```
*******************************************************************************
JPL/HORIZONS                ATLAS (C/2025 N1)              2025-Dec-19 15:27:37
Rec #:90004922 (+COV) Soln.date: 2025-Dec-17_07:57:07    # obs: 763 (214 days)

IAU76/J2000 helio. ecliptic osc. elements (au, days, deg., period=Julian yrs):

  EPOCH=  2460894.5 ! 2025-Aug-07.0000000 (TDB)    RMSW= n.a.
   EC= 6.139422831829797   QR= 1.356418761995381   TP= 2460977.9822178655
   OM= 322.1566239181344   W= 128.0096924001076    IN= 175.1130917268881
   A= -.2639243367163182   MA= 113.1534403848549   ADIST= 9.999999E99
   PER= 9.999999E99        N= 7.269171509          ANGMOM= .053531559
   DAN= -3.48269           DDN= 2.02569             L= 194.0456468
   B= 3.848654             MOID= .365841            TP= 2025-Oct-29.4822178655

Comet physical (GM= km^3/s^2; RAD= km):
   GM= n.a.                RAD= n.a.
   M1= 12.5     M2= n.a.      k1= 4.5     k2= n.a.     PHCOF= n.a.
Comet non-gravitational force model (AMRAT=m^2/kg;A1-A3=au/d^2;DT=days;R0=au):
   AMRAT= 0.                                     DT= 0.
   A1= 4.572104930878E-8   A2= 1.862444758415E-8   A3= -5.019464492798E-9
 Non-standard or simulated/proxy model:
   ALN= 1.            NK= 0.         NM= 2.        NN= 0.        R0= 1.

COMET comments
1: soln ref.= JPL#44, data arc: 2025-05-15 to 2025-12-15
2: k1=4.5;Nongravitational accels. using g(r) = (1 au/ r)^2 for CO2
*******************************************************************************


*******************************************************************************
Ephemeris / WWW_USER Fri Dec 19 15:27:37 2025 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: ATLAS (C/2025 N1)                 {source: JPL#44}
Center body name: Earth (399)                       {source: DE441}
Center-site name: GEOCENTRIC
*******************************************************************************
Start time      : A.D. 2025-Dec-14 00:00:00.0000 UT
Stop  time      : A.D. 2025-Dec-25 00:00:00.0000 UT
Step-size       : 720 minutes
*******************************************************************************
Target pole/equ : undefined
Target radii    : undefined
Center geodetic : 0.0, 0.0, -6378.137              {E-lon(deg),Lat(deg),Alt(km)}
Center cylindric: 0.0, 0.0, 0.0                     {E-lon(deg),Dxy(km),Dz(km)}
Center pole/equ : ITRF93                            {East-longitude positive}
Center radii    : 6378.137, 6378.137, 6356.752 km {Equator_a, b, pole_c}
Target primary  : Sun
Vis. interferer : MOON (R_eq= 1737.400) km          {source: DE441}
Rel. light bend : Sun                               {source: DE441}
Rel. lght bnd GM: 1.3271E+11 km^3/s^2
Small-body perts: Yes                               {source: SB441-N16}
Atmos refraction: NO (AIRLESS)
RA format       : HMS
Time format     : CAL
Calendar mode   : Mixed Julian/Gregorian
EOP file        : eop.251219.p260317
EOP coverage    : DATA-BASED 1962-JAN-20 TO 2025-DEC-19. PREDICTS-> 2026-MAR-16
Units conversion: 1 au= 149597870.700 km, c= 299792.458 km/s, 1 day= 86400.0 s
Table cut-offs 1: Elevation (-90.0deg=NO ),Airmass (>38.000=NO), Daylight (NO )
Table cut-offs 2: Solar elongation (  0.0,180.0=NO ),Local Hour Angle( 0.0=NO )
Table cut-offs 3: RA/DEC angular rate (      0.0=NO )
*******************************************************************************
Initial IAU76/J2000 heliocentric ecliptic osculating elements (au, days, deg.):
  EPOCH=  2460894.5 ! 2025-Aug-07.0000000 (TDB)    RMSW= n.a.
```

```
      EC= 6.139422831829797     QR= 1.356418761995381    TP= 2460977.9822178655
      OM= 322.1566239181344    W= 128.0096924001076     IN= 175.1130917268881
     Equivalent ICRF heliocentric cartesian coordinates (au, au/d):
      X=-2.378747297356065E-01  Y=-3.102759005720133E+00  Z=-1.090203350456866E+00
     VX=-1.384709488604957E-02 VY= 3.112560878097644E-02 VZ= 1.183817971407601E-02
 Comet physical (GM= km^3/s^2; RAD= km):
     GM= n.a.                    RAD= n.a.
     M1=  12.5      M2=  n.a.      k1=  4.5     k2= n.a.      PHCOF= n.a.
 Comet non-gravitational force model (AMRAT=m^2/kg;A1-A3=au/d^2;DT=days;R0=au):
     AMRAT=  0.                                   DT=  0.
     A1= 4.572104930878E-8    A2= 1.862444758415E-8    A3= -5.019464492798E-9
  Non-standard or simulated/proxy model:
     ALN=  1.           NK=  0.          NM=  2.         NN=  0.         R0=  1.
 *****************************************************************************
  Date__(UT)__HR:MN               delta      deldot   RNG_3sigma RNGRT_3sig
 *****************************************************************************
 $$SOE
  2025-Dec-14 00:00      1.80874153350944  -7.1585168    2341.5018  0.0005530
  2025-Dec-14 12:00      1.80676435220470  -6.5340615    2363.1948  0.0005553
  2025-Dec-15 00:00      1.80496929834600  -5.8970819    2384.8235  0.0005576
  2025-Dec-15 12:00      1.80335996737456  -5.2477210    2406.3803  0.0005599
  2025-Dec-16 00:00      1.80193991118017  -4.5861373    2427.8571  0.0005621
  2025-Dec-16 12:00      1.80071263360829  -3.9125050    2449.2462  0.0005643
  2025-Dec-17 00:00      1.79968158594812  -3.2270138    2470.5396  0.0005665
  2025-Dec-17 12:00      1.79885016240555  -2.5298691    2491.7296  0.0005687
  2025-Dec-18 00:00      1.79822169556743  -1.8212923    2512.8082  0.0005709
  2025-Dec-18 12:00      1.79779945186444  -1.1015201    2533.7678  0.0005730
  2025-Dec-19 00:00      1.79758662704311  -0.3708051    2554.6006  0.0005751
  2025-Dec-19 12:00      1.79758634166032   0.3705846    2575.2991  0.0005771
  2025-Dec-20 00:00      1.79780163661530   1.1223654    2595.8558  0.0005791
  2025-Dec-20 12:00      1.79823546873703   1.8842387    2616.2633  0.0005811
  2025-Dec-21 00:00      1.79889070644702   2.6558910    2636.5145  0.0005831
  2025-Dec-21 12:00      1.79977012551861   3.4369942    2656.6024  0.0005850
  2025-Dec-22 00:00      1.80087640495456   4.2272063    2676.5202  0.0005869
  2025-Dec-22 12:00      1.80221212300555   5.0261716    2696.2614  0.0005887
  2025-Dec-23 00:00      1.80377975335071   5.8335215    2715.8196  0.0005905
  2025-Dec-23 12:00      1.80558166146122   6.6488753    2735.1887  0.0005922
  2025-Dec-24 00:00      1.80762010116524   7.4718407    2754.3630  0.0005939
  2025-Dec-24 12:00      1.80989721143222   8.3020145    2773.3369  0.0005956
  2025-Dec-25 00:00      1.81241501339169   9.1389837    2792.1053  0.0005972
 $$EOE
 *****************************************************************************
 Column meaning:

 TIME

   Times PRIOR to 1962 are UT1, a mean-solar time closely related to the
 prior but now-deprecated GMT. Times AFTER 1962 are in UTC, the current
 civil or "wall-clock" time-scale. UTC is kept within 0.9 seconds of UT1
 using integer leap-seconds for 1972 and later years.

   Conversion from the internal Barycentric Dynamical Time (TDB) of solar
 system dynamics to the non-uniform civil UT time-scale requested for output
 has not been determined for UTC times after the next July or January 1st.
 Therefore, the last known leap-second is used as a constant over future
 intervals.

   Time tags refer to the UT time-scale conversion from TDB on Earth
 regardless of observer location within the solar system, although clock
 rates may differ due to the local gravity field and no analog to "UT"
 may be defined for that location.

   Any 'b' symbol in the 1st-column denotes a B.C. date. First-column blank
 (" ") denotes an A.D. date.
```

CALENDAR SYSTEM

  Mixed calendar mode was active such that calendar dates after AD 1582-Oct-15
(if any) are in the modern Gregorian system. Dates prior to 1582-Oct-5 (if any)
are in the Julian calendar system, which is automatically extended for dates
prior to its adoption on 45-Jan-1 BC. The Julian calendar is useful for
matching historical dates. The Gregorian calendar more accurately corresponds
to the Earth's orbital motion and seasons. A "Gregorian-only" calendar mode is
available if such physical events are the primary interest.

  NOTE: "n.a." in output means quantity "not available" at the print-time.

STATISTICAL UNCERTAINTIES

  Output includes formal +/- 3 standard-deviation statistical orbit uncertainty
quantities. There is a 99.7% (1-D) or 98.9% (2-D) chance the actual value is
within given bounds. These statistical calculations assume observational data
errors are random. If there are systematic biases (such as timing, reduction or
star-catalog errors), results can be optimistic. Because the epoch covariance
is mapped using linearized variational partial derivatives, results can also
be optimistic for times far from the solution epoch, particularly for objects
having close planetary encounters.

 'delta   deldot' =
   Apparent range ("delta", light-time aberrated) and range-rate ("delta-dot")
of the target center relative to the observer. A positive "deldot" means the
target center is moving away from the observer, negative indicates movement
toward the observer. Units: AU and KM/S

 'RNG_3sigma RNGRT_3sig' =
  Range and range rate (radial velocity) formal 3-standard-deviation
uncertainties. Units: KM, KM/S

Computations by ...

    Solar System Dynamics Group, Horizons On-Line Ephemeris System
    4800 Oak Grove Drive, Jet Propulsion Laboratory
    Pasadena, CA 91109   USA

    General site: https://ssd.jpl.nasa.gov/
    Mailing list: https://ssd.jpl.nasa.gov/email_list.html
    System news : https://ssd.jpl.nasa.gov/horizons/news.html
    User Guide : https://ssd.jpl.nasa.gov/horizons/manual.html
    Connect   : browser   https://ssd.jpl.nasa.gov/horizons/app.html#/x
                  API   https://ssd-api.jpl.nasa.gov/doc/horizons.html
                  command-line   telnet ssd.jpl.nasa.gov 6775
                  e-mail/batch   https://ssd.jpl.nasa.gov/ftp/ssd/horizons_batch.txt
                  scripts   https://ssd.jpl.nasa.gov/ftp/ssd/SCRIPTS
    Author   : Jon.D.Giorgini@jpl.nasa.gov

****

!$$SOF
COMMAND = '3I'
START_TIME = '2025-12-14'
STOP_TIME = '2025-12-25'
STEP_SIZE = '12 hour'
QUANTITIES = '20,39'