**Geo-thermal-project:**

Check global temperatures for the past 39 years. In case of a Global Warming, the objective is to determine the leading contributing cause.

One hypothesis is the sun is in a moving rotating orbiting motion around the galaxy, the same way earth rotates in a variable orbital velocity and elliptical distance and/or path while performing gravitational orbiting motion around the sun. The shift or even a slight alteration in the revolution distance of earth-round-sun orbit causes the distance from the sun to earth shortened and triggers the increased warming effect on a year to year comparison basis.

Another hypothesis, the warming is caused by lower atmosphere trapped carbon dioxide gasses confining the heat radiation gases to the planets greenhouse, resulting in an increased warming effect.

Another hypothesis, the warming effect is caused by a combination of decreased distances between the sun and trapped greenhouse gasses. The question arises, which one of these factors contributes more to the global warming effect, if such effect even exists.

**Probable causes of possible global Temperature increases could be based/tested on the following relationships:**

* Alternating orbital positioning distance and/or (solar radiation) of sun to earth vs. time
* Alternating carbon emissions presence in atmosphere vs. time
* Orbital Positioning and/or(radiance) vs. Position (Temp)
* Carbon Emissions (CO2) vs. Distance earth-round-the-sun and/or Solar Radiation

**Obtain data sets:**

* Compare the preferable selective identical data with dates starting from: 01-01-1970 and ranging to: 01-01-2019.
* Compare the preferable selective identical data with 4 days in 4 Seasons for each year: Jan 1, Apr 7, July 4 and October 1.
* Compare the preferable selective identical data from a geo-point with the hottest maximum temperature for one of the 4 selected days in a 39-year period and temperatures for each of the 7 continents: North America, South America, Antarctica, Eurasia, Australia and Africa.

## The warmest points for 7 continents: Furnace Creek, Ca, (36.4580° N, 116.8709° W); Rivadavia, Argentina (45.8656° S, 67.4822° W); Esperanza base, Antarctica (63.3981° S, 56.9973° W); Tirat Zvi, Israel(32.4225° N, 35.5283° E); Oodnadatta, Australia( 27.5423° S, 135.4203° E); Kebili, Tunisia (33.7072° N, 8.9715° E)

* Compare the preferable selective identical data from a geo-point with the warmest maximum temperature for one of the 4 selected days in a 39-year period and temperatures for each of the 7 above selected geo-points to the Co2 concentration above each point in the lower atmosphere.

Compare the preferable selective identical data from a geo-point with the warmest maximum temperature for one of the 4 selected days in a 39-year period and temperatures for each of the 7 above selected geo-points to the solar distance and/or solar radiation.

**Obtain types of data sets in a 2nd Scenario(case of missing vital params):**

From 01-01-1970 to 01-01-2019

* Monthly (12 months) Global Average Temperature (Both Hemispheres)
* Monthly (12 months) Global Average Carbon (Co2) concentration in atmosphere
* Monthly (12 months) Average Distance or (radiance levels) earth to sun
* Actual annual full 360 Degree revolution orbital time vs set 365.0 days(Could be measured on month to month) comparison also called Sideral Period. The 360 Degree earths-round-sun orbit time annual fluctuation, could represent the distance fluctuation between a planet and a star. (Cannot find any present data)

Data ranges are preferred to remain set. In case of the source, the data set search parameters are able to match one another. Example: in case data in one of the sets becomes limited on dates with the available range starting 01-01-1978(instead of 01-01-1970); all other data sets, have to adjust and cross-reference 01-01-1978

**Here is one link** to Solar Positioning Algorithm, may help estimate sun/earth distance and the environment code is available for Python, I do want to look for additional sources as this link is offered by National Renewable Energy Lab, the formulation maybe biased. But for the sake of our limited resources and timely constraints, it can become useful.

Fraunhofer Institute for Solar Energy Systems ISE

The algorithm with the highest accuracy should be the Solar Position Algorithm (SPA) by the National Renewable Energy Laboratory (NREL) of the US.

A paper describing the algorithm is available from

[http://rredc.nrel.gov/solar/codesandalgorithms/spa/](https://www.researchgate.net/deref/http%3A%2F%2Frredc.nrel.gov%2Fsolar%2Fcodesandalgorithms%2Fspa%2F)

The code (written in C) is available from the same website after a registration.

(The paper is also available on researchgate:

<https://www.researchgate.net/publication/222533716_Solar_position_algorithm_for_solar_radiation_applications?)>

There are free versions in other programming languages avalibale too:

Python: [http://pysolar.org/](https://www.researchgate.net/deref/http%3A%2F%2Fpysolar.org%2F)

Matlab: [http://pvpmc.org/pv-lib/](https://www.researchgate.net/deref/http%3A%2F%2Fpvpmc.org%2Fpv-lib%2F)

An online calculator is avaible here:

[https://www.nrel.gov/midc/solpos/spa.html](https://www.researchgate.net/deref/https%3A%2F%2Fwww.nrel.gov%2Fmidc%2Fsolpos%2Fspa.html)

**World Meteorological Organization(WMO) site worth looking at:**

[**https://www.wmo.int/cpdb/**](https://www.wmo.int/cpdb/)

**Link to NASA data sets:**

<https://www.giss.nasa.gov/>

**Link to US Navy geocentric position, it is private, no access:**

<https://aa.usno.navy.mil/data/docs/geocentric.php>

Geocentric perihelion distance 2010 - 2026  
computed by MICA (Multiyear Interactive Computer Almanac by US Naval Observatory)

|  |  |  |
| --- | --- | --- |
| 2010 - 2026 | Distance / AU | Distance / km |
| Mean | 0.983,299,155 | 147.099,459 |
| Minimum | 0.983,243,565 | 147,091,143 |
| Maximum | 0.983,341,273 | 147,105,760 |
| Max. - Min. | 0,000,097,708 | 14,617 |
| (Max-Min)/Mean | 0.010 % | |
| Stand. Dev. | 0.000,026,692 | 3.993 |
| Stand. Dev. | 0.0029 % | |

**Link to NASA Solar Radiation and Meteorogical Data set:**

[**https://power.larc.nasa.gov/data-access-viewer/**](https://power.larc.nasa.gov/data-access-viewer/)

[**https://data.nasa.gov/Earth-Science/Surface-Meteorology-and-Solar-Energy/wn3p-qsan**](https://data.nasa.gov/Earth-Science/Surface-Meteorology-and-Solar-Energy/wn3p-qsan)

**World Weather Online, weather datasets:**

[**Worldweatheronline.com**](https://www.worldweatheronline.com/developer/api/)

**OpenWeatherMap, covered in class:**

[**https://home.openweathermap.org/api\_keys**](https://home.openweathermap.org/api_keys)