	19	14	↓	3		023		
R	0458	0	15+			238	19	15	↓↙	3		023	607 18 25671 4454	
R	0558	0	15+			247	17	13	↓↓	3		022		
R	0658	0	15+			257	18	13	↓	3		023		
R	0758	0	15+			252	19	13		C		024	303	
R	0857	0	15+			242	33	20	↓	3		025		
R	0956	0	15+			236	40	21	↓↙	5		026		
R	1055	0	15+			218	46	20	←↙	5		025	003 17 25553	
R	1158	0	15+			214	48	23	↓	4		024	FEW C I W	
R	1256	0	15+			204	51	20	↓↙	3		020		
R	1357	0	15+			196	53	22	↙	4		019	717	
R	1456	0	15+			202	53	22	↙	5		019		
R	1558	0	15+			205	53	25	↙	4		019	FEW C I W	
R	1658	0	15+			217	49	24	↙	6		021	303 1001 54 25217	
R	1758	1-①	15+			241	38	26		C		022		
R	1858	0	15+			260	33	24	↓↓	4		024		
R	1958	0	15+			268	28	22		C		025	114	
R	2058	0	15+			261	27	21	↓↙	3		026		
R	2157	0	15+			245	25	21	↓	3		027		
R	2258	0	15+			239	24	21	↓	3		028	207 54 25641	
R	2358	1-①	15+			240	24	20	↘	5		029		

A synoptic observation, in WMO code format FM11A, is entered on line following related aviation observation.

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WBAN 10-B (10-1-58)

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

SURFACE WEATHER OBSERVATIONS

STATION Flagstaff, Arizona DATE NOV 27 1963

TIME (L.S.T.) 16	STATION PRESSURE (INS.) 17	DRY BULB (°F.) 18	WET BULB (°F.) 19	REL. HUMIDITY (%) 20	TOTAL SKY COVER 21	CLOUDS AND OBSCURING PHENOMENA: LOWEST LAYER AMT. 22	LOWEST LAYER TYPE & DIR. 23	LOWEST LAYER HEIGHT 24	SECOND LAYER AMT. 25	SECOND LAYER TYPE & DIR. 26	SECOND LAYER HEIGHT 27	SUMMATION TOTAL 28	THIRD LAYER AMT. 29	THIRD LAYER TYPE & DIR. 30	THIRD LAYER HEIGHT 31	SUMMATION TOTAL 32	FOURTH LAYER AMT. 33	FOURTH LAYER TYPE & DIR. 34	FOURTH LAYER HEIGHT 35	TOTAL OPAQUE SKY COVER 36	PRESSURE TENDENCY 37	NET 3-HR. CHANGE 38	SUNSHINE (MINUTES) 39	PRECIPITATION (INCHES) 40
0058	23350	23.9	21.6	71	0	0			0			0	0			0	0			0				
0158	23350	24.0	21.3	67	0	0			0			0	0			0	0			0	1	010		
0258	23340	21.4	19.9	77	0	0			0			0	0			0	0			0				
0358	23330	19.0	18.0	81	0	0			0			0	0			0	0			0				
0458	23330	19.0	18.2	83	0	0			0			0	0			0	0			0	6	020		
0558	23325	17.0	16.2	82	0	0			0			0	0			0	0			0				
0658	23330	18.0	17.0	80	0	0			0			0	0			0	0			0				
0758	23340	19.3	18.0	77	0	0			0			0	0			0	0			0	3	010		
0857	23350	32.6	28.0	60	0	0			0			0	0			0	0			0				
0956	23360	40.0	32.0	65	0	0			0			0	0			0	0			0				
1055	23350	45.8	35.0	56	0	0			0			0	0			0	0			0	0	010		
1158	23340	48.2	37.0	57	0	0	Ci	/	0			0	0			0	0			0				
1256	23310	51.0	37.5	49	0	0			0			0	0			0	0			0				
1357	23300	53.2	39.0	49	0	0			0			0	0			0	0			0	7	050		
1456	23300	52.8	39.0	50	0	0			0			0	0			0	0			0				
1558	23300	53.2	40.0	53	0	0	Ci	/	0			0	0			0	0			0				
1658	23310	49.4	37.8	56	0	0	Ci	/	0			0	0			0	0			0	3	010		
1758	23320	38.3	32.8	60	1	1	Ci	/	0			1	0			1	0			0				
1858	23340	32.7	29.2	69	0	0			0			0	0			0	0			0				
1958	23350	28.3	26.0	76	0	0			0			0	0			0	0			0	1	040		
2058	23360	27.0	25.2	79	0	0			0			0	0			0	0			0				
2158	23360	24.8	23.7	85	0	0			0			0	0			0	0			0				
2258	23370	24.1	23.2	87	0	0			0			0	0			0	0			0	2	020		
2358	23380	24.0	23.1	86	1	1	Ci	/	0			1	0			1	0			0				

SYNOPTIC OBSERVATIONS

TIME (G.C.T.) 41	TIME (L.S.T.) 42	NO. 43	PRECIP. (INS.) 44	SNOW FALL (INS.) 45	SNOW DEPTH (INS.) 46	MAX. TEMP. (°F.) 47	MIN. TEMP. (°F.) 48	HGT. 850 MB. SURFACE 49	STATE OF GRND. 50	SEA STATE & DIR. 51	SWELL HGT. & DIR. 52	SWELL PERIOD 53	SURF H_0 H_0 M_0 P_0 D_0 54	WATER TEMP. 55	SOIL TEMP. 56	57	58
	MID TO 0450	X	0	0	X	30	18	X	X	X	X	X	X	X	X		
	0450	1	0	0	1	32	18	569	6								
	1050	2	0	0	1	46	17	555	5								
	1650	3	0	0	T	54	46	571	5								
	2250	4	0	0	T	49	34	564	5								
	MID.	X	0	0	T	24	24	X	X	X	X	X	X	X	X		

STATION PRESSURE COMPUTATIONS

TIME (L.S.T.) 59	0455	1055	1650	2250
ATT. THERM. 60				
OBSRVD. BAR. 61	30.330	30.255	30.205	30.280
TOTAL CORR. 62				
STA. PRESS. 63	23.330	23.350	23.310	23.370
BAROGRAPH 64	23.330	23.350	23.305	23.365
BAR. CORR. 65	0	0	.005	.005

SUMMARY OF DAY (MIDNIGHT TO MIDNIGHT)

24-HR. MAX. TEMP. (°F.) 66	24-HR. MIN. TEMP. (°F.) 67	24-HR. PRECIP. WATER EQUIV. (INS.) 68	24-HR. SNOWFALL UNMLTD. (INS.) 69	SNOW DEPTH (INS.) 70	PEAK GUST SPEED (KNOTS) 71	PEAK GUST DIRECTION 72	PEAK GUST TIME L.S.T. 73	THICKNESS OF ICE ON WATER (INS.) 74	FROZEN GRND. LAYER (INS.) TOP 75	FROZEN GRND. LAYER (INS.) BASE 76	RIVER GAGE 77	24-HR. MAX. R. H. 78	24-HR. MIN. R. H. 79	WATER EQUIV. (INS.) 80	81
54	17	0	0	1											

PRECIP. & THDRSTM. 88	BEGAN 83	ENDED 84	DUR. 85 Hrs. Mins.	OBSTR. TO VIS. 86	BEGAN 87	ENDED 88	DUR. 89 Hrs. Mins.

90 REMARKS, NOTES AND MISCELLANEOUS PHENOMENA

Total sunshine _____ Sunrise 0713 / Sunset 1716

Fastest observed 1-minute wind speed 7 / m.p.h., or NE / and time: 1658

Fastest mile _____ m.p.h.; associated direction _____ and time: _____

Excessive precipitation:

Δt (MINUTES)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (INCHES)												

/ Only the last of several occurrances.

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GPO 916219