



Temporal variation on the spherical albedo of the Earth from EPIC images

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- Introduction
- Web interface to the data
- Details of data production
- Collection of results



- We are producing the shortwave spherical albedo of the Earth from EPIC images
- Daily averages are offered from June 2016 onwards, and the data is updated daily
- The (shortwave) spherical (Bond) albedo of the Earth is the ratio between the reflected radiation from the Earth to the incident radiation on the Earth's disk
- Annual average of spherical albedo is estimated to be $29.5\% \pm 0.8\%$

Web interface to the albedo data

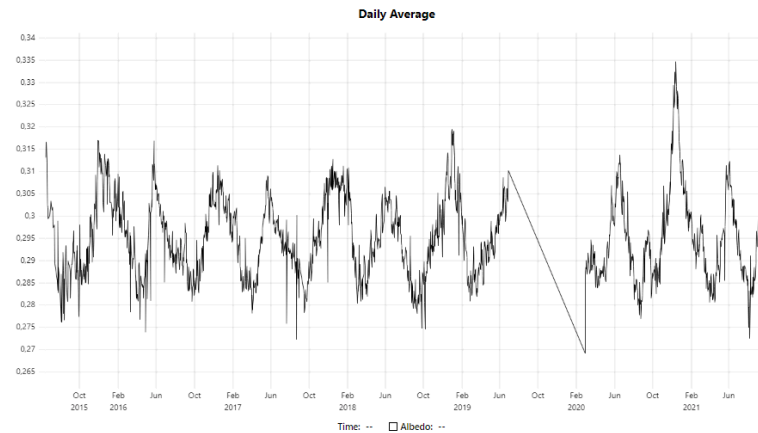


Earth Spherical Albedo

From DSCOVR/EPIC Satellite Images

Full albedo time series

From the start of the DSCOVR mission to the current date. The time series plot is automatically updated once per day with the latest EPIC images.



Browse individual values

Select year and month to see all the entries from that month.

2015 ← 2016 ← 2017 ← 2018 ← 2019 ←
2020 ← 2021 ←

| Timestamp | Albedo |
|-------------------------------|---------------------|
| Tue, 21 Sep 2021 12:00:00 GMT | 0.28172964762957886 |
| Mon, 20 Sep 2021 12:00:00 GMT | 0.27979914821130714 |
| Sun, 19 Sep 2021 12:00:00 GMT | 0.28126416914612874 |
| Sat, 18 Sep 2021 12:00:00 GMT | 0.2827611240848783 |
| Fri, 17 Sep 2021 12:00:00 GMT | 0.29043434049026606 |
| Thu, 16 Sep 2021 12:00:00 GMT | 0.28386809917839931 |
| Wed, 15 Sep 2021 12:00:00 GMT | 0.2844215904240802 |
| Tue, 14 Sep 2021 12:00:00 GMT | 0.2852418670473453 |
| Mon, 13 Sep 2021 12:00:00 GMT | 0.28696474789306437 |
| Sun, 12 Sep 2021 12:00:00 GMT | 0.2822101885248867 |
| Sat, 11 Sep 2021 12:00:00 GMT | 0.2871891791437133 |
| Fri, 10 Sep 2021 12:00:00 GMT | 0.29007555163897253 |
| Thu, 09 Sep 2021 12:00:00 GMT | 0.2915006392500183 |
| Wed, 08 Sep 2021 12:00:00 GMT | 0.291333867809621 |
| Tue, 07 Sep 2021 12:00:00 GMT | 0.29103140484340826 |
| Mon, 06 Sep 2021 12:00:00 GMT | 0.2924130296447906 |
| Sun, 05 Sep 2021 12:00:00 GMT | 0.2950742950687071 |

See <https://albedo.physics.helsinki.fi/>

Graphs and tabular data of the daily albedo



- Python-scripts running once per day, fetching the latest EPIC images, running the analysis, and updating the website
- For each EPIC image, compute the albedo of every pixel
 - Get land/ocean category from IGBP map
 - Run custom cloud detection for each pixel
 - Cloud detection done using channels 325, 551, and 780 nm in logistic regression model
 - Separate models for land and ocean pixels
 - Use CERES ADM models to convert EPIC radiances into integrated ToA albedos
 - Simplified and interpolated ADM tables for [1] clear land, [2] clear ocean, and [3] cloud-covered surface, observed close to backscattering
 - Average over Earth's disk
 - Correct with current Earth-Sun distance

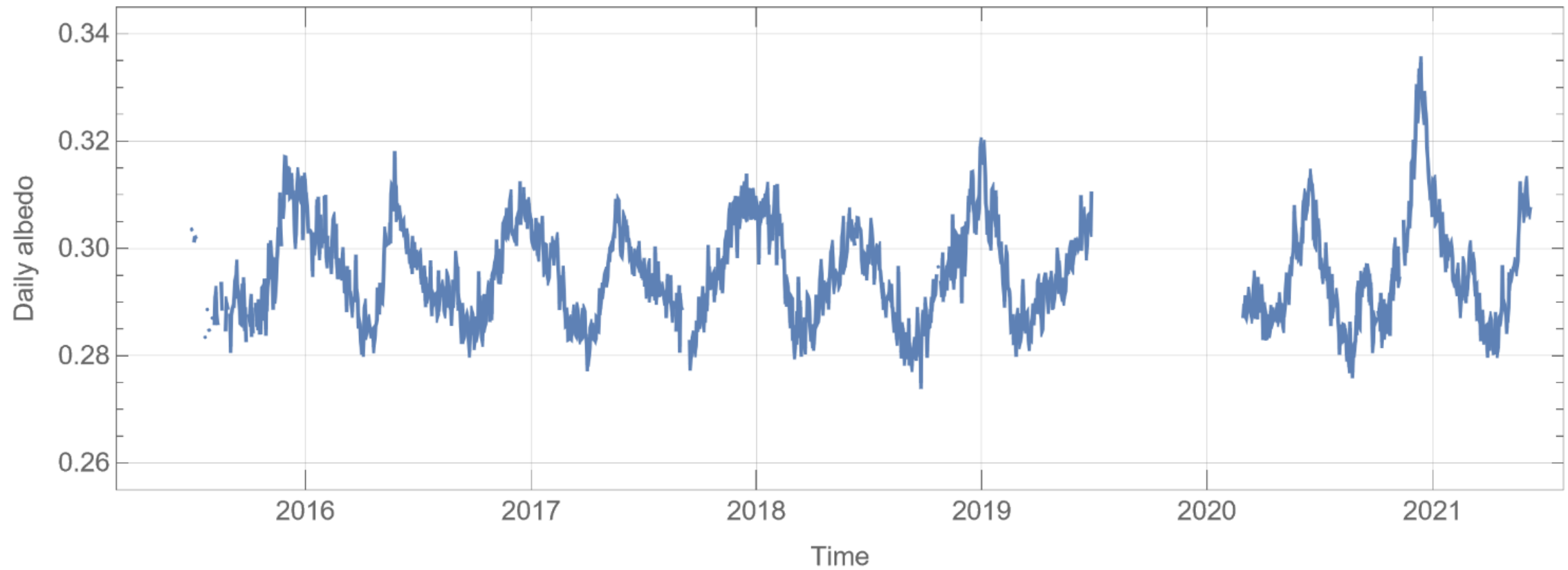
For the daily average albedo

- Average over EPIC albedos over the day
- Filter out if too much missing data for that day — biased to only some parts of the Earth

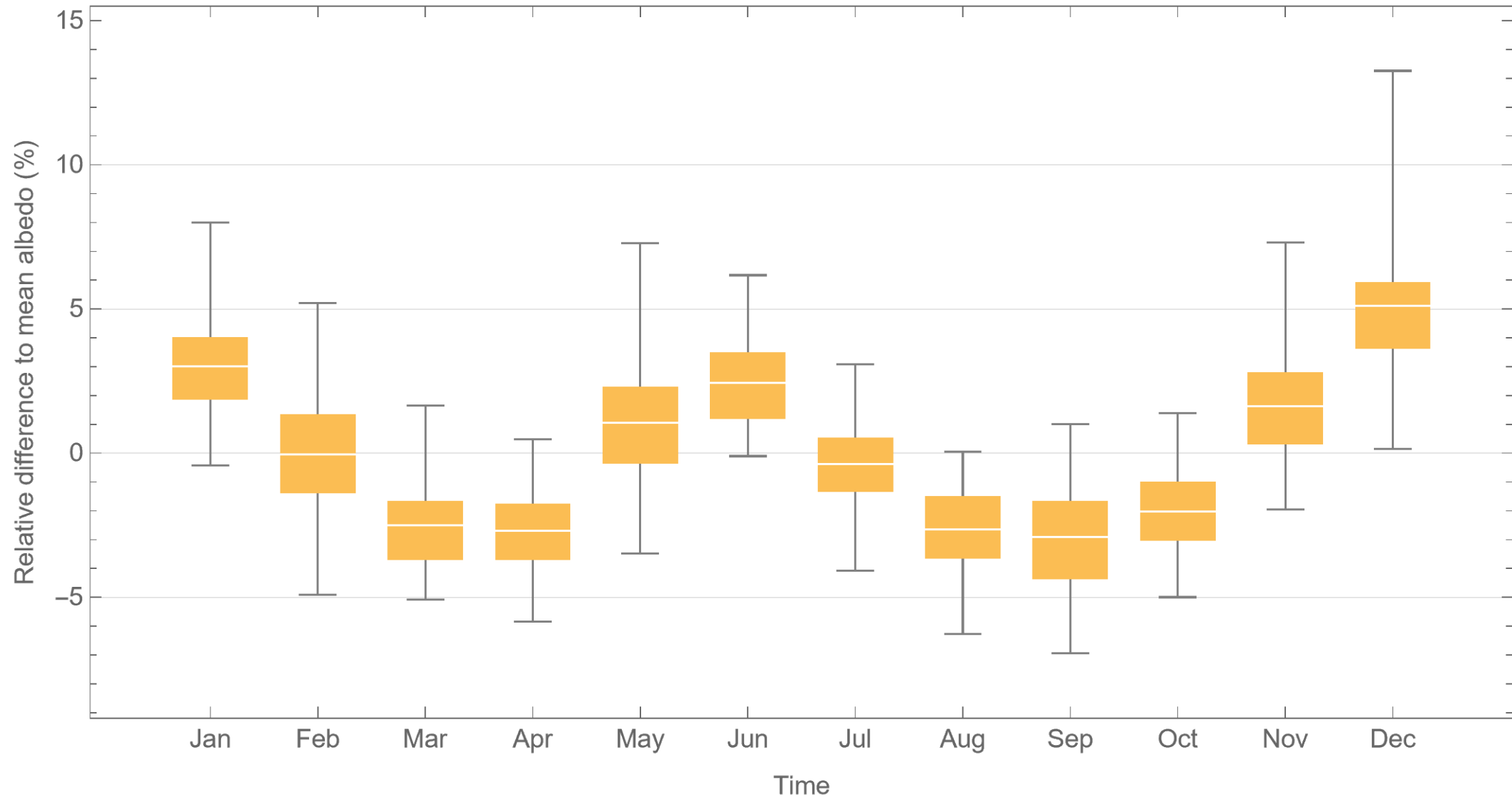
For the annual average albedo

- Average first over day-in-year — avoid bias due to different number of values in different years for some days
- Then, average over day-in-year to get annual average albedo

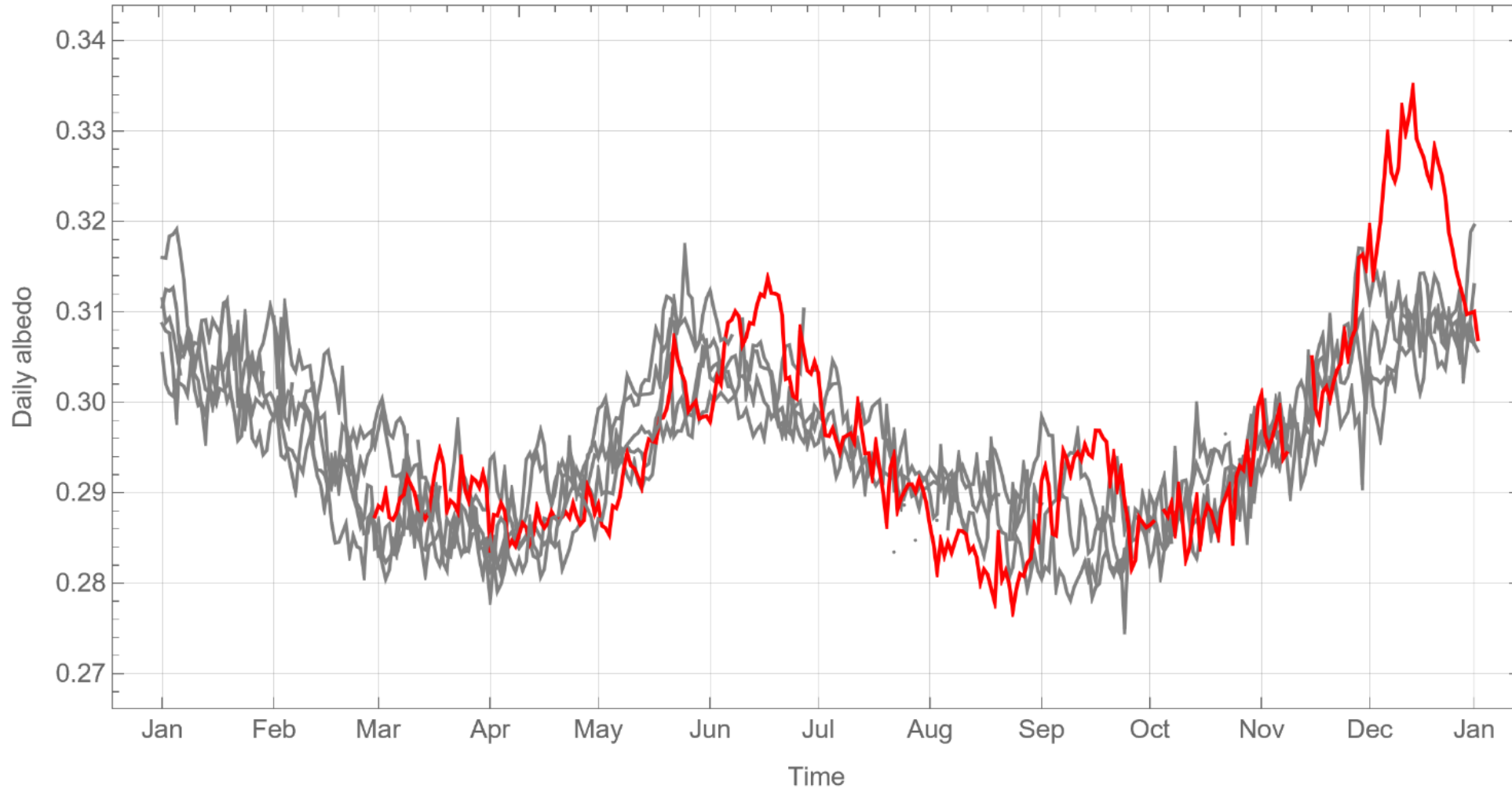
Result – time series of Earth's spherical albedo



Average variation over a year



Year 2020, especially January 2020



Red line – year 2020
Gray lines – other years

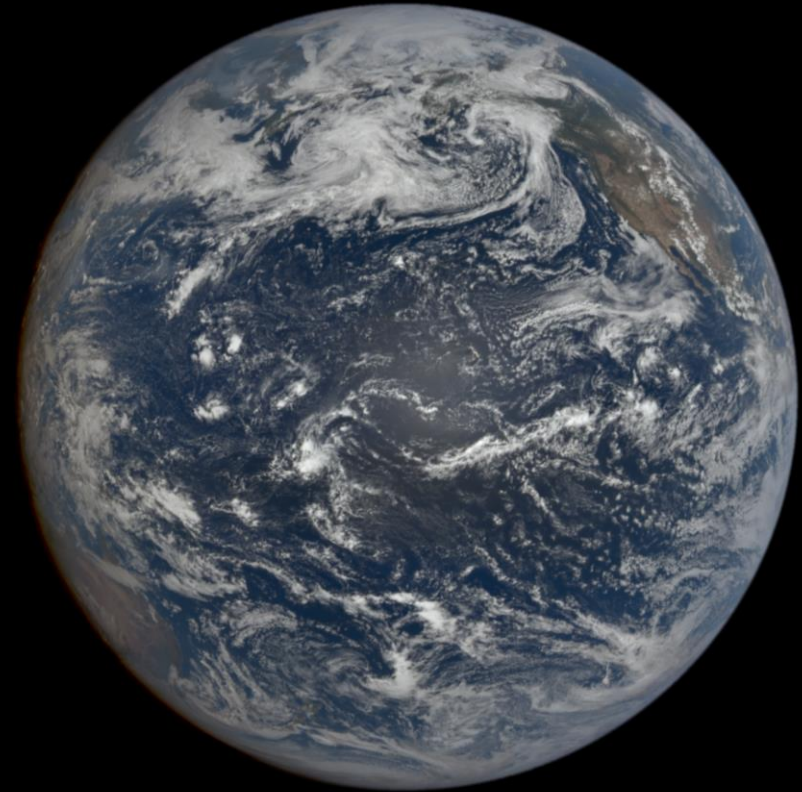
What is causing high or low albedo values



Highest albedo, 0.350 (2020-12-13 at 04:40 UCT)

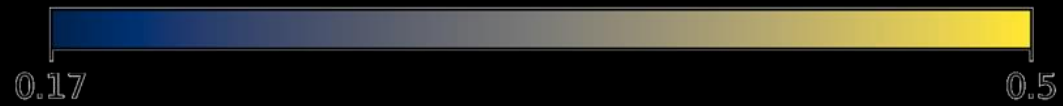
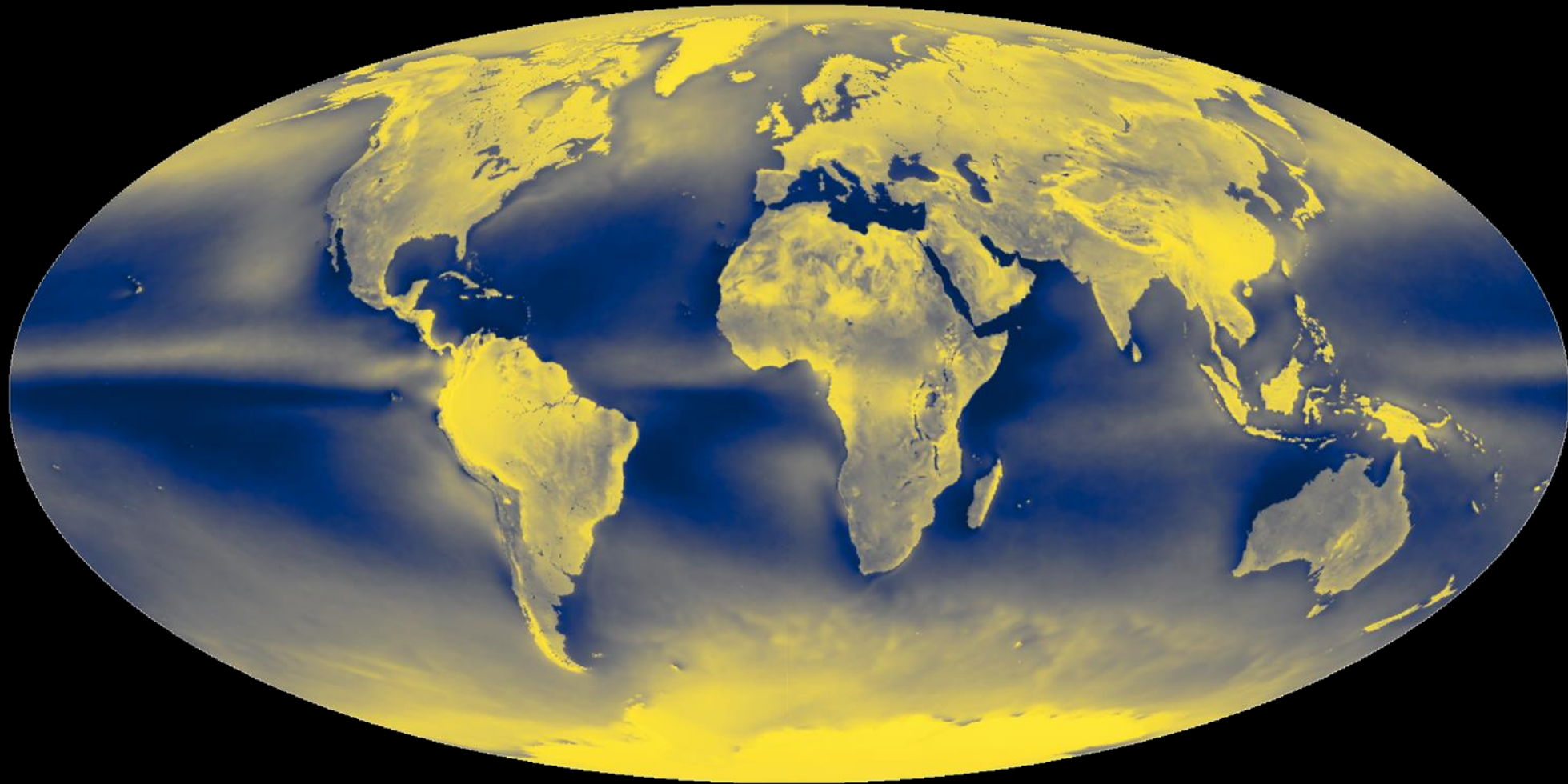


Lowest albedo, 0.253 (2020-08-04 at 22:25 UCT)

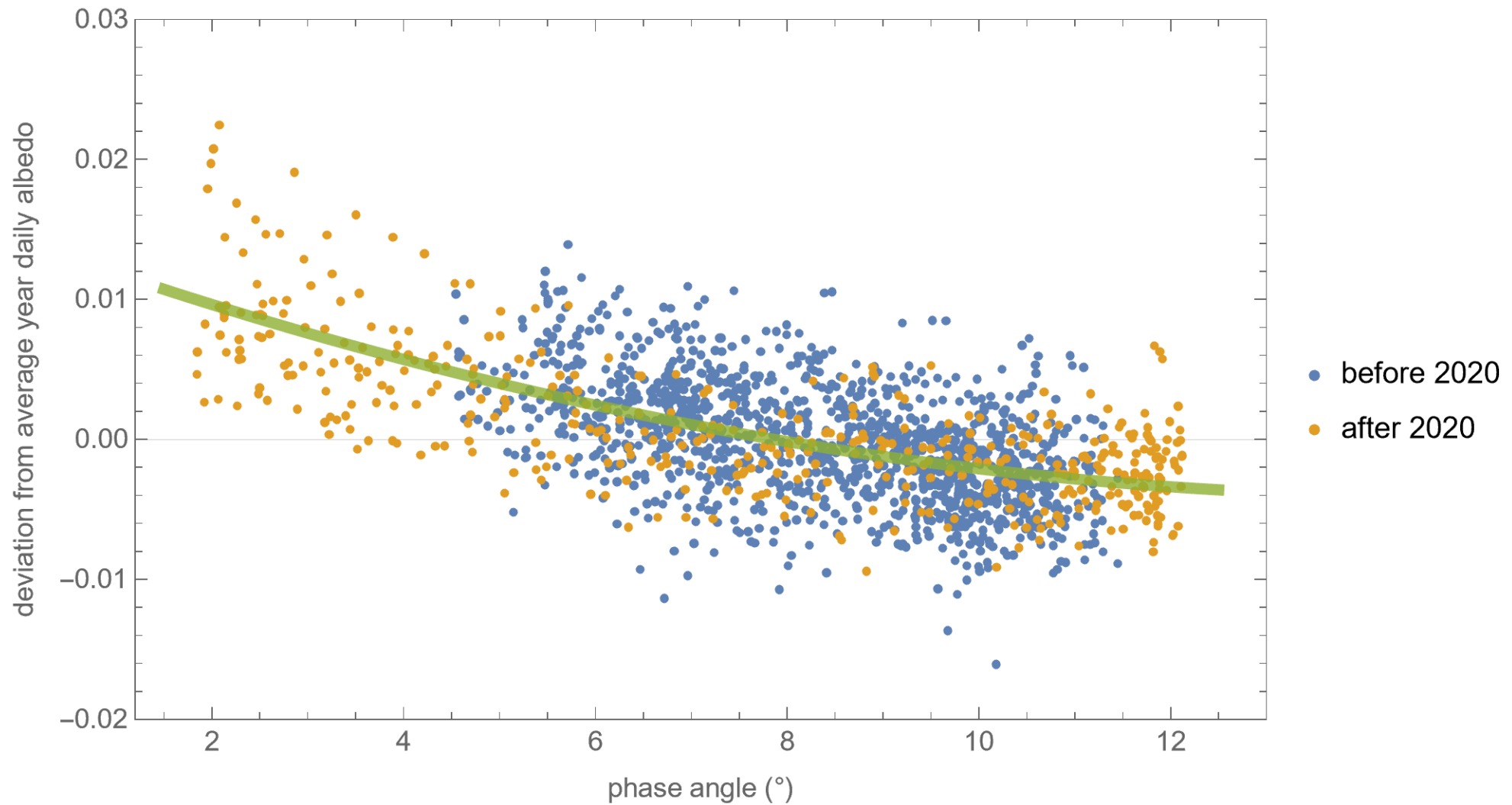


Short answer — clouds

Map of Earth's average albedo over 2015–2021



Sun-EPIC phase angle can have influence on the derived albedo values





Thanks for you attention

