Comments from Public Consultation on ECV Requirements 13/01 – 13/03 2020 for:

# Albedo

## ECV Product: Spectral and Broadband (visible, near infrared and shortwave) DHR & BHR with associated spectral Bidirectional Reflectance Distribution Function (BRDF) parameters (required to derived albedo from reflectances).

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| **Name** | Spectral and Broadband (visible, near infrared and shortwave) DHR & BHR with associated spectral Bidirectional Reflectance Distribution Function (BRDF) parameters (required to derived albedo from reflectances). | | | | |
| **Definition** | The land surface albedo is the ratio of the radiant flux reflected from Earth’s surface to the incident flux.  Each spectral/broadband value depends  on natural   variations and is  highly  variable  in  space  and  time  as  a  result  of  terrestrial    properties    changes,    and    with    illumination    conditions. | | | | |
| **Unit** | N/A | | | | |
| **Note** | LENGTH OF RECORD: Threshold: 20 years; Target: > 40 years | | | | |
| **Requirements** | | | | | |
| **Item needed** | **Unit** | **Metric** | **[1]** | **Value** | **Derivation and References and Standards** |
| **Horizontal Resolution** | m |  | G | 10 | Due to the heterogeneous nature of terrestrial surfaces, having surface albedo at such scale will increase accuracy for further assimilation of local/regional climate model. |
| B |  |  |
| T | 250 | Enable assimilation in earth/climate model. |
| **Vertical Resolution** | N/A |  | G |  |  |
| B |  |  |
| T |  |  |
| **Temporal Resolution** | days |  | G | 1 | In order to be adequate in climate change services. Multi-angular instruments (including geostationary) and/or accumulation of daily data for BRDF parameters retrieval. |
| B |  |  |
| T | 10 | Same as above as mono-angular instrument  Enable assimilation in earth/climate model. |
| **Timeliness** | days |  | G | 1 | In order to be adequate in climate change services. |
| B |  |  |
| T | 5 | In order to be useful in NRT reanalysis. |
| **Required Measurement Uncertainty** |  | One standard deviation or error covariance matrix, with associated PDF shape (functional form of estimated error distribution for the term). | G | 3% for values higher than 0.05;  0.0015 for smaller values. | “A change of 1% to the Earth’s albedo has a radiative effect of 3.4 W/m2”  Over snow-free and snow-covered land, climate, biogeochemical, hydrological, and weather forecast models require this uncertainty. |
| B |  |  |
| T | 5%  for values higher than 0.05;  0.0025 for smaller values. | See Ohring, et. al. 2005. <https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-86-9-1303> |
| **Stability** | Rate of change of surface albedo over the available time period (per decade) | A factor of uncertainties to demonstrate that the ‘error’ of the product remains constant over the period, typically a decade or more (see background information). | G | < 1 % | ‘The required stability is some fraction of the expected signal’ (see Ohring, et. al. 2005. <https://journals.ametsoc.org/doi/pdf/10.1175/BAMS-86-9-1303>). “ |
| B |  |  |
| T | < 1.5 % | Same as above with Threshold value of uncertainty. |
| **Standards and References** |  | | | | |
| **Adaptation and Extremes** | | | | | |
|  | Relevant? (Yes/No) | Sugg. Req. sufficient? (Yes/No) | Explanation | | |
| **Adaptation[2]** | yes | yes | Due to the heterogeneous nature of terrestrial surfaces, change of vegetation cover apply a change in surface albedo and further the local and regional climate. | | |
| **Extremes[3]** | yes | yes | Extremes climatic events modify the exchanges between surface and atmosphere. | | |

[1]Goal (G); Breakthrough (B)(not mandatory, more as one possible); Threshold (T), for definitions see [Guidelines](http://tiny.cc/ecv-review)

[2] Is the ECV Product directly relevant to support Climate Adaptation?

[3] Can the ECV Product be used to monitor climate extremes or aspects of extremes?

### Comment 1

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| Author: ECMWF | Email: ecresgcosreqs@gmail.com |
| For modelling applications (both NWP and climate) it is important to characterize (1) the solar zenith angle dependence of albedo, and (2) the spectral variation, particularly for snow, ice and vegetation where the albedo in the UV/Vis and in the near infrared can be very different. ECMWF currently uses a MODIS dataset that does both of these things (https://www.sciencedirect.com/science/article/abs/pii/S0034425702000913). (Robin Hogan, ECMWF.)  Add a reference for monitoring extremes with the albedo: (Boussetta et al., 2015): Boussetta S., Balsamo G., Dutra E., Beljaars A., Albergel C. (2015) Assimilation of surface albedo and vegetation states from satellite observations and their impact on numerical weather prediction, Remote Sensing of Environment, pp. 111-126. DOI:10.1016/j.rse.2015.03.009 | |

### Comment 2

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| Author: MRI Scnatweb | Email: mountainresearchinitiative@gmail.com |
| In mountains Albedo is important for processes such as snow melt. Single scattering albedo (based on in-situ near surface and EO data) would be useful for trace gas and aerosol transport.  Based on discussions and preliminary outcomes of the GEO GNOME workshop for identifying ECVs to monitor and understand mountain climate change. More information on the workshop here: LINK. | |