

URANUS OPPOSITION 2013-2014

1- Abstract :

79 drawings over 28 nights this present opposition with 127-180-230-280mm apertures from August 2013 until February 2014.

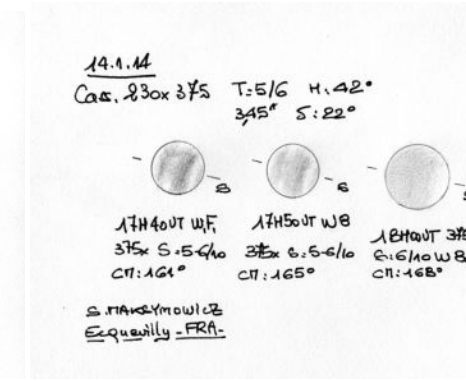
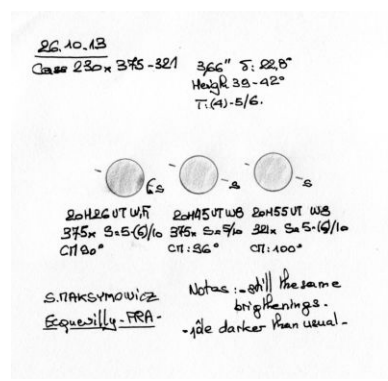
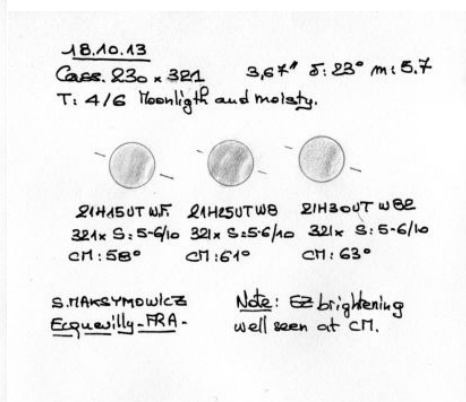
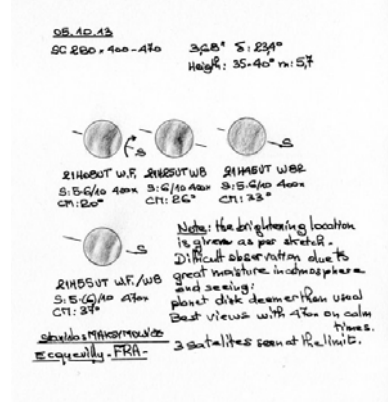
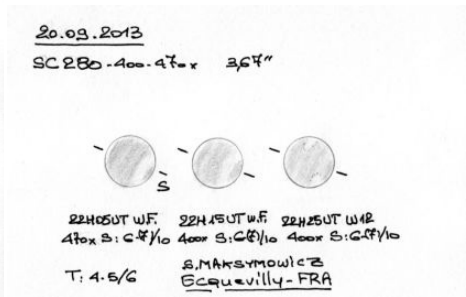
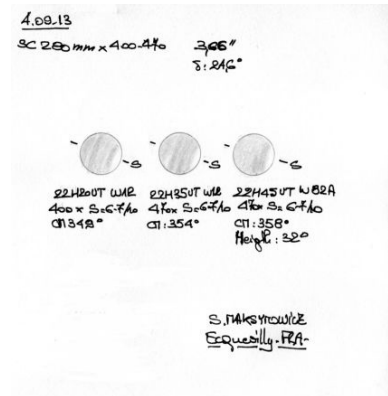
Uranus exhibited on the period of observations some variability accessible visually with the help of colored filters (light yellow W8-12 and light blue W82A).

Mainly EZ appeared faint (in comparison with previous opposition) with brightenings revealed into EZ, sometimes in the bright collar near the south cap not always recorded.

The south banding boundary was studied because with evidence appeared varying.

A tentative of some "mechanism" appearing between cap occurrence, banding system and contrast of features was encountered.

§2.2 gives just a tentative of explanation because of the low data quantity and the low coverage of observations over the said period of observations.



2- **Main topics:**

2.1 Events:

South polar cap:

Not always captured, not seen until 1st week of September, then seen dark until 1st week of October, fading during October, well seen during ,November from mid-October, fading 1st week of December, well seen until last week of December, fading 2 1st weeks of January and then stronger for the last period of observation (until begin February).

The bright collar:

bordering the cap when seen was always bright, this was the more conspicuous feature over the opposition. Sometimes a brightening appeared into (20th September, 10th November, 12th December).

EZ contrast:

Was over the opposition faint level and improved from 10th November until 20th December. Was clear on 15th December then faint after until begin of February where it seems clearer.

Banding in south hemisphere:

2 bands were seen from the beginning of the opposition until 21th September (3 bands on the 04th September), then uniform (as 1 large band) on 4th October, darker on the south edge until 18th October, 2 bands until the 10th November with the south one darker near the bright collar, then 1 band with the south border darker near the bright collar until the 3rd January (2 bands on 9th December), then 1 band wide uniform with a darker south edge on 14th January.

In relation, more or less, the latitude on the planet of the south edge of the south banding system was fluctuating from 55° in average to 43°, then 50° to 40°, then 50° to 44° following the variations of the cap activity with having, may be, involvements about the brightening occurrence in EZ captured.

Banding in north hemisphere:

The contrast captured at the eyepiece was noted. All along the observation period, some fluctuations were highlighted.

Dark near EZ from the beginning to 21st September (of same density 1st week of September), then almost of same density than south hemisphere bands until 8th November (lighter on 5th October), darker improved until 8th December, more darker at EZ border after until 13th February 2014.

This seems to follow the cap activity with a drift in time, but not well quantified.

Blue color observations:

Over the period, features appeared in blue color (W82A filter) especially during the periods of stronger dark banding occurrence. Brightenings were sometimes also recorded in this channel. As this is a contrast effect due to the blue filter characteristics (not deep in all colors) as this is actual. Difficult to comment more accordingly.

2.2 Comments:

In spite of the few reports, this coverage needs to be improved in order to get a better confidence about the circulation of the atmospheric planet system assessment.

It is sustained the fact that the cap activity is in correlation with the banding structure and latitudes observed on the banding system, with the contrast levels observed among the features captured and with the brightenings also captured over the period.

In other words, we think there is a material mass transfer from south to north revealed by the contrast variation of the cap and the bands and by the south latitude variation of the bands of the south hemisphere, EZ shows brightenings in relation exhibiting an atmosphere layer covering EZ, these brightenings can be holes in the layer covering EZ (these brightening seems to be localized when plotting the CM of their boundaries).

Indeed an interpretation of the data but expectable, the main objection being the apparent absence of featuring on the bright collar located near the cap showing a transfer media (except few cases with brightening on 20th September, 10th November, 12th December).

Considering the moderate apertures in use we can consider also that this global activity reported represents the top contrasted features we have access.

However, we think this is enough to show some dynamics of the planet atmosphere, the quantify of reports will have on first approach more influence than the aperture itself on the 1st approach.

Sometimes, it was used a more moderate diameter for the confirmation of what was seen through the common scope in use.

Again, the scopes in use were duly characterized and the effective perfect diameter in correspondence was defined for ranking the scopes abilities:

- The MC 180 from Intes is 120mm (not far from the personal threshold).
- The Cass 230 is 142mm
- The SC280 is 162mm.

Hope the next opposition will occur with better seeing and sky local conditions.

I guess other observers to perform also such program in order to make confirmation of the given assessment or different.

Again a daily basis observation program is needed for better confidence.

Thanks for reading these notes.

3- Reference document:

Previous report of last 2012-2013 opposition of Uranus attached here.

Uranus report results (.xls file) attached here.

The 79 drawings: available at the BAA Director.

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URANUS opposition 2013-2014 observational data,

S,Maksymowicz Ecquevilly-FRA-

Date	Dia(mm) Seeing	South polar cap	Bright colar	Banding south hemi-Latt,	EZ contras	Brightenings EZ-CM	Banding north hemi,	Sub-earth Latt,	
14.08.13	SC280 5-6/10	CLEAR	incl. cap	2 bands/ dark south/55°	faint	no	dark near EZ	24.2°-3,62"	
20.08.13	SC280 7/10	FAINT DARK	YES	2 bands/ dark south/53°	faint	no	dark near EZ	24.1°-3,63"	
30.08.13	SC280 6-7/10	CLEAR	incl. cap	2 bands/ dark south/59°	faint	1/ 10°-95°+	dark near EZ	23.8°-3,65"	
02.09.13	SC280 6/10	CLEAR	incl. cap	2 bands/ same dens./62°	faint	no	same density	23.7°-3,66"	south-ez hemi band
04.09.13	SC280 6-7/10	CLEAR	incl. cap	3 bands/ dark south/62°	faint	1/ 5°-85°+	same density	23.7°-3,66"	wider
20.09.13	SC280 6-7/10	DARK	YES	2 bands/ dark south/46°	faint	1/140°-180°+	dark near EZ	23.1°-3,67"	1 bright in collar cap
21.09.13	MC180 9/10	DARK	YES	2 bands/ same dens./43°	faint	no	dark near EZ	23.0°-3,67"	CM0°-50°
04.10.13	N514 5-6/10	DARK strong	YES strong	uniform density	not seen	no	uniform density	22.5°-3,68"	G 200x ONLY
05.10.13	SC280 6/10	FAINT DARK	YES	1 band uniform darkS/43°	faint	1/ 20°-110°	clearer than S.hemi	22.5°-3,68"	
05.10.13	SC280 6/10	FAINT DARK	YES	1 band uniform darkS/43°	faint	1/ 20°-110°		22.5°-3,68"	50min after
12.10.13	Cass230 7/10	FAINT DARK	YES	1 band uniform darkS/49°	faint	1/340°-20°	lightly darker near ez	22.2°-3,68"	
16.10.13	Cass230 5-6/10	CLEAR	incl. cap	1 band uniform/ 47°	faint	1/ 120°-200°+	uniform density	22.1°-3,67"	
18.10.13	Cass230 5-6/10	DARK	YES	1 band uniform darkS/50°	faint	1/ 30°-90°	lightly darker near ez	22.0°-3,67"	
26.10.13	Cass230 5-6/10	DARK strong	YES	2 bands uniform/ 50°	faint	2/130-180°+/0°+-50°	lightly darker near ez	21.7°-3,66"	
08.11.13	Cass230 5-6/10	DARK	YES	1 band uniform/38°	faint	1/60°+-120°	lightly darker near ez	21.3°-3,64"	
10.11.13	Cass230 5-6/10	DARK	YES	2 bands dark south/ 38°	improved	no	dark improved	21.2°-3,64"	1 bright in collar cap
15.11.13	Cass230 5-6/10	DARK	YES	1 band uniform darkS/39°	faint	1/ 70°-145°+	dark improved	21.1°-3,63"	CM20°-110°
02.12.13	Cass230 6-7/10	FAINT DARK	YES	1 band uniform darkS/38°	improved	no	dark improved	20.7°-3,59"	
02.12.13	MC180 7/10	CLEAR	incl. cap	1 band uniform darkS/39°	improved	no	dark improved	20.7°-3,59"	
08.12.13	Cass230 7-9/10	DARK	YES	1 band uniform darkS/39°	improved	no	dark improved	20.7°-3,57"	
09.12.13	Cass230 7-9/10	FAINT DARK	YES	2 bands DARK south/ 41°	improved	1/ 150°-210°	dark near EZ	20.7°-3,57"	
12.12.13	Cass230 5-6/10	DARK	YES	1 band uniform darkS/41°	improved	1/ 230°-280°+	dark near EZ	20.7°-3,55"	1 bright in collar cap
15.12.13	Cass230 6-7/10	DARK	YES	1 band uniform darkS/41°	clear	1/ 220°-150°	dark near EZ	20.7°-3,54"	CM140°-100°+
20.12.13	Cass230 8-9/10	FAINT DARK	YES	1 band uniform darkS/50°	improved	1/ 220°-150°+	dark near EZ	20.7°-3,53"	
03.01.14	Cass230 5-6/10	FAINT DARK	YES	1 band uniform darkS/51°	faint	1/ 60°-145°+	dark near EZ	20.8°-3,48"	
11.01.14	Cass230 5-6/10	CLEAR	incl. cap	1 band uniform/51°	faint	1/ 70°-190°+	dark near EZ	20.9°-3,46"	
13.01.14	Cass230 6-7/10	FAINT DARK	YES	1 band uniform/51°	faint	2/ 75°-115°/320°-290	dark near EZ	21.0°-3,46"	
14.01.14	Cass230 5-6/10	FAINT DARK	YES	1 band uniform darkS/51°	faint	2/220°-250°+/150°	dark near EZ	21.0°-3,45"	
19.01.14	Cass230 6-7/10	FAINT DARK	YES	1 band uniform/43°	faint	1/180°-240°+	dark near EZ	21.1°-3,44"	
13.02.14	Cass230 5-6/10	FAINT DARK	YES	1 band uniform/44°	improved	no	dark near EZ	22.0°-3,38"	

nights	3	4	6	3	6	5	1	28	
	aug,13	sept,13	oct,13	nov,13	dec,13	jan,14	feb,14	Total	

URANUS OPPOSITION 2012-2013

(Opposition on last 2012.09.29th)

1- Abstract :

91 drawings (36nights) were performed this present opposition with 150-305mm apertures (July 2012-February 2013).

Uranus exhibited from the August 2012 to February 2013 period some variabilities accessible visually with the help of light coloured filters (light yellow W8 and sometimes the light blue W82A).

Almost featureless at the beginning with moderate apertures (except the 150mm refractor) where EZ was only accessible faint fuzzy, then more consistently clearer in yellow light and with more contrasty and bigger apertures.

Brightenings were collected at some periods in relation with the emergence of a third south hemisphere band.

On October 2012, EZ seemed to reconstitute but faintly, then deemer on December and getting a clearer appearance on January 2013.

Clear bright patches appeared brighter on the planet during the emergence of the third south hemisphere band that was reported on November 2012.

2- Main topics:

2.1- Events:

South polar cap:

always captured clearer except on the 23th October 2012, the cap was seen clear bordered by a thin lighter band and bordered by a darker collar.

South hemisphere:

At the beginning only 2 bands were reported until November where on 21st Nov; 12, then on 2nd-8th Dec.12, 3 bands were reported with brightenings in relation.

On 17th-30th Dec.12 and 1st Jan. 13 the south equatorial band that appeared double on the 11th Dec.12 seemed to fade and dilute into the south hemisphere sothat this became faint and fuzzy, light grey.

At the beginning on 15thNov.12 albedo variations were collected on the south equatorial band in relation with a brightening presence in EZ.

On 11th-16th and 17th, the 3 south hemisphere bands were again collected clearly and distinctly separated. Still brightenings in relation (probably spot for some).

The last observations 30th Jan.13 and 14th Feb.13 didn't confirm the 3 bands pattern with regards to the viewing conditions.

EZ, equatorial zone:

Appeared clear on some periods.

EZ also get the tendency to fade with the fading of the 3 bands pattern reported during end Dec.12 until begin Jan.13.

Except with the use of moderate aperture (150mm refractor excluded) EZ was reported more or less.

North hemisphere:

The north equatorial band was seen darker, as dark as the polar south cap collar. With EZ, these are the main features on the planet accessible in first, even with the moderate aperture (as the C8 or the DK180).

Brightenings:

Some of the brightenings could be probably spots (on 24th-25th Jul.12, 11th -17th Jan.13, 26th Jan.13) but mainly zones between bands exhibit brightenings or albedo variations in relation sometimes with band albedo variations (15th Nov.12).

Blue colour observations:

Normally the planet disk is featureless in that field; however, on some period the south polar cap collar and the north equatorial band were reported faintly. This is probably in correlation with the planet activity.

2.2- Comments:

In spite of the few reports, the coverage needs to be improved in order to verify some assessments suggested above through the “events” observed. This would make stronger the conclusions brought here.

What is obvious:

- Uranus is not a featureless planet in visual mode,
- Uranus exhibits pattern variations that are obvious,
- Uranus pattern changes involve some albedo variations and contrast variations that need to be followed narrowly through a larger coverage.

Hope the next opposition will occur in relation with more better weather local conditions. Only 10-20% of the time was usable for the survey. This is not enough as for some periods a daily basis observation program is needed (during the emergence of the third south hemisphere band) for understanding what is happening more exactly.

3- Reference documents:

Please refer to the attachments:

- The scope factor,
- Uranus spectrum (from Mr Sromovsky),
- Uranus results (.xls file), present opposition 2012-2013 and the 91 drawings,
- F20 pictures (IL, Yellow, IR742), Jul.2012,
- “Viewing Uranus dual tests”,
- Necessary conditions for capturing features on Uranus with annexes,
- Comparatif scopes-Uranus,
- Uranus methane bands for visual CCD,
- GraphspectraKarkoschka,
- Uranus resume 2010-2011.

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Uranus on July 2012 SC305mm F20

Without filter

Yellow W12 filter

NIR 742 filter

Date	Scope mm	Gx	Heigth °	Seeing/10	Transp./6	D equiv.	CM °	Bands n°	Band south	Band equa.	Band north	Brightenings	Location	South clear polar regio
23.7.12	DK180	360/ 432	39	8	5	124	293/303	3	2	faint	discret	2	limbs at equa	yes
24.7.12	SC305	435/ 506	42	7	5	172	88/97	3	2	faint	yes variations	3	limb equa near meridian	yes dark collar
25.7.12	SC305	506	37	8	6	172	217/226	3	2	faint	yes variations	4	limb equa south meridian	yes dark collar
1.8.12	N200	333/ 400	44	7	5	114	141/150	2 fuzzy	hemisphere	not seen	fuzzy darker	0	N/A	yes with collar
8.8.12	N200	333/ 400	42	7	5	114	32/42	2 fuzzy	hemisphere	very faint	fuzzy darker	0	N/A	yes with collar
10.8.12	N200	333/ 400	44	7	5	114	326/337	2 fuzzy	hemisphere	not seen	fuzzy darker	0	N/A	yes with collar
11.8.12	DK180	360	34	6	5	124	50/64	2	hemisphere	very faint	fuzzy darker	0	N/A	yes with collar
17.8.12	SC203	333	30	6	6	115	84/91	2 fuzzy	hemisphere	very faint	fuzzy darker	0	N/A	yes with collar
25.8.12	SC203	333	35	7	5	115	290/298	2 fuzzy	hemisphere	very faint	fuzzy darker	0	N/A	yes with collar
8.9.12	SC203	333	40	8	4	115	139/164	2 fuzzy	hemisphere	very faint	fuzzy darker	0	N/A	yes with collar
15.9.12	R150	375	40	10	6	138	46/63	3	2	faint	fuzzy variations	2	limbs equa meridian	yes dark collar
29.9.12	SC305	339	36	6	4	172	203/215	3	2	seen	yes variations	2	limbs	yes collar fainter
12.10.12	Cass 235	375	42	5	6	146	260/266	3	2	seen	yes	3	limbs equa, south hemi	yes collar fainter
15.10.12	Cass 235	375	32	6	5	146	280/284	2	2 faint	seen	yes darker	2	limb, south hemi	yes collar fainter
22.10.12	MC150	313	25	9	5	100	160	2 fuzzy	hemisphere	very faint	fuzzy darker	0	N/A	not seen
23.10.12	SC305	435	39	7	4	172	340/344	3	2	seen	yes	2?	between hemi bands south	yes dark collar and clear band
27.10.12	SC305	339/ 435	42	6	5	172	205/209	3	2 fainter	seen faint	yes darker	0	N/A	yes collar fainter
1.11.12	SC305	381	42	6	6	172	193	2	hemisphere	seen faint	yes darker	0	N/A	yes collar not seen
2.11.12	SC305	339/ 435	42	5	6	172	332/336	3	2 fainter	seen faint	yes darker	0	N/A	yes collar not seen
4.11.12	SC305	339	28	6	4	172	185/189	3	2 fainter	seen	yes darker	0	N/A	yes collar fainter
15.11.12	SC305	435	32	7--8	4	172	294/296	3	2 variations	seen	yes less dark	1	limb rise equa	yes collar fainter
21.11.12	SC305	435	39	6	6	172	78/81	4	3	seen	yes less dark	0	N/A	yes collar fainter
25.11.12	Cass 235	375	34	6	5	146	254/258	3+1?	2+1?	seen	yes less dark	1	after meridian equa	yes collar darker
29.11.12	Cass 235	375	40	6	5	146	170	3	2	seen	yes less dark	0	N/A	yes collar darker
2.12.12	SC305	435	36	7	4	172	158/166	4	3	seen	yes less dark	1	limb rise equa	yes dark collar variations
8.12.12	Cass 235	375	40	10	4	146	284/308	4	3	seen	yes less dark	1	limb to meridian equa	yes dark collar
11.12.12	SC305	435/ 506	42	10	5	146	1--10	4	3	seen	yes less dark	2	limbs to meridian equa	yes dark collar also in blue co.
17.12.12	SC280	400	41	6	5	158	121/124	3	2	seen	yes darker	2	limb set south, hemi rise	yes dark collar
30.12.12	Cass 235	375	39	6	4	146	180/192	2	1+hemisphere	seen faint	yes darker	1	limb set	yes dark collar
1.1.13	SC280	400	36	6	5	158	117	3	2, 1 equa faint	seen very faint	yes less dark	1	limb set south, hemi rise	yes dark collar
11.1.13	SC280	400	40	6	5	158	61	4	3	seen faint	yes darker	1	meridian equa	yes dark collar variations
16.1.13	Cass 235	375	34	8	5	146	62/64	4	3	seen faint	yes less dark	2	limb rise, meridian hemi south	yes dark collar
17.1.13	SC280	400	35	7	4	158	175/182	4	3	seen	yes variations	2	limb rise, limb hemi south	yes dark collar
26.1.13	SC280	400	36	6	4	158	16	4	3	seen	yes variations	3	limbs equa, limb hemi south	yes dak collar variations
30.01.13	Cass 235	375	34	5	6	146	222	3	2	seen	yes darker	2	limbs equa	yes dark collar
14.02.13	SC280	350	27	6	6	158	179	3+1?	2+1?	seen faint	yes darker	0	N/A	Yes dark collar

	CM °	Nights											
			July 12	August	Sept.12	Oct.12	Nov.12	Dec.12	Jan.13	Feb.13			
	1--91	10											
	117--193	12	Nights	3	6	3	5	7	5	6	1		
	203--258	5	rate	10%	20%	10%	15%	25%	15%	20%	3%		
	260--344	9	DWGs	8	19	13	9	15	15	11	1		

Necessary conditions for capturing features on Uranus.

1- Requested conditions:

Data are extracted from the publication

“Observing the moon, planets and comets”

By Clark R. Chapman and Dale P. Cruikshank.

1.1- Uranus surface brightness (B)

Albedo: 0.509 Surface brightness: 54 cd/m²

Saturn albedo: 0.461 Surface brightness: 180 cd/m²

Sky transparency: μ

Minimal visual sky transparency: usually m: 4.0 to 5.0 well accessible,

Filter in use (usually: W82A, W8, W12, W.F.): coefft.>0.80,

Clean optics: coefft.>0.80 (including reflectivity and CO optical).

Brightness through the telescope: $B+ = D^2 \cdot B_f / d^2 \cdot M^2$ or $25 \cdot D^2 \cdot \mu \cdot B / M^2$

D: aperture (here 8” or 200mm),

d: eye pupil diameter,

B_f : brightness at scope exit $B_f = \mu \cdot B$

m = 4.0 $\mu = 0.05$ Tr (sky) 0.4 to 0.8

m = 5.0 $\mu = 0.25$

$B+$ for D 8” M = 360x $\mu = 0.05$ $B_f = 2.5$ cd/m²

d = 0.55mm or 0.022” $\mu = 0.25$ $B_f = 12.5$ cd/m²

$B+ = 0.15$ cd/m² D 8” M 360x m: 5.0

$B+ = 0.03$ cd/m² D 8” M 360x m: 4.0

Needed optimum magnification $P = M/D$ (magnification per inch aperture) or $\sqrt{25 \cdot \mu \cdot B / B+}$

1.2- Optimal conditions:

For 8” aperture 360x magnification m:5.0:

Brightness at the eyepiece: 0.15 cd/m²

Brightness of planet: 50 cd/m²

Requested magnification per inch: 45.6x therefore 365x for 8”

Mesopic vision: Lighting level from 0.001 cd/m² until 10 cd/m²

FOR A STANDARD EYE.

Observation of Uranus features mainly for 619nm area.

Represents about 40% of the max eye sensitivity for a mesopic vision

So the planet brightness at the eyepiece of 0.15 cd/m² becomes 0.06 cd/m².

The use of a W8 filter represents the ratio of the 40% under eye sensitivity curve.

0.06 cd/m² level preserve well the mesopic vision abilities with the scope conditions not affected.

1.3- Contrast perception:

a- Uranus exhibits clouds on a tiny 3.60" disk size.

Width of the cloud bands, say: about 1.0"

1.0" x 360 (magnification) = 360" or 6' arc apparent size at eyepiece,

Therefore 10 cycles/°,

The standard eye contrast sensitivity function at 10 cycles/°:

- mesopic vision: 1-2%

- photopic vision: 0.6-0.7%

for the planet on subject.

b- Scope effect:

- Strehl ratio: contrast through scope = actual contrast of feature x strehl ratio

Strehl 99% not affecting results.

c- CO, central obstruction:

For a RC200 with CO 35 and 42%, resolution limit remains 0.60",

FTM curves exhibit the fact that contrast are kept in comparison with a perfect scope of no CO near the ultimate resolution ability (right part of the curve).

d- Maximisation of the magnification for the contrast perception at low light levels

should be at about 10 cd/m²,

but performance (contrast versus feature size) can be kept with the proper increased magnification.

8" scope with 400x

M: 5.0, clean optics, μ : 0.25

Seeing good to excellent (Danjon scale 10/10 to 7-8/10),

Contrast through the 8" scope

For features as lines: $c+ = c \cdot (w / (w + 5.6/D))$

w: line width

c: actual feature contrast

c+: observed contrast

for 1.0" width line, $c = 1\%$, $c+ = 0.59\%$

for 1.2" width line, $c = 1\%$, $c+ = 0.63\%$

for a 12" scope and $c = 1\%$ $c+ = 0.68\%$

for a 16" scope and $c = 1\%$ $c+ = 0.74\%$

for a 40" scope and $c = 1\%$ $c+ = 0.88\%$

e- Optimum observational conditions including the seeing for contrast perception:

- 10" scope perfect, μ 0.1, m 4.5, M 540x seeing 1/3" (Danjon 7-8/10),

M 280x seeing 1" (Danjon 3-4/10),

- 16" scope perfect, μ 0.1, m 4.5, M 710x seeing 1/3" (Danjon 7-8/10),

M 325x seeing 1" (Danjon 3/10),

- 8" scope, 360x seeing <1/3" (Danjon 9-10/10)

Apparent size at the eyepiece about 22' arc, surface apparent brightness 0.15-0.20 cd/m²

The contrast perception can be 1.50%.

- 8" scope, 400x seeing < 1/3",
 Apparent size 24' arc: the contrast perception can 1.30%.

2- Tests performed:

2.1- Distanced targets:

Creation of targets.

Software word can ceate features until 5% contrast level.

Disk size at 1000m distance: 17mm

a- Background color of the disk: light grey (10% contrast with a whitish paper)

b- Feature levelled at 15%

See the specimen.

c- Same specimen with 2-3% contrast level.

d- Lighting conditions of the target:

Day light with no sun,

Twiglight,

Moon light (full moon as 0.5-1.0 Lux lighting).

e- Seeing evaluation:

An artificial star was installed just near the target panel.

Worked well in twilight and moon light.

f- Results:

	C=5%	C=2-3%	M	
L110	Y.Y.Y Y.Y.N	Y.Y.N Y.(Y).(N)	308x	apochromat
L150	Y.Y.Y Y.Y.Y	Y.Y.Y Y.Y.(Y)	313_350x	achromat
RC200	Y.Y.Y Y.Y.Y	Y.Y.Y Y.Y.Y	360x	Ritchey
Seeing	10/10 7-8/10	10/10 7-8/10	S	

Results were aleatory when S < 7/10 continuous.

Answers formatted as: Y.Y.N (daylight, twilight, moon light), Y: yes pass, N: not pass.

2.2- Personnal eye evaluation:

Performed at a famous Engineering Body for oil and gas activities.

Divers can be tested under US standards.

The tests were conducted in B G R colors, low light levels, FTM grids for some.

Results:

50" resolution ability at few lux illumination of examined targets of very low contrast levels (<5%).

3- Works performed:

3.1- Observations since the 2009 opposition,

Results published at the Japanese Alpo and the BAA Uranus section

<http://alpo-j.asahikawa-med.ac.jp/Latest/Uranus.htm>

The results shows some variabilities of the planet (especially last opposition 2010-2011)

- slight contrast variabilities,
- cloud activity accessible in visual fields.

3.2- Uranus requested conditions:

The spectrum of Uranus exhibits absorption rays in visual area (especially at the 619nm), but other lighter rays are existing in other visual fields.

Rather than the direct visual observations, some US amateur observers (Schmude, Mellilo, ...) suggested the follow-up of the activity of Uranus though the collection of spectrum (absorption rays variation).

Some polarimetric observations for investigation should be undertaken also, being a not negligible parameter a priori (having owned a C8 with a light polarimetric effect, that may false some data).

Think that the features collection remains accessible directly visually but to-day at the margin of a 150-200mm scope aperture.

The pertinence of the result is:

- lightly improved with the aperture increase, the seeing parameter becoming the more influent parameter quickly,
- at the best when the global transparency and transmission are at the best possible,
- at the best when the scope strehl ratio is high (>95% actual and global),
- at the best when the exit pupil diameter is fixed to 0.50-0.55mm, where the mesopic vision potential is at the best conditions.

4- **Conclusion:**

The present study may involve a good pertinence and reliability of the given results by:

- the respected best mesopic vision conditions,
- the results get on distanced targets,
- the personal vision control.

If visual observations are faced to difficult conditions, what is sure is

- average trained observers cannot do something fruitfully,
- imagers are also faced by these observational conditions, features being washed quickly by the site observation condition and the lack of scope quality (as a preliminary approach).

Stanislas Maksymowicz

BAA member

Uranus observer.

Annexes:

- article from www.telescope-optics.net/eye_spectral_response.htm,
- fig.1 from the Chapman and Cruikshank publication
- tablesheet from the Chapman and Cruikshank publication, sheet 182-183,
- table 2 from the Chapman and Cruikshank publication, sheet 145,
- table 3 from the Chapman and Cruikshank publication, sheet 146,
- table 4 from the Chapman and Cruikshank publication, sheet 152.

Planet with fluctuations of contrasts ($\sim 2\%$)
Rechannel

Brightness
54 cd/m²

Atmospheric conditions

- seeing
- transparency
- dust
- moisture



- Scope quality

- FTT curve.
- shear ratio.
- air currents

Eye

- capability under lighting conditions
- light glare

Is it matching?

TESTS

Targets

Artificial Star \rightarrow 1 km distance

($\phi 17^m$ at 1000 meters)
TESTS with:
lighting conditions

- day.
- dawn.
- moon light (almost Uranus Brightness)

Atmospheric conditions:

- seeing: quoted
- haze: noted
- dust: noted
- moisture: noted



Scopes in use:

- characterized: PVT-RNS \Rightarrow FTT typical shear ratio
- air currents
- TEST with R150-K2cd.CB

Eye

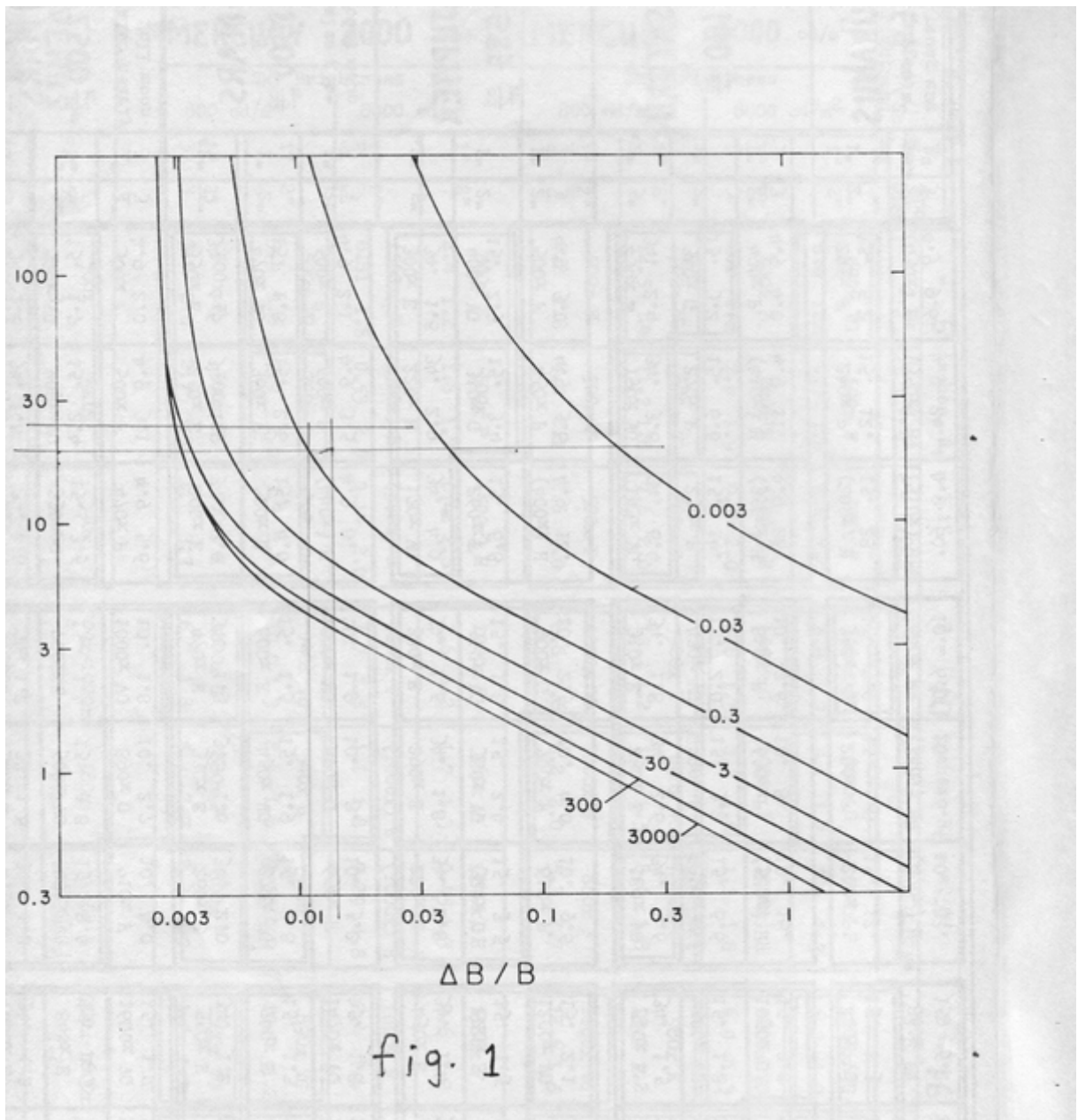
- capability under lighting conditions:
- o TESTED AT LAB \Rightarrow FTT
- o ON PRESENT TESTS - personal

Stanislas-Jean

Table 1. The Planets and their Surface Brightnesses

Planet	Radius R (A.U.)	Geometric Albedo, p_v	Phase Angle, i	Phase Factor	Effective Albedo, A_v	Brightness B (cd/m^2)	Brightness Ratio Perihelion/Aphelion
Mercury	0.39	0.100	90°	0.17	0.017	4,200	2.3
			50	0.32	0.032	7,700	
			130	0.072	0.0072	1,800	
Venus	0.72	0.586	90°	0.48	0.28	20,000	
			50	0.73	0.43	29,000	
			130	0.45	0.26	18,000	
Moon	1.00	0.115	0°	1.	0.115	4,100	
			90	0.17	0.020	700	
			50	0.34	0.039	1,400	
			130	0.084	0.0095	340	
Mars	1.52	0.154	0°	1.0	0.154	2,350	1.5
			47	0.62	0.095	1,400	
Jupiter	5.20	0.445				585	1.2
Saturn	9.58	0.461				180	
Uranus	19.14	0.565				54	
Neptune	30.2	0.509				20	

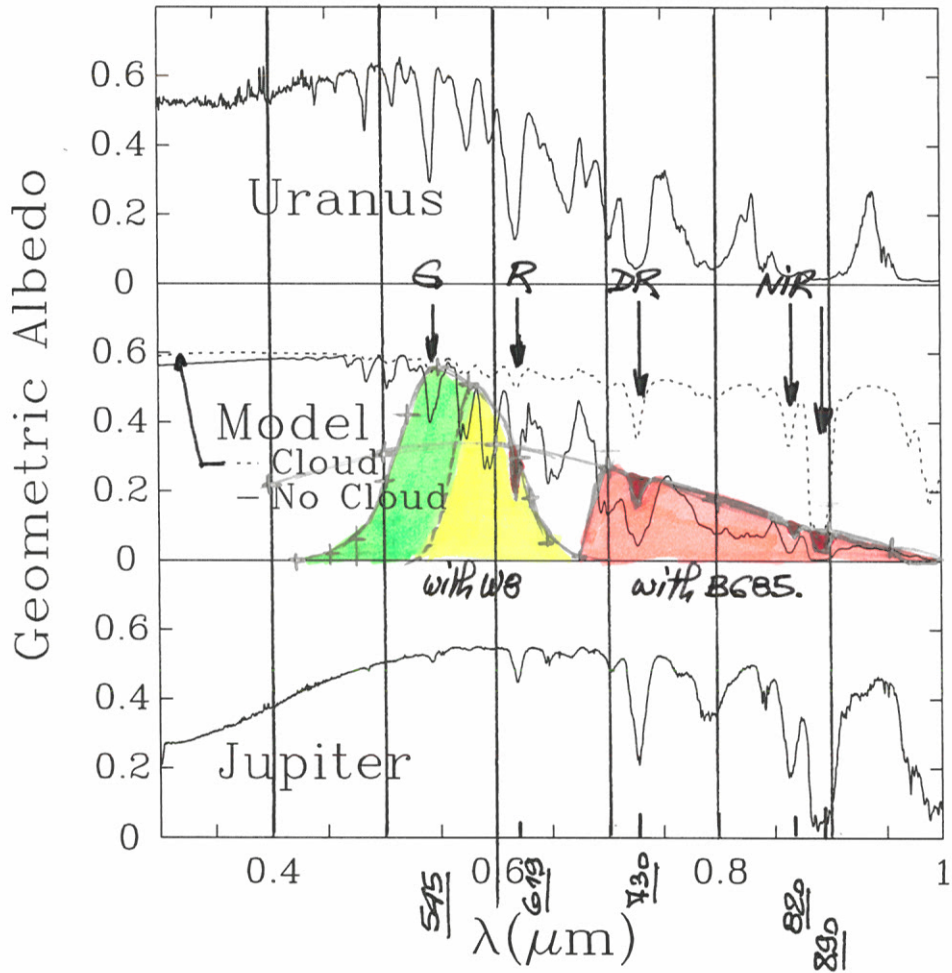
(Note: Jupiter's satellites I and II are about twice as bright as Jupiter, III about equal, and IV about half as bright. Also, it is of interest to note that a typical brightness for the daylit sky is $8,000 \text{ cd/m}^2$.)



Y axis: disk size in (') arc

X axis: contrast image

Curves: for surface brightness image in cd/m²



Scope	Aperture mm	Dia. Perfect equiv.	Acuracy L/x	CO %	Dia gain	contrast transfert	contrast transfert
Achromat	R150	138	L/6.5	0	0.8		
Mewlon	DK180	124	L/10	30	0.72		
SCT	SC203	115	L/5	33.5	0.67		
Newton	N200	114	L/4	29	0.68		
Newton	N200	150	L/10	23	0.87		
Newton	N250	196	L/10	20	1.14		
Newton	N300	232	L/10	21	1.35	46%	57%
SCT	SC305	172	L/4.5	33.5	1	29%	50%
Newton	N350	270	L/10	22	1.57	45%	64%
Dobson	N406	250	L/4	22	1.45	44%	63%
Dobson	N406	306	L/10	22	1.78	53%	65%
Newton	N457	350	L/10	22	2	63%	68%
Clark 9.25"	R235	210	L/6	0	1.22	32%	53%
SCT 11"	SC280	158	L/4.5	33.4	0.92		
Newton	N600	407	L/5	22	2.36	66%	74%
Newton	N600	455	L/10	22	2.64		
SCT 14"	SC355	200	L/4.5	33.5	1.16	31%	55%

(mm)

width1" and by FTM width1" and by formula

apparent c.	apparent c.
0.9-1.50%	<<1%
1.6-2.0%	2.5-4.0%
1.0-1.6%	xx
1.8-2.2%	5.3-6.3%

Visual 0.56µm NIR 1.12µm
3% on planet 10% on planet

For NIR applications at 1.12µm, just reduce aperture by the ratio 2 (0.56µm).

Formula: apparent c. (at eyepiece)= actual contrast * w/(w+(5.6/Dequiv."))

w: width in (")

Dequiv.: Perfect diameter equiv.(inch)

FTM curve: FTM curve from a sinusoidal pattern

THE SCOPE FACTOR

S. MAKSYMOWICZ
Ecquerily-FRA-

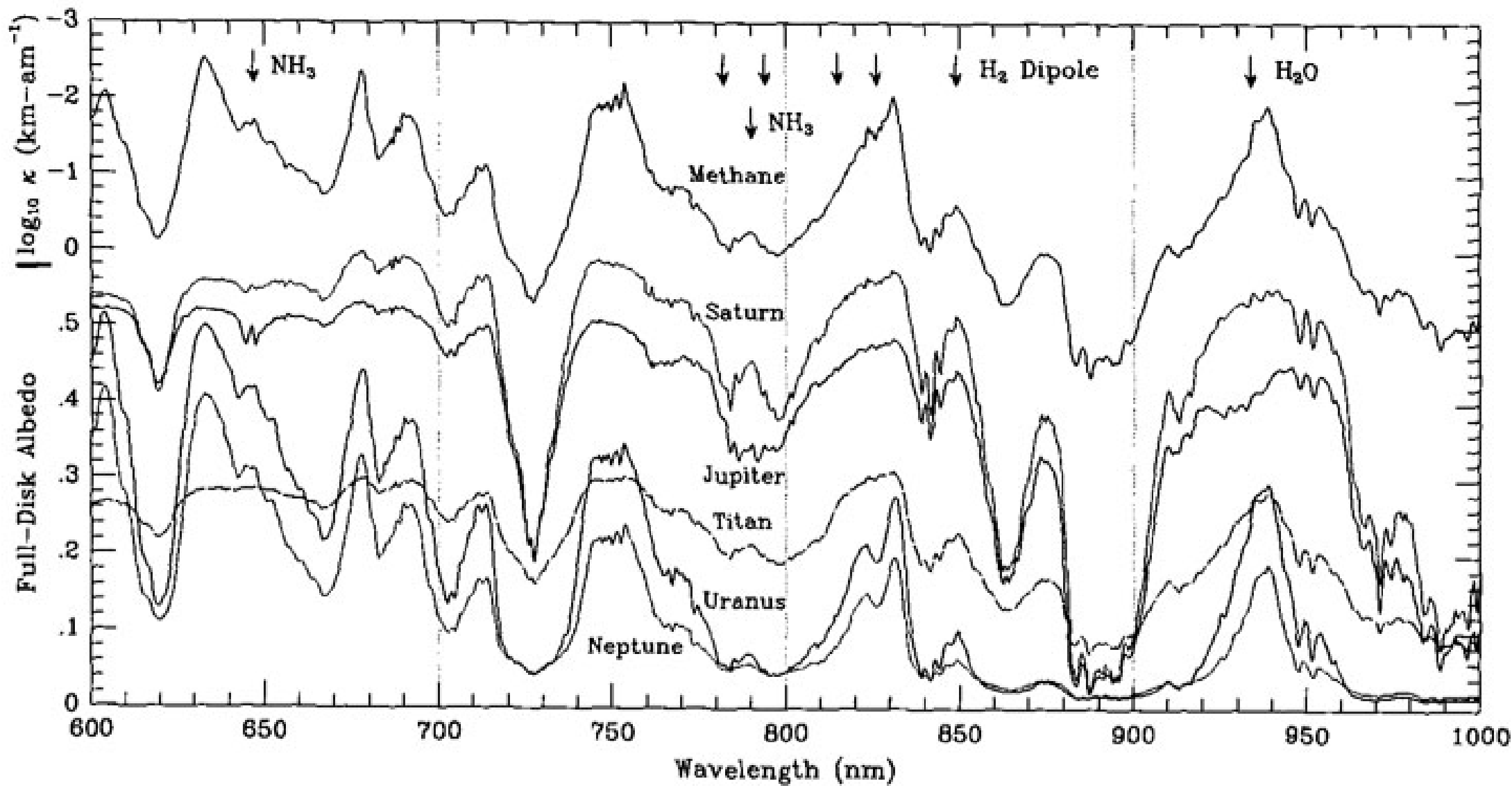


FIG. 3. Full-disk albedo spectra of the jovian planets and Titan. Corresponding phase angles are listed in Table III. For comparison of spectral features, the methane spectrum for the temperatures of the jovian planets is shown too. Solar spectra shown at the top are for comparison of Raman scattering features. Arrows mark theoretical wavelengths of some absorptions bands.

08.08.2012
 N200 x 333-400 T: 5/G 361"
 Satellite not captured.
 Sun rise: 4H35UT
 S. MAKSYMOWICZ
 Ecquevilly - FRA.

2H40UT WB-W12
 333x S: 6-7/10
 CM: 32° Height: 42°

2H30UT WB
 400x S: 6-(7)/10
 CM: 39°

2H40UT W.F.
 400x S: 6-(7)/10
 CM: 42°

Newton 203mm CO29% L/4

2H45UT WB 323x
 S: 6-(7)/10 T6/6 CM: 145°

Uranus L150
 351"

Refractor 150mm L/6.5

12.10.12
 T200 F9
 S: 104° 366"
 T: 5-G/C

T: (4) - 5/G

19H20UT 300x WB
 S: 5-(7)/10
 → 19H10UT (WIND)
 MC: 330° H: 24°

20H25UT 360x WB
 S: 5-6/10 MC: 0° H: 34°
 → 20H40UT WIND
 S: < 4/10

S. MAKSYMOWICZ
 Ecquevilly - FRA -

Cassegrain 200mm CO40% L/8

23.7.2012
 DK180 T: 5/G
 356" Decl. earth: 21°
 Sun rise: 4h14UT
 S. MAKSYMOWICZ
 Ecquevilly - FRA.

Rosalita: Oberon, Titania,
 Ariel, Uran.
 Puck, Umbriel.

2H10UT WB
 360x S: 8/10
 CM: 293°

2H35UT W.F.
 432x S: 7/10
 CM: 301°

2H40UT W2A
 360x S: 7-8/10
 CM: 303°
 Height: 38°

MEWLON 180mm CO30% L/10

1.11.2011

SC 305mm x 435-381x



18425UT 435x	18440UT 381x
WB S=5-(7)/10	WB S=5-6/10
T 5/6 MC:30°	T 4/6 MC:30°
	H:31°

Note: strong moisture at end
with bad seeing.
The brightness should be
confirmed with more sketches
after +1H, +2H, ...

S. NAKSYMOWICZ
Esquevilly - FRA -

Cassegrain 305mm CO33% L/4.5

21.7.2012

SC 305^{mm} x 435-506 T: 5/6 (hazy)

Sun rise: 4H15UT. 3,57° No wind.



2H50UT WB	3H05UT WBA	3H15UT W.F.
435x S=6-7/10	435x	435-506x S: 6-7/10
CM: 88°	CM: 83°	CM: 94°
		Height: 42°

Note: Contrasts are considerably improved
with the sketches under pretty good images.

S. NAKSYMOWICZ
Esquevilly - FRA -

Cassegrain 305mm CO33% L/4.5

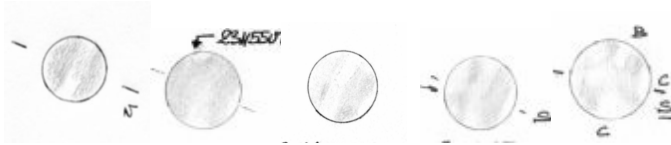
84 drawings (26 nights) were performed this present opposition with 200-305mm apertures (July 2010-February 2011).

Uranus exhibited from the August 2010 to February 2011 period some variability accessible visually with the aid of light colored filters.

Almost featureless at the beginning where EZ was only accessible to be captured, then more consistently brighter in yellow-near IR spectra portion on September in EZ and fading and diluting in a bubbling system at the end of December.

On January 2011, EZ seemed to reconstitute but faintly.

Clear bright patches appear brighter at planet edges than at the meridian.



2010.01.30th 2010.08.28th 2010.09.17th 2010.09.18th 2011.01.16th

MC:298° MC:194° MC:83° MC:238° MC:168°

Cassegrain 305mm x381-435, filter W8, S:5-7/10, T:6/6.

Stanislas Maksymowicz

Ecquevilly- France (JN08XW)

BAA member n° 32334

Uranus section.