APPENDIX

A. DESCRIPTION OF THE SUPPLEMENTARY ONLINE MATERIAL (SOM)

Detailed occultation prediction tables and figures are available as Supplementary Online Material (SOM) at NASA's Planetary Data System Ring-Moon Systems node. Users should download the entire repository to a local storage device, using the command `wget`, freely available from https://www.gnu.org/software/wget/. To download the entire SOM contents, enter the following commands from the command line of a terminal:

`cd destdir` (where `destdir` is the local directory within which the SOM directory will reside)

```
wget -c -r -nH --cut-dirs=2 https://pds-rings.seti.org/rms-annex/french23_occult_pred/SOM/
```

The top directory name is `SOM/`. The approximate data volume is 28 GB.

The abbreviated directory structure of the `SOM/` directory is shown below. Each directory has its own `aareadme.txt`, with its filename including its home directory. The entire SOM can be navigated by opening the `index.html` file in a web browser. The `SOM/docs/` directory contains two sample python programs to illustrate simple occultation searches of the SOM. They can be easily modified for more complex searches.

```
SOM/
    aareadme.txt            Brief description of SOM/ contents
    index.html              Open this file in a browser to navigate SOM directory
    doc/
        aareadme.txt                  Description of SOM/doc/ contents
        EventSearchExample*.*         Example occultation search codes and output files
        Occpred-manuscript.pdf        Typeset version of prediction paper
        Occpred-SOM.pdf               Typeset version of SOM documentation
    tables/
        aareadme.txt                  Description of SOM/tables/ contents
        Jupiter/
        Saturn/
        ......
    events/
        aareadme.txt                  Description of SOM/events/ contents
        Jupiter/
        Saturn/
        ......
```

A.1. SOM/

Contents of the `SOM/aareadme.txt` file:

```
SOM/ is the top-level directory for Supplementary Online Material (SOM)
for the paper "Earth-based Stellar Occultation Predictions for Jupiter, Saturn,
Uranus, Neptune, Titan, and Triton: 2023-2050"

Authors: Richard G. French and Damya Souami
Publication: Planetary Science Journal (accepted July 2023)
```

```
SOM: Supplementary Online Material

The directory structure is shown below, with aareadme.txt files in each subdirectory.

SOM/
    aareadme.txt           Brief description of SOM/ contents
    index.html             Open this file in a browser to navigate SOM/ directory
    doc/
        aareadme.txt                  Description of SOM/doc/ contents
        EventSearchExample*.*         Example occultation search codes and output files
                           To perform the example searches:
                             python3 EventSearchExample1.py
                             python3 EventSearchExample2.py

        Occpred-manuscript.pdf        Typeset version of occultation prediction paper
        Occpred-SOM.pdf               Typeset version of SOM documentation
    tables/
        aareadme.txt                  Description of SOM/tables/ contents
        Jupiter/
        Saturn/
        Uranus/
        Neptune/
        Titan/
        Triton/
    events/
        aareadme.txt                  Description of SOM/events/ contents
        Jupiter/
        Saturn/
        Uranus/
        Neptune/
        Titan/
        Triton/
        Jupiter/
```

A.2. SOM/doc/

Contents of the SOM/doc/aareadme.txt file:

```
This directory contains:

SOM/doc/
        aareadme.txt                    Description of SOM/doc/ contents

        EventSearchExample1.ipynb       Example1 files
        EventSearchExample1.py
        EventSearchExample1.out

        EventSearchExample2.ipynb       Example2 files
        EventSearchExample2.py
        EventSearchExample2.out
```

```
        Occpred-manuscript.pdf          Typeset version of prediction paper
        Occpred-SOM.pdf                 Typeset version of SOM documentation
```

A.3. SOM/events/

Contents of the SOM/events/aareadme.txt file:

```
The SOM/events/ directory contains both summary and detailed occultation predictions
with a subdirectory for each of six targets:
      Jupiter Saturn Uranus Neptune Titan Triton

For example, the SOM/events/Neptune/ directory has the following structure and
abbreviated contents:

SOM/events/Neptune:

-------------gallery of views of Earth from Neptune at mid-occultation time
-------------for 25 events per file
    Neptune_globes_2023-05-03_to_2032-02-16.pdf
    Neptune_globes_2032-09-05_to_2040-07-12.pdf
    Neptune_globes_2041-07-03_to_2047-03-16.pdf
    Neptune_globes_2047-07-01_to_2049-11-05.pdf

-------------gallery of views of skyplane from Earth at mid-occultation time
-------------for 25 events per file
    Neptune_skyplanes_2023-05-03_to_2032-02-16.pdf
    Neptune_skyplanes_2032-09-05_to_2040-07-12.pdf
    Neptune_skyplanes_2041-07-03_to_2047-03-16.pdf
    Neptune_skyplanes_2047-07-01_to_2049-11-05.pdf

-------------detailed information for each event is in subfolders, by year:
Neptune/2023:
-------------Overview summary PDF file for the event
-------------with C/A time 2023-05-03T13_00_52.170
-------------from prediction series YYYYMMDD 20230528
-------------version a :
    Neptune_2023-05-03T13_00_52.170_20230528a.pdf

-------------Text file containing summary of this event:
    Neptune_2023-05-03T13_00_52.170_20230528a.txt

-------------full-size images of :
-------------    altitude of target as a function of time
-------------    globe (view of Earth from target)
-------------    skyplane (view of target and occultation chords)
    Neptune_2023-05-03T13_00_52.170_20230528a.alt.jpg
    Neptune_2023-05-03T13_00_52.170_20230528a.globe.jpg
    Neptune_2023-05-03T13_00_52.170_20230528a.skyplane.jpg

-------------Text file containing detailed predictions
-------------for all observatories from which this event was
-------------visible, subject to altitude constraints
```

```
-------------    sun more then 5 degrees below horizon
-------------    target more then 5 degrees above horizon
-------------The observatory code in this case is PAL
-------------for Mt. Palomar 5m telescope.
-------------See full list of observatory codes in the main
-------------body of the paper:
    Neptune_2023-05-03T13_00_52.170_PAL_20230528a.txt
```

A.4. SOM/tables/

Contents of the SOM/tables/aareadme.txt file:

```
The SOM/tables/ directory contains tables of occultation predictions in both typeset
form and in machine-readable form, with with a sub-directory for each target:
        Jupiter, Saturn, Uranus, Neptune, Titan, and Triton.

The table contents differ slightly for ringed/non-ringed planets and for the satellite targets.

For example, the Neptune directory contains the following files:

./Neptune:
Neptune_tables.pdf                Complete set of typeset tables, produced
                                  from the following LaTeX source files:

Neptune_tables.tex                LaTeX file to produce Neptune_tables.pdf
Neptune_predictions_01_of_01.tex Data tables referred to in Neptune_tables.tex
aastex631.cls                     LaTeX style sheet used for Neptune_tables.tex

Note that to get proper column alignment in the typeset output file, the
input Neptune_tables.tex file must be typeset three times in succession.

Neptune_predictions_MR.txt        Machine-readable version of complete
                                  set of predictions for Neptune.
The format of the machine-readable file is listed at the beginning of the file.

The header, file format, and first line of data (line-wrapped) for the file
Neptune/Neptune_predictions_MR.txt are as follows:

head -59 Neptune/Neptune_predictions_MR.txt | fold -124
```

```
Title: Earth-based Stellar Occultation Predictions for Jupiter, Saturn, Uranus, Neptune, Titan, and Triton: 2023-2050
Authors: Richard G. French &  Damya Souami
Table: Occultation predictions for Neptune 2023-2050 for K<15
================================================================
Byte-by-byte Description of file: Neptune_predictions_MR.txt
-------------------------------------------------------------
   Bytes     Format   Units    Label     Explanations
-------------------------------------------------------------
     1-  8      A8      ---              TARGET Occultation target
    10- 80     A71      ---         SUMMARY_PDF SOM pathname to event summary PDF
    82- 92     A11      ---             EVENTID Event identification (target letter, YYnnn)
    94-112   F19.7        d                  JD Julian date of closest approach (CA)
   114-140     A27      ---              UTC_CA UTC of closest approach
   142-151     A10      ---           EVENTTYPE Event type P: planet, g: geocentric t: topocentric
   153-174     I22      ---              STARID Gaia star ID
   176-211     A36      ---             STARPOS J2000 star position at epoch hh mm ss dd mm ss
   213-219    F7.1       km           STARERR_F E-W error in star position in skyplane (E positive)
```

```
    221-227    F7.1        km           STARERR_G N-S error in star position (N positive)
    229-264     A36       ---             TARGPOS J2000 target position at epoch hh mm ss dd mm ss
    266-274    F9.3    arcsec                  CA closest approach distance of target and star in skyplane
    276-285   F10.2       deg                  PA position angle of CA
    287-295    F9.3   1000 km              RKM_CA sky plane separation at CA
    297-305    F9.2      km/s                VSKY sky plane velocity of target relative to star
    307-316   F10.3        au              DISTAU Observer-target distance
    318-327   F10.3      km/s                RDOT ring plane radial velocity
    329-338   F10.2       deg                   P position angle of target pole
    340-349   F10.2       deg                BDEG ring opening angle
    351-357    F7.1       deg                LATI Ingress geodetic latitude
    359-367    F9.1       deg                LATE Egress geodetic latitude
    369-377    F9.3       mag                KMAG apparent K magnitude of occultation star
    379-388   F10.3       mag                GMAG apparent G magnitude of occultation star
    390-399   F10.3       mag               GSTAR apparent G magnitude of occultation star, corrected for vsky
    401-410   F10.3       mag               RPMAG apparent RP magnitude of occultation star
    412-412      I1       ---                 DUP Source with multiple source identifiers (Gaia catalog entry)
    414-422    F9.3        km               SDIAM projected diameter of occultation star at target
    424-432    F9.1       deg              LONDEG Sub-target Earth longitude (East) at CA
    434-441    F8.1       deg              LATDEG Sub-target Earth latitude at CA
    443-450    F8.1       deg                 SGT Sun-Earth-Target separation at CA
    452-460    F9.1       deg                 MGT Moon-Earth-Target separation at CA
    462-469    F8.2       ---                RUWE Renormalized unit weight error (<1.4 is good astrometric solution)
    471-491     A21       ---           _2MASS_ID 2MASS catalog ID
    493-493      I1       ---      _2MASS_DUPFLAG another nearby event with a different STARID shares this 2MASS catalog ID
    495-503    F9.3    arcsec                  _R angular separation of Gaia and 2MASS positions
    505-505      I1       ---  EAS_N_TARGETOCCS number of target occultations by candidate observatories in EAS region
    507-507      I1       ---    EAS_N_RINGOCCS number of ring occultations by candidate observatories in EAS region
    509-509      I1       ---  ENA_N_TARGETOCCS number of target occultations by candidate observatories in ENA region
    511-511      I1       ---    ENA_N_RINGOCCS number of ring occultations by candidate observatories in ENA region
    513-513      I1       ---  GEO_N_TARGETOCCS number of target occultations by candidate observatories in GEO region
    515-515      I1       ---    GEO_N_RINGOCCS number of ring occultations by candidate observatories in GEO region
    517-517      I1       ---  NAM_N_TARGETOCCS number of target occultations by candidate observatories in NAM region
    519-519      I1       ---    NAM_N_RINGOCCS number of ring occultations by candidate observatories in NAM region
    521-521      I1       ---  OCN_N_TARGETOCCS number of target occultations by candidate observatories in OCN region
    523-523      I1       ---    OCN_N_RINGOCCS number of ring occultations by candidate observatories in OCN region
    525-525      I1       ---  SAF_N_TARGETOCCS number of target occultations by candidate observatories in SAF region
    527-527      I1       ---    SAF_N_RINGOCCS number of ring occultations by candidate observatories in SAF region
    529-529      I1       ---  SAM_N_TARGETOCCS number of target occultations by candidate observatories in SAM region
    531-531      I1       ---    SAM_N_RINGOCCS number of ring occultations by candidate observatories in SAM region
--------------------------------------------------------
 Neptune   SOM/events/Neptune/2023/Neptune_2023-05-03T13_00_52.170_20230528a.pdf      N23001     2460068.0422705      2023-0
5-03 13:00:52.17      PgRgt    2447704782568325504       23 48 59.15652  -02 29 12.98136     4.4      3.0       23 48 59.14834
 -02 29 12.68060     0.324     337.79     7.199     26.29     30.600     33.510     -41.58     -21.13     2.4     -34.4
9.623      11.116     11.413     10.610 0     1.181     301.2     -2.4     46.1     160.6     0.96      23485925-0229122 0
  0.324 0 0 0 0 1 1 0 1 0 0 0 0 0 0
```

B. EXAMPLES OF SOM FILES

For each predicted occultation, the SOM includes visual and tabular overviews of the observing circumstances. We illustrate these using the 2028-12-19 Uranus occultation.

A single PDF file for each predicted occultation includes key observational data and plotted figures showing the event geometry. Figure B1 shows the summary page for this event.[13] Both the view of Earth and the sky plane plots are included in the same SOM subdirectory. The summary page includes information about the target object and occultation star, along with other geometrical information defined in more detail below. This text is included in a separate plain text file on the SOM.[14] At lower right, a finder chart image (created using the `plot_finder_image` from the Python `astronplan.plots` package) is shown, with the event star marked by crosshairs. At the bottom of the page, a convenient summary of the observability of the occultation from all 13 observing sites is included:

- The observing site code, name, and topocentric Earth location are shown.
- The observability of each individual ring event and the planet limb occultations is summarized. In time order, each of the ten Uranus rings is marked during ingress with a + if the ring was observable, given the usual altitude constraints.

[13] `SOM/events/Uranus/2028/Uranus_2028-12-29T17_39_23.210_20230528a.pdf`

[14] `SOM/events/Uranus/2028/Uranus_2028-12-29T17_39_23.210_20230528a.txt`

- The ingress and egress planet occultations are marked, followed in time order by the egress rings.[15] For example, from PIC (Pic du Midi), all ingress and egress ring events were observable, but the grazing occultation chord missed the atmosphere.
- The next column lists the complete interval over which any marked events were predicted to be observable.
- We include a summary observed event code (OEcode) for each site, in the following format: `PXYRxy`, where `X` is set to `i` if the target planet/satellite (denoted by `P`) ingress limb event is observable and `Y` is set to *e* if the egress limb event is observable. Similarly, `x` is set to `i` if any ingress ring events (denoted by `R`) are observable from the given site (unblocked by the planet and meeting the standard altitude criteria), and `y` is set to `e` if any egress ring events are observable. If the given events are not observable, the appropriate letters are set to `n`. In this example, the OEcodes for the PIC and KAV observations are `PnnRie` and `PnnRne`, respectively; from KAV, only the outer five rings are observable during egress. An OEcode of `PnnRnn` indicates that neither the planet nor any ring occultations were observable for the site in question, such as PAL for this example.

For each site that has an OEcode indicating that a planet/target limb and/or ring occultation is observable, we include a separate page in the SOM PDF file that provides additional detailed information about the geometric circumstances of these events. Figure B2 shows this page for the predicted Pic du Midi observations of the 2028-12-29 Uranus event. Inset figures showing the Earth from Uranus and the altitude of the target and sun over time are included, available at full resolution in the SOM. The text shown includes details of the occultation event and included as a separate text file in the SOM.[16]

At the bottom of the page, we include detailed predictions for each ring event and planet limb that intersects the sky plane chord for the occultation as observed from this site:

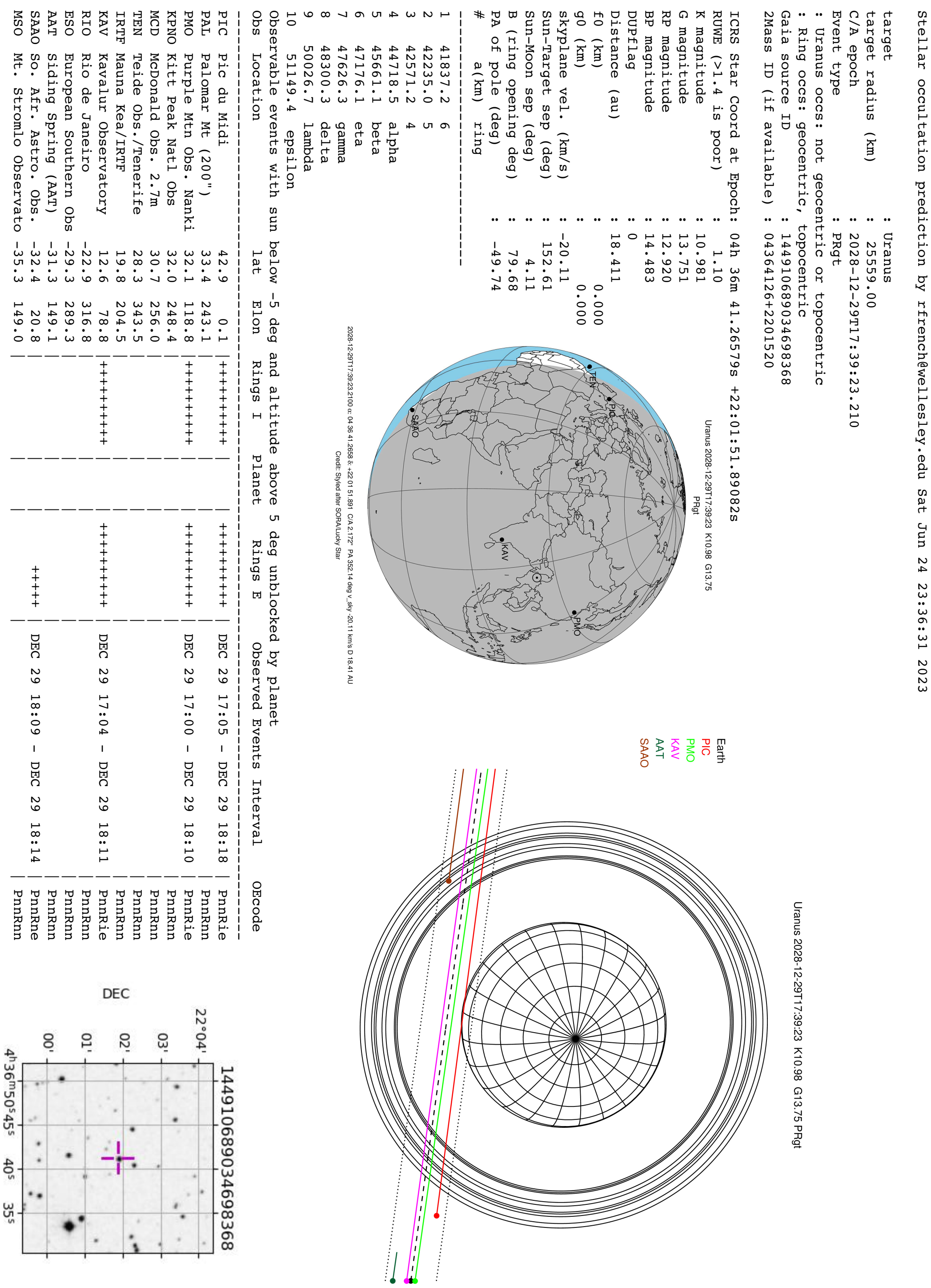
- For each listed ring, we computed the ingress (I) and egress (E) predicted event times. (For Uranus, we use the full eccentric and inclined ring orbital elements for the rings, taken from French et al. (2023b); for the other planets, we assume circular and equatorial ring orbits).
- The UTC time of each predicted event is given, along with the altitudes of the target object and sun at the event time, the ring plane radius probed (taking into account the orientation of the possibly inclined, eccentric ring at the observed time and accounting for general relativistic bending by the oblate planet), and the ring plane radial velocity, labeled as `r-dot`, negative for ingress and positive for egress.
- If the planet occultation is observable, we include the predicted occultation time assuming the planetary shape/oblateness as specified in the kernel file `pck00010.tpc`. Our atmospheric event times do not take into account the refractive bending of the atmospheric half-light ray that typically amounts to one atmospheric scale height.
- Ring events that are blocked by the planet are marked with a `b` in cases where the rings are viewed nearly edge-on and the occultation sky plane chord intersects the rings only when in the shadow of the planet (not applicable in this instance).
- Events for which the target altitude is less than 5° or the sun's altitude is above −5° are marked by an `x` to indicate that they are not observable. In this example, none of the events are so marked.

C. MACHINE READABLE TABLES, LATEX SOURCE AND TYPESET FILES

The complete prediction list for each target is contained in both machine-readable and typeset form. The `SOM/tables/` directory contains subdirectories for each target, within which is a single machine-readable file in the

[15] For some Saturn and Neptune ring occultations, the ingress and egress ring events all precede or follow the planet occultation, rather than being interrupted by the planet event, but for simplicity we retain the same format for all ringed planets.

[16] `SOM/events/Uranus/2022/Uranus_2028-12-29T17_39_23.210_PIC_20230528a.txt`, where the event time in the filename is the geocentric C/A time.



Stellar occultation prediction by rfrench@wellesley.edu Sat Jun 24 23:36:31 2023

target : Uranus
target radius (km) : 25559.00
C/A epoch : 2028-12-29T17:39:23.210
Event type : PRgt
: Uranus occs: not geocentric or topocentric
: Ring occs: geocentric, topocentric
Gaia source ID : 144910689034698368
2Mass ID (if available) : 04364126+2201520

ICRS Star Coord at Epoch: 04h 36m 41.26579s +22:01:51.89082s
RUWE (>1.4 is poor) : 1.10
K magnitude : 10.981
G magnitude : 13.751
RP magnitude : 12.920
BP magnitude : 14.483
DUPflag : 0
Distance (au) : 18.411
f0 (km) : 0.000
g0 (km) : 0.000
skyplane vel. (km/s) : -20.11
Sun-Target sep (deg) : 152.61
Sun-Moon sep (deg) : 4.11
B (ring opening deg) : 79.68
PA of pole (deg) : -49.74

#	a(km)	ring
1	41837.2	6
2	42235.0	5
3	42571.2	4
4	44718.5	alpha
5	45661.1	beta
6	47176.1	eta
7	47626.3	gamma
8	48300.3	delta
9	50026.7	lambda
10	51149.4	epsilon

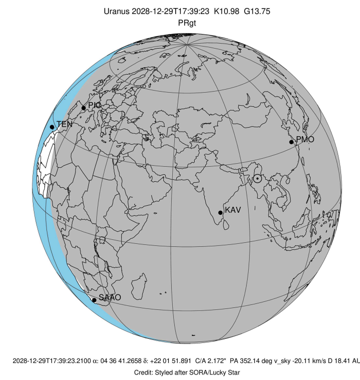
Observable events with sun below -5 deg and altitude above 5 deg unblocked by planet

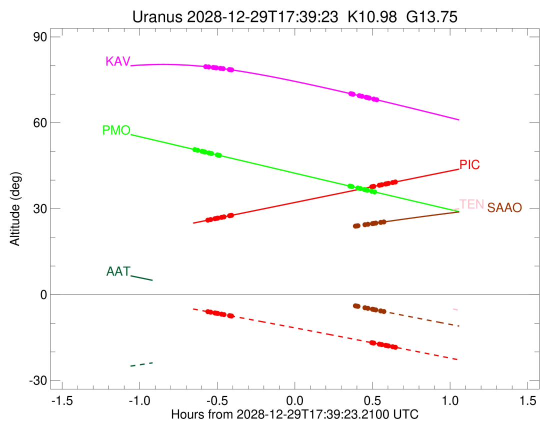
Obs	Location	lat	Elon	Rings I	Planet	Rings E	Observed Events Interval	OEcode
PIC	Pic du Midi	42.9	0.1	++++++++++		++++++++++	DEC 29 17:05 - DEC 29 18:18	PnnRie
PAL	Palomar Mt (200")	33.4	243.1					PnnRnn
PMO	Purple Mtn Obs. Nanki	32.1	118.8	++++++++++		++++++++++	DEC 29 17:00 - DEC 29 18:10	PnnRie
KPNO	Kitt Peak Natl Obs	32.0	248.4					PnnRnn
MCD	McDonald Obs. 2.7m	30.7	256.0					PnnRnn
TEN	Teide Obs./Tenerife	28.3	343.5					PnnRnn
IRTF	Mauna Kea/IRTF	19.8	204.5					PnnRnn
KAV	Kavalur Observatory	12.6	78.8	++++++++++		++++++++++	DEC 29 17:04 - DEC 29 18:11	PnnRie
RIO	Rio de Janeiro	-22.9	316.8					PnnRnn
ESO	European Southern Obs	-29.3	289.3					PnnRnn
AAT	Siding Spring (AAT)	-31.3	149.1					PnnRnn
SAAO	So. Afr. Astro. Obs.	-32.4	20.8			+++++	DEC 29 18:09 - DEC 29 18:14	PnnRne
MSO	Mt. Stromlo Observato	-35.3	149.0					PnnRnn

Figure B1. Summary page of the PDF file contained in the Supplementary Online Material (SOM) for the 2028-12-29 Uranus occultation.

```
Uranus_2028-12-29T17_39_23.2100_PIC.txt
Occultation predictions computed by rfrench@wellesley.edu Sun Jun 11 11:15:28 2023

target                   : Uranus
target radius (km)       :  25559.00
C/A epoch                : 2028-12-29T17:42:22.350
Event type               : PRgt
: Uranus occs: not geocentric or topocentric
: Ring occs: geocentric, topocentric
Observer code            : PIC
Location                 : Pic du Midi
Latitude (deg)           :  42.93656
E. Longitude (deg)       :   0.14231
Altitude (km)            :   2.890
Gaia source ID           : 144910689034698368
2Mass ID (if available) : 04364126+2201520
ICRS Star Coord at Epoch: 04h 36m 41.26579s +22:01:51.89082s
RUWE (>1.4 is poor)      :   1.10
K magnitude              : 10.981
G magnitude              : 13.751
RP magnitude             : 12.920
BP magnitude             : 14.483
DUPflag                  : 0
Distance (au)            : 18.411
f0 (km)                  :       0.000
g0 (km)                  :       0.000
skyplane vel. (km/s)     : -20.11
Sun-Target sep (deg)     :  152.61
Sun-Moon sep (deg)       :    4.28
B (ring opening deg)     :   79.68
PA of pole (deg)         :  -49.74
Pole direction: RA (deg): 257.31100
Dec (deg): -15.17500
C/A sky separation (")   :   1.892
C/A sky separation (km)  :  25264.4
NAIF SPICE kernels       : RAJobs_U111+rgf15.spk
URKALLv1.spk
ura111.bsp
IAU_URANUS_for_RINGFIT.tpc
vgr2.ura111.bsp
ura161.bsp
vgr2.ura161.bsp
peph.ura160.bsp
earthstns_itrf93_040916.bsp
earth_720101_070426.bpc
earth_200101_990628_predict.bpc
pg3f0000r.bsp
pg490000r.bsp
naif0012.tls
earth_flat_IAU.spk
```





b: ring blocked by planet   x: target alt <   5.0 deg or   sun >   -5.0 deg

Ring	I/E	UTC	b?	alt	alt-sun	radius	r-dot	lat-geo	lat-geodetic
epsilon	I	2028-12-29T17:05:31.824		25.99	-5.90	51389.62	-17.72		
lambda	I	2028-12-29T17:06:49.350		26.23	-6.11	50026.71	-17.50		
delta	I	2028-12-29T17:08:28.626		26.53	-6.39	48300.35	-17.28		
gamma	I	2028-12-29T17:09:07.454		26.65	-6.49	47631.37	-17.18		
eta	I	2028-12-29T17:09:34.001		26.73	-6.57	47176.12	-17.11		
beta	I	2028-12-29T17:11:01.963		27.00	-6.81	45680.90	-16.88		
alpha	I	2028-12-29T17:12:00.836		27.18	-6.97	44691.87	-16.70		
4	I	2028-12-29T17:14:12.091		27.58	-7.34	42526.42	-16.29		
5	I	2028-12-29T17:14:34.911		27.65	-7.40	42154.90	-16.20		
6	I	2028-12-29T17:14:57.205		27.71	-7.46	41796.03	-16.12		

No planet occultations

6	E	2028-12-29T18:09:06.790		37.67	-16.76	41837.84	16.17
5	E	2028-12-29T18:09:33.131		37.76	-16.84	42260.04	16.25
4	E	2028-12-29T18:09:53.415		37.82	-16.90	42590.30	16.34
alpha	E	2028-12-29T18:12:01.024		38.21	-17.27	44708.20	16.76
beta	E	2028-12-29T18:12:57.331		38.38	-17.44	45657.03	16.94
eta	E	2028-12-29T18:14:26.416		38.65	-17.70	47176.12	17.18
gamma	E	2028-12-29T18:14:52.363		38.73	-17.78	47622.75	17.25
delta	E	2028-12-29T18:15:31.542		38.85	-17.89	48300.35	17.34
lambda	E	2028-12-29T18:17:10.421		39.15	-18.19	50026.71	17.57
epsilon	E	2028-12-29T18:18:22.799		39.38	-18.40	51304.06	17.80

Figure B2. Site-specific page for PIC (Pic du Midi) observations from the PDF file contained in the Supplementary Online Material (SOM) for the 2028-12-29 Uranus occultation.

form support by the American Astronomical Society journals and described at https://journals.aas.org/mrt-overview/. Also included are the LaTeX source files used to typeset the tables for each target, and a PDF file containing the typeset tables. These make use of the document class `aastex631.cls`, provided in each target subdirectory.

D. EXAMPLE OCCULTATION SEARCHES

The body of this paper contains only a small subset of the full list of predicted events contained in the SOM. As part of the SOM documentation, we provide two example programs written in Python3 that perform searches of the entire database for occultations that match requested criteria. To run these example codes, users should first download the entire SOM repository to their local machines and then navigate to the `SOM/doc/` directory. Both programs are provided as Python source files `*.py` and as Jupyter notebooks `*.ipynb`, with sample output files `*.out` produced by running the codes in their default configurations. The codes are intended to be illustrative only, and can be modified to conduct more sophisticated searches.

D.1. *Example 1 - find selected occultations by geographical region*

In the first example, the user specifies the following search criteria:

- The list of targets to search
- The corresponding upper limits on the K magnitude for each target
- The range of dates for the search
- The geographical regions to search (see Table 2 in the main body of the paper)

Additional options are included that control the output of the search. In its default mode, the output file produce by the program includes:

- A list of the available quantities in the Python table read from the Machine Readable (MR) file for each target
- A summary of the requested search criteria
- For each occultation found, a listing of the summary text file of observing circumstances for all sites
- The SOM pathnames for the summary PDF and text files for each event
- The summary PDF file is opened for user viewing for each identified occultation

In its tersest mode, the default search results in the following output:

```
********** Contents of  EventSearchExample1.out  ****************
Results of  EventSearchExample1.py
-------------------------------------------------------------------------------
Results of search for occultations by Jupiter between 2024-01-01 and 2030-01-01
K magnitude limit 5
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2027-02-22 11:12:09.02 Pgt     K= 4.926 is visible from N. Am., Oceania, E. Asia

-------------------------------------------------------------------------------
Results of search for occultations by Saturn between 2024-01-01 and 2030-01-01
```

```
K magnitude limit 8
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2024-08-06 17:12:21.22 PgtRgt  K= 7.716 is visible from N. Am., Oceania, E. Asia
  2029-07-19 00:57:19.09 PgtRgt  K= 7.241 is visible from Eur.&N.Afr., S. Afr., E. Asia

------------------------------------------------------------------------------
Results of search for occultations by Uranus between 2024-01-01 and 2030-01-01
K magnitude limit 10.9
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2026-07-21 02:13:50.22 PgtRgt  K= 10.802 is visible from Eur.&N.Afr., S. Afr.

------------------------------------------------------------------------------
Results of search for occultations by Neptune between 2024-01-01 and 2030-01-01
K magnitude limit 11
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2024-10-09 00:36:23.19 PgtRgt  K= 9.068 is visible from N. Am., Eur.&N.Afr., S. Afr., S. Am.

------------------------------------------------------------------------------
Results of search for occultations by Titan between 2024-01-01 and 2030-01-01
K magnitude limit 7
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2029-03-04 02:37:38.25 Pt      K= 6.151 is visible from N. Am.

------------------------------------------------------------------------------
Results of search for occultations by Triton between 2024-01-01 and 2030-01-01
K magnitude limit 15
Visible from  N. Am., Eur.&N.Afr., S. Afr., S. Am., Oceania, E. Asia

  2029-06-11 05:23:26.00 Pt      K= 10.259 is visible from Eur.&N.Afr.
```

D.2. *Example 2 - find selected occultations by observing site*

In the second example, the user specifies the following search criteria:

- The list of targets to search
- The corresponding upper limits on the K magnitude for each target
- The range of dates for the search
- Specific observing sites for the search (see Table 2 in the main body of the paper)

Additional options are included that control the output of the search. In its default mode, the output file produce by the program includes:

- A list of the available quantities in the Python table read from the Machine Readable (MR) file for each target
- A summary of the requested search criteria

- For each occultation found, a listing of the summary text file of observing circumstances for all sites
- The SOM pathnames for the summary PDF and text files for each event
- The SOM pathnames for the individual event summary text files for each observing site
- The summary PDF file is opened for user viewing for each identified occultation

In its tersest mode, the default search results in the following output:

```
********** Contents of  EventSearchExample2.out  ****************
Results of  EventSearchExample2.py
------------------------------------------------------------------------------
Results of search for occultations by Jupiter between 2024-01-01 and 2030-01-01
K magnitude limit 5
Visible from  IRTF, TEN, KPNO

  2027-02-22 11:12:09.02 Pgt     K= 4.926 is visible from IRTF, KPNO

------------------------------------------------------------------------------
Results of search for occultations by Saturn between 2024-01-01 and 2030-01-01
K magnitude limit 8
Visible from  IRTF, TEN, KPNO

  2024-08-06 17:12:21.22 PgtRgt  K= 7.716 is visible from IRTF
  2029-07-19 00:57:19.09 PgtRgt  K= 7.241 is visible from TEN

------------------------------------------------------------------------------
Results of search for occultations by Uranus between 2024-01-01 and 2030-01-01
K magnitude limit 10.9
Visible from  IRTF, TEN, KPNO

No events found with requested conditions

------------------------------------------------------------------------------
Results of search for occultations by Neptune between 2024-01-01 and 2030-01-01
K magnitude limit 11
Visible from  IRTF, TEN, KPNO

  2024-10-09 00:36:23.19 PgtRgt  K= 9.068 is visible from KPNO, TEN

------------------------------------------------------------------------------
Results of search for occultations by Titan between 2024-01-01 and 2030-01-01
K magnitude limit 7
Visible from  IRTF, TEN, KPNO

  2029-03-04 02:37:38.25 Pt      K= 6.151 is visible from KPNO

------------------------------------------------------------------------------
Results of search for occultations by Triton between 2024-01-01 and 2030-01-01
K magnitude limit 15
Visible from  IRTF, TEN, KPNO

```

1054 2029-06-11 05:23:26.00 Pt K= 10.259 is visible from TEN