Compliance sheet — star-j2

Everything a supplier qualification, a legal review or an export check usually asks about star-j2 0.1.0, in one document.

1. Identity

Document	STAR-PKG-STAR-J2-EN · v2.3 · 2026-11-14
Package	star-j2
Version	0.1.0
Capability	star.orbit.j2-secular
Maturity	Released & Verified (RELEASED)
Python	>=3.9
Source commit	dc09f61d
Source	https://github.com/Andrea07072000/S.T.A.R.-/tree/main/packages/star_j2

2. Licence and obligations

Apache License 2.0. You may use, copy, modify and distribute it, also commercially, and you receive a patent licence from the contributors. When you redistribute it: keep the LICENSE file and the copyright notices (and a NOTICE file, if a future version adds one), and state in modified files that you changed them. You may not use the S.T.A.R. name to endorse your product.

3. What it needs at run time

Nothing beyond the Python standard library: it works offline.

4. Integrity

SHA-256 fingerprints of the files published on this website. Check a downloaded file with:

```
python -c "import
hashlib,sys;print(hashlib.sha256(open(sys.argv[1],'rb').read()).hexdigest())" star_j2-0.1.0-
py3-none-any.whl
```

FILE	SHA-256
star_j2-0.1.0-py3-none-any.whl	53948a19eb367cae41ffaf2cda736c51497efdbe7730f3a2d087e93c94f69aa3
star_j2.py	e97f9628cbc4ebb6cbfcf5c74143e1bc5a7dce2ba68e3192b2a4c259b82d460f
star_j2-0.1.0-source.zip	5b26ec710e4c30567c35f8c55498673d3aa5181835922952017183b495f73755

5. What it does, and its limits

First-order secular effect of J2 on mean elements: node regression, perigee rotation, mean-anomaly rate, nodal period, sun-synchronous inclination; measured within 0.4 % of Orekit's Eckstein-Hechler theory and of a numerical integration.

Mean rates only: no short-period terms, no J2-squared, J3 or higher harmonics, no drag, no third bodies. Not a propagator. For mission design at the 0.5 % level; a station-keeping budget needs a full theory or an integration.

- `raan_rate_deg_day`, `argp_rate_deg_day`, `mean_anomaly_rate_deg_day`, `nodal_period_s` for mean elements (a in km, e, inclination in degrees), EGM96/WGS-84 constants by default, overridable by keyword.
- `sun_synchronous_inclination_deg(a_km, e=0)`: the inclination whose node advances 360 degrees per tropical year; `CRITICAL_INCLINATION_DEG` = 63.4349...: the perigee does not rotate.
- Accuracy, measured on 51 orbits: node rate within 0.31 % of Orekit's Eckstein-Hechler theory (J2 only, mean elements) and within 0.38 % of a numerical integration of the equations of motion with J2; perigee rate within 0.013 deg/day of the numerical integration. The formulas are first order in J2: differences of this size are the model, not a rounding error.
- Every function returns a finite float or raises `ValueError`: non-numeric, boolean, NaN or infinite input; a <= 0; e outside [0, 1); inclination outside [0, 180]; perigee inside the Earth; non-positive mu, re or j2; an orbit too high to be sun-synchronous (above about 12 350 km semi-major axis for a circular orbit).

6. Export, use and certification

The package is published and freely available. That usually takes software out of export-control lists, but not every use of it: read the page on space activities and export control before using it in a controlled programme. It is not certified or qualified for flight; the evidence describes what was tested and how.

7. Citation and bill of materials

```
@software{cavazzini_star_j2_0_1_0,
  author  = {Cavazzini, Andrea},
  title   = {{star-j2}: What the Earth's oblateness does to an orbit, on average},
  version = {0.1.0},
  year    = {2026},
  url     = {https://andrea07072000.github.io/S.T.A.R.-/software/star_j2/},
  note    = {Apache-2.0. Source: https://github.com/Andrea07072000/S.T.A.R.-, commit dc09f61d}
}
```

CITATION.cff · BibTeX · SBOM CycloneDX 1.5 · SBOM SPDX 2.3

8. Warranty and liability

Provided "as is", without warranties or conditions of any kind (Apache License 2.0, sections 7 and 8), to the extent the law allows. This never excludes liability that the law does not allow to exclude.

Related: space activities and export control · acceptable use · evidence and limits · licence texts