Sunshine Helper

What is it?

Sunshine Helper is an application currently in beta that will be released as open-source monetization-free software. (Beta link: https://testflight.apple.com/join/3kfWg7gi)

Why Vitamin D

The modern computer-age lifestyle of the western world, especially with COVID measures, can easily prevent us from getting the sun exposure that our bodies need to function properly.

Why Software

Creating and sharing software allows me to force-multiply, and help improve the health of friends/family/strangers throughout the world, which could add up to a significant impact.

It's not exactly transparent or easy to judge what constitutes "enough" sun exposure.

The number of variables involved with determining if you've gotten 'enough sun' for the day are difficult to track mentally, and the variation of 'how long' is big depending on those variables (i.e. summertime with shorts and a t-shirt it may take 5 minutes, wintertime fully covered may take hours)

https://www.climate-policy-watcher.org/ultraviolet-radiation-2/calculation-of-optimal-times-for-exposure-to-sunlight.html

Why Free & Open Source

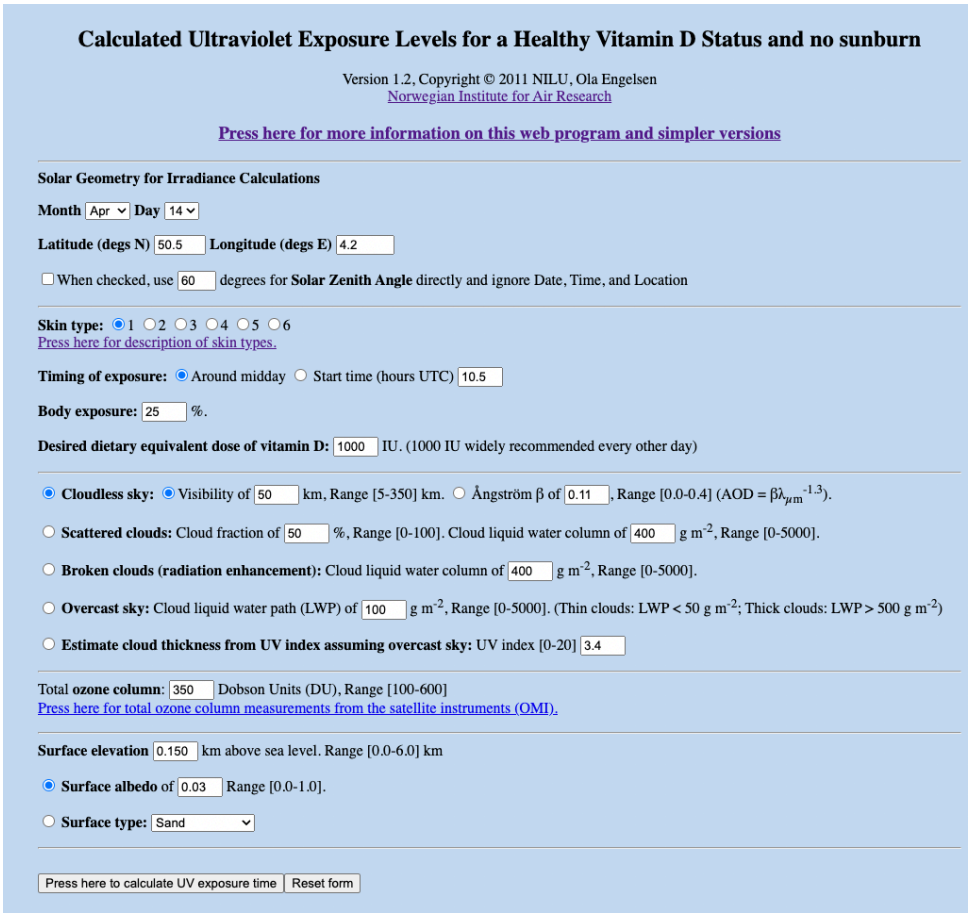
It's the right thing to do.

Everyone benefits when health education resources and tools are easily and freely available.

Everyone, but sick people and vulnerable people especially, should not be monetized or data-mined.

Software and technology that can be used, copied, improved, and shared lifts all of the collective boats of our world.

Design and functionality



Calculated Ultraviolet Exposure Levels for a Healthy Vitamin D Status and no sunburn

Version 1.2, Copyright © 2011 NILU, Ola Engelsen
Norwegian Institute for Air Research

Press here for more information on this web program and simpler versions

Solar Geometry for Irradiance Calculations

Month Apr **Day** 14

Latitude (degs N) 50.5 **Longitude (degs E)** 4.2

When checked, use 60 degrees for **Solar Zenith Angle** directly and ignore Date, Time, and Location

Skin type: 1 2 3 4 5 6
Press here for description of skin types.

Timing of exposure: Around midday Start time (hours UTC) 10.5

Body exposure: 25 %.

Desired dietary equivalent dose of vitamin D: 1000 IU. (1000 IU widely recommended every other day)

Cloudless sky: Visibility of 50 km, Range [5-350] km. Ångström β of 0.11, Range [0.0-0.4] (AOD = $\beta\lambda_{\mu m}^{-1.3}$).

Scattered clouds: Cloud fraction of 50 %, Range [0-100]. Cloud liquid water column of 400 g m^{-2}, Range [0-5000].

Broken clouds (radiation enhancement): Cloud liquid water column of 400 g m^{-2}, Range [0-5000].

Overcast sky: Cloud liquid water path (LWP) of 100 g m^{-2}, Range [0-5000]. (Thin clouds: LWP < 50 g m^{-2}; Thick clouds: LWP > 500 g m^{-2})

Estimate cloud thickness from UV index assuming overcast sky: UV index [0-20] 3.4

Total **ozone column**: 350 Dobson Units (DU), Range [100-600]
Press here for total ozone column measurements from the satellite instruments (OMI).

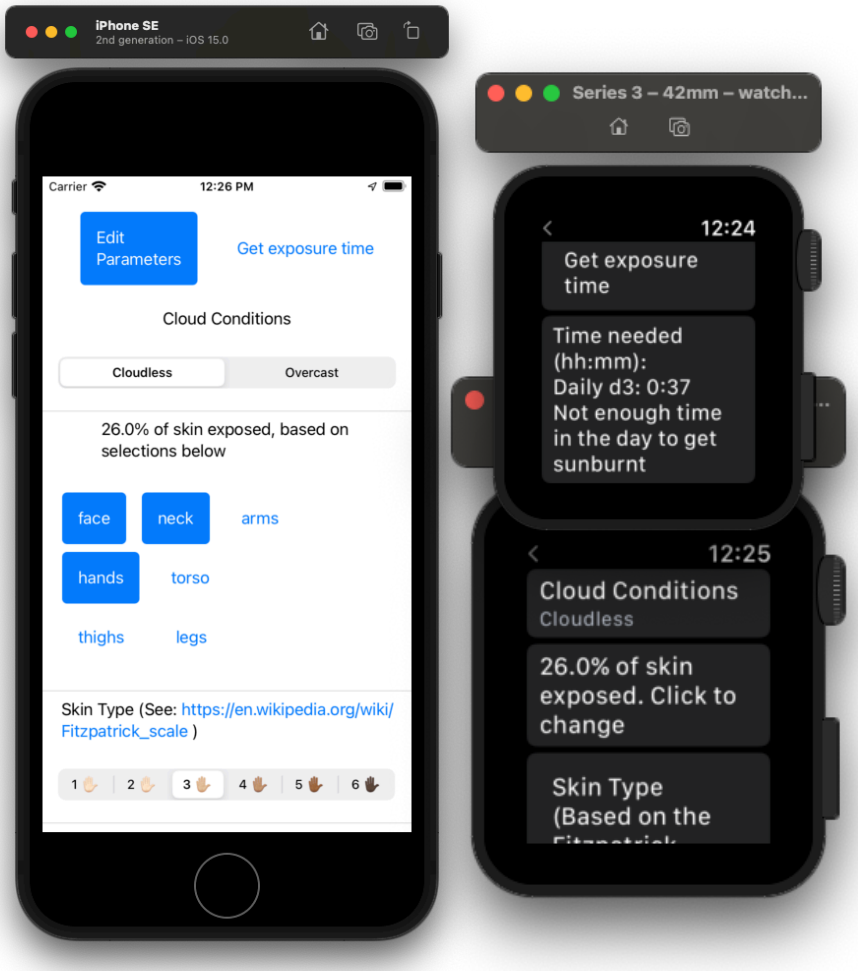
Surface elevation 0.150 km above sea level. Range [0.0-6.0] km

Surface albedo of 0.03 Range [0.0-1.0].

Surface type: Sand

Press here to calculate UV exposure time Reset form

This tool is incredibly accurate, adjustable, and is based on a great body of research, but it's very hard to use. (The research behind it is a great read: https://folk.nilu.no/~arve/publications/Engelsen2005.pdf)



I wanted the accuracy and flexibility, but with improved ease-of-use, so I started building out some UI and contextual data usage, while still using the same backend.

The academic research paper published by the author of the above tool is sufficient enough for recreating the backend locally to run on-device.

Integrating with that will allow data visualization, and integration against weather APIs.

The final stages I have planned involve tracking sun exposure sessions and providing notifications when a sufficient amount for d3 is achieved, and warning when sunburn may occur soon.

Progress/Feature Roadmap

- ~~Create wrapping API to call CGI of the web tool~~
- ~~Pull basic data from device that shouldn't require user input (time/date/location)~~
- ~~Add UI components for core functionality~~
  - ~~Fitzpatrick scale skin type~~
  - ~~Body parts/areas exposed to sun picker~~
  - ~~Sky Condition Picker~~
- ~~Adjust layout/components to allow decent UX on desktop/phone/watch~~
- Option for Daily notification reminder with amount of sun needed that day
- Add UI Components for manual cloud condition data entry
- Integrate against open weather API
- Add option to prefill sky conditions from weather API
- port simulation to native code for local computation
- Create UV exposure over the course of the day visualization / exposure start time picker
- Stopwatch for start/stop/pause exposure, and providing notifications during a session
- integrate with watchOS sensors to automatically detect the start of a session, and notify user to confirm.