

README — Supplementary Appendices Overview

This repository contains supplementary materials supporting the manuscript “*Reassessing the Giza Pyramids: Cross-Disciplinary Evidence for a Mid-Holocene Construction (~4400 BCE)*.” All datasets, simulation scripts, and reproducibility protocols are archived here for open scientific verification.

Note: All analyses are based on previously published or publicly available archaeological, geological, and astronomical datasets. No new field excavations or physical sample collections were conducted for this study.

Repository structure:

- /data – GIS layers, DEM rasters, and sediment-core tables
- /code – Python 3.11 reproducibility scripts
 - |— Appendix B.py – main module containing computational functions
 - |— Appendix C1.py – generates Table C1 numerical outputs
 - |— Appendix C2.py – reproduces Figure 3 alignment simulation
- /figures – High-resolution supplementary figures (300 dpi)
- /docs – Appendices A–K (PDF and DOCX versions)

All code is written in Python 3.11 and uses open-source packages (numpy, pandas, matplotlib, skyfield, grass.script).

Each script is fully annotated for line-by-line reproducibility and cross-references the corresponding appendix sections cited in the manuscript.

Appendix A — Hydrological Modelling and Geospatial Data

Complete workflow for palaeo-Nile floodplain reconstructions used in *Methodology, Section 1*. Includes SRTM-derived DEMs, hydrological masks, and QGIS/GRASS scripts for accessibility modelling.

Appendix B — Engineering Simulation Protocol and Output Tables

Python-based dynamic simulations assessing gravitational and frictional behaviour during 50-tonne block unloading. Full code and results reproducible in Python 3.11.

Appendix C — Astronomical Alignment Parameters and Workflow

Celestial alignment analysis using NASA JPL DE431 ephemerides and Skyfield (VSOP87). Monte Carlo ($n = 10\,000$) results quantify precision for 4400 ± 200 BCE and 2500 ± 30 BCE epochs.

Appendix D — Structural and Geoarchaeological Evidence

Integrates architectural, sedimentological, and comparative data demonstrating that the KVT exhibits U-shaped recessed geometry and hydrological features consistent with a hydraulic dock rather than a mortuary chapel.

Appendix E — Comparative Foundation Evidence (MVT vs KVT)

Parallel analysis of Menkaure and Khafre Valley Temples revealing massive limestone foundations designed for hydraulic stability and load distribution.

Appendix F — Engineering Analysis of Platform Geometries

Mechanical comparison between linear (I-shaped) and recessed (U-shaped) platforms showing superior torque stability and frictional safety in the latter configuration.

Appendix G — Sediment Core and Geological Context

Core stratigraphy, AMS ^{14}C ages, and lithologic logs confirming mid-Holocene (~ 4400 BCE) inundation at the KVT façade.

Appendix H — Wadi Geomorphology

Morphological mapping of the eastern Giza wadis (el-Jarf and Digla), demonstrating potential fluvial connectivity to the Nile floodplain during the mid-Holocene.

Appendix I — Paleoenvironmental Evidence

Synthesis of regional pollen, diatom, and isotopic ($\delta^{18}\text{O}$) datasets corroborating wetter mid-Holocene conditions consistent with sustained wadi discharge.

Appendix J — Reverse-Engineered Hydraulic Design of the Khafre–Sphinx Complex

Reconstructs the hydraulic logic governing the Khafre and Sphinx Valley Temples. By comparing ancient stratigraphy and architecture with modern coastal-engineering principles, this appendix demonstrates that the complex conforms to functional quay-design standards—establishing a reproducible engineering framework for the site’s original purpose.