Characterizing the confidence in a gap-free static atlas of monthly-averaged BRDF parameters derived from MODIS MCD43C1 v5

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Introduction

Earth's surface reflectance is a key variable for various geoscience topics including Earth's radiative budget.

The bidirectional reflectance distribution function (BRDF) models the isotropic and anisotropic parts of reflectance. It is constructed with specific kernels weighted by 3 parameters (f_{iso}, f_{vol} & f_{geo}) that depend on the surface's physical properties (Roujean et al. 1992).

MCD43C1 is a BRDF-parameter dataset derived from satellite-based measurements produced by the Moderate Resolution Imaging Spectroradiometer (**MODIS**).

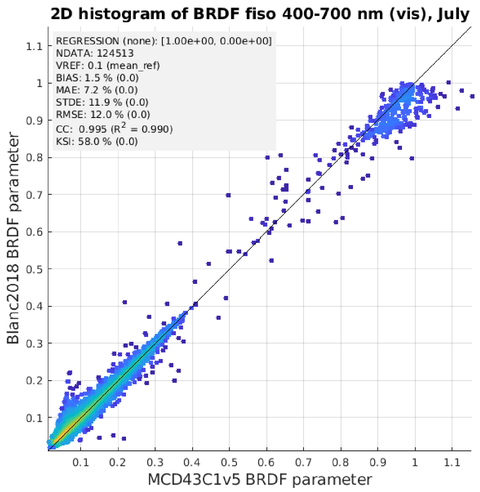
This dataset contains a **large fraction of blank pixels**, especially because of cloud cover and polar night. **[Blanc et al., 2018]** propose a **gap-free version of MCD43C1 v5**, averaging, on a monthly basis, several years of original data. The new product is composed of **12 monthly-averaged world maps of each BRDF parameter for the 10 spectral bands in MCD43C1**.

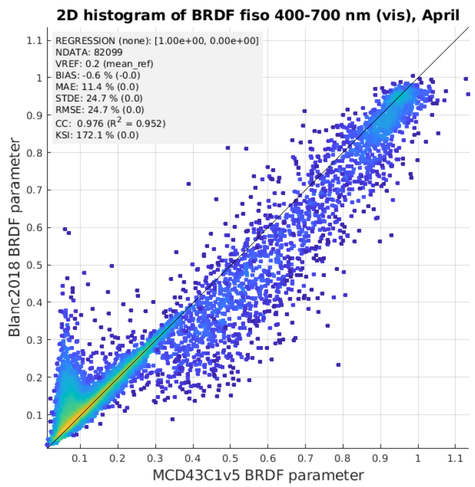
Is this approach valid? Can interannual and intra-monthly variabilities of reflectance be neglected?

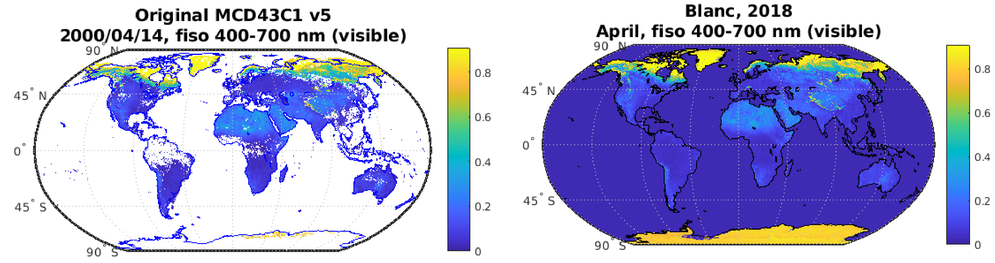
	MCD43C1 v5	Blanc, 2018
Time period	2000 -	**1** typical year (2004-2011 average)
Gap-free maps	✗	✓
Temporal averaging	16 days	1 month
Time step	8 days	1 month
Spatial resolution	0.05° x 0.05°	0.05° x 0.05°
10 spectral bands	✓	✓
3 BRDF parameters	✓	✓

Methods

Discrepancies between MCD43C1 v5 and [Blanc et al., 2018] products are analyzed. A random selection of 10 million valid data in MCD43C1 has been drawn between 2000 and 2013. A linear temporal interpolation is applied to [Blanc et al., 2018] data, monthly values being assigned to the 15th day of the calendar months.





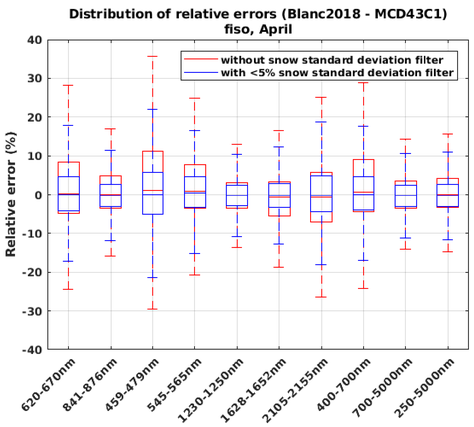


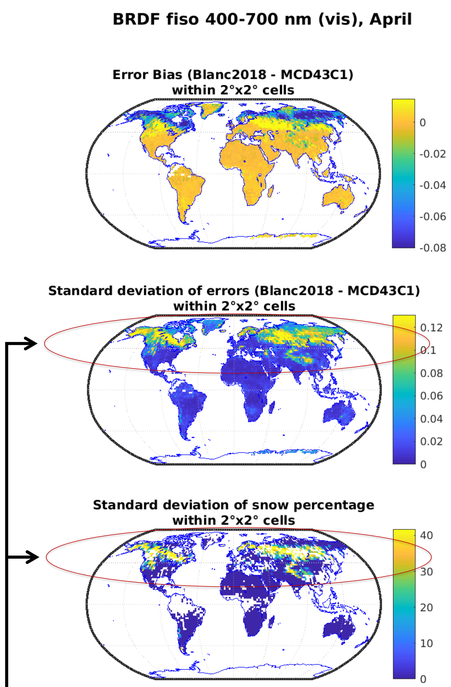
Main points

[Blanc et al., 2018] is in good agreement with MCD43C1, except some specific cases: most of error added by [Blanc et al., 2018] comes from regions with **high interannual and intra-monthly variabilities of snow cover** :

- Northern hemisphere's midlatitudes during winter
- Arctic regions during spring and fall
- Himalaya, Chile

Results shown here only consider the main BRDF parameter f_{iso}. An analysis has also been done on f_{vol} & f_{geo}, for which results can be shared on demand.





Errors from [Blanc et al., 2018] turn significant where snow cover has temporal variability*.

By removing data affected by significant snow cover temporal variability, we observe an improvement of relative errors for every spectral band.

*Snow percentage data come from MCD43C1 v5 product).

References

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- Blanc, P., Gschwind, B., Ménard, L., and Wald, L.: Monthly-averaged maps of surface BRDF parameters in ten spectral bands for land and water masses, *Earth Syst. Sci. Data Discuss.*, https://doi.org/10.5194/essd-2017-141, in review, 2018.

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